
I put a lot of time into producing these files which is why you are met with the above when you open the file.

In order to generate this file, I need to:

1. Scan the pages (Epson 15000 A3 scanner)
2. Split the photographs out from the text only pages
3. Run my own software to split double pages and remove any edge marks such as punch holes
4. Run my own software to clean up the pages
5. Run my own software to set the pages to a given size and align the text correctly.
6. Run Omnipage (Ultimate) on all the pages to OCR them.
7. Generate a searchable Acrobat pdf file.

Hopefully after all that, I end up with a presentable file, though I can't guarantee there aren't errors in the OCR. If you find missing pages, pages in the wrong order, anything else wrong with the file or simply want to make a comment, please drop me a line (see above).

It is my hope that you find the file of use to you personally – I know that I would have liked to have found some of these files years ago – they would have saved me a lot of time !

Colin Hinson
In the village of Blunham, Bedfordshire.

Interim Technical Document
SPB 492

TELETEXT SPECIFICATION

(625 line television systems)

european broadcasting union

December 1992 **Geneva**

This document is intended to be the primary reference specification on teletext for European broadcasters. The original information contained was supplied to the EBU by Mr Bernard J. Rogers. Additions have been made to encompass optional codes of practice adopted nationally within certain countries of Europe. As explained in the Introduction, Supplements are available which extend this core documentation to include those features which comprise 'World System Teletext' (also known as CCIR Teletext System B). The EBU acknowledges the considerable contribution to the development of the World System Teletext specification made by Mr Rogers over many years.

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CONTENTS

ABBREVIATIONS

AL	Address Length
BCD	Binary Coded Decimal
CAF	Controlled Access Flag
CCIR	International Radio Consultative Committee
CEPT	Conference of Postal and Telecommunications Administrations
CI	Continuity Indicator
CRC	Cyclic Redundancy Check
DCLUT	Colour Look-up Table for Dynamically Redefinable Character Sets
DIDON	Diffusion de Données
DL	Data Length
DRCS	Dynamically Redefinable Character Sets
EBU	European Broadcasting Union
ECB	Electronic Code Book
ESCORT	EBU System of Classification Of Radio and Television Programmes
FLOF	Full Level One Facilities
IAL	Interpretation and Address Length
ISO	International Organization for Standardization
LUF	Label Up-date Flag
LUT	Look-up Table
MI	Mode Indicator
MJD	Modified Julian Date
PDC	Programme Delivery Control
PRF	Prepare-to-Record Flag
PTU	Pattern Transfer Unit
RI	Repeat Indicator
TOP	Table of Pages
UTC	Coordinated Universal Time

REFERENCES

[1] - CCIR Report 624-4, Characteristics of television systems, 1990, International Radio Consultative Committee, Geneva

[2] - CEPT Recommendation T/TE 06/01, Videotex Service, 1988, European Conference of Postal and Telecommunications Administrations, Bern

[3] - EBU Interim Technical Document, Teletext Specification (625 line TV Systems), Supplement 1 - The coding of Character Sets for syllabic writing systems for Sanskrit-like languages, European Broadcasting Union, Geneva

[4] - EBU Interim Technical Document, Teletext Specification (625 line TV Systems), Supplement 2 - Two-byte Character Coding - Han'gul (Korean) Alphabet Application, European Broadcasting Union, Geneva

[5] - EBU Interim Technical Document, Teletext Specification (625 line TV Systems), Supplement 3 - Two-byte character coding for ideographic characters, European Broadcasting Union, Geneva

[6] - EBU Interim Technical Document, Teletext Specification (625 line TV Systems), Supplement 4 - Musical Sound Data, European Broadcasting Union, Geneva

[7] - EBU Interim Technical Document, Teletext Specification (525 line TV Systems), European Broadcasting Union, Geneva

[8] - CCIR Recommendation 653-1, Teletext Systems, 1990, International Radio Consultative Committee, Geneva

[9] - EBU SPB 459, Specification of the domestic video Programme Delivery Control (PDC) system, Revision 2 February 1992, European Broadcasting Union, Geneva

[10] - ISO 9281-1:1990, Information Technology: Picture coding methods, Part 1 Identification, International Organization for Standardization, Geneva

[11] - ISO 8372:1987, Information Processing: Modes of operation for 64-bit block cipher algorithms, International Organization for Standardization, Geneva

[12] - ARD/ZDF/ZVEI Technical Directive No. 8 R 5: TOP system for teletext (TOP- Verfahren für Fernsehtext), Institut für Rundfunktechnik, München

[13] - ESCORT - EBU System of Classification Of Radio and Television Programmes, 1984, European Broadcasting Union, Geneva

[14] - DIDON uses Layers 1 to 4 of CCIR Teletext system C of [8]

LIST OF FIGURES

PART A: INTRODUCTION

This specification defines the application of CCIR Teletext System B to CCIR 625 line 50 field Television Systems D, B, G, H, I, K and L [1]. The System is optimised for broadcast media using cable, terrestrial and satellite transmission and the associated service and product environment. Reliable reception of data is ensured, since there is a good match between the service area defined for vision and sound reception and that provided for teletext data broadcasting.

The range of presentation and application features are arranged to be downward compatible. This permits initial services to be defined and existing services to be upgraded, without rendering equipment already in the field obsolete.

The data is organised in a manner optimum for broadcast media by using the rigid timing framework of the television signal. When multiplexed with a video waveform, this permits a fixed relationship to be provided between the data bytes on a television signal data line and locations in the decoder memory. Using this relationship, error identification and correction are available, matched to the statistical occurrence of bit errors.

Critical control data and addressing information are protected by Hamming coding. Basic data is protected by using parity checks. Complete blocks of data may be checked for accuracy using Cyclic Redundancy Check words and these may also be used to provide error correction.

The system provides a presentation layer using alpha-mosaic and DRCS (Dynamically Redefinable Character Sets) character coding. In addition to the characters, a full range of colours can be downloaded providing a colour map with four colour tables, each including eight colours. The presentation features and range of display attributes include those of the CEPT Videotex Presentation Layer Syntax [2], with which they are fully compatible.

A range of display formats is available, from 40 to 160 characters per displayed row and up to 101 rows per page.

The facility to invoke the presentation of characters of any writing system or language, or a mixture of such systems is available. This specification includes the coding for latin based, Greek, Cyrillic and Arabic alphabets. Where appropriate the character repertoires and coding structures of the ISO are used. Associated EBU publications specify the coding for syllabaries [3 & 4] and idiographic [5] scripts and language requirements that use hybrid combinations of them, plus the coding of musical notes [6].

Alphageometric and Alphaphotographic presentation layers are provided, using the coding methods standardized by the ISO and the service profiles adopted by the CEPT.

In addition to the basic text and graphics display presentation, a wide range of other applications can be supported.

Convenient user access to editorially specified pages and structured groups of pages can be provided by a page linking protocol, transmitted in a special page linking data packet. This permits selected pages to be displayed by a single key stroke, rather than the use of a multi-digit page number. An Inventory Page for each Magazine is provided to optimise memory use in decoders having large storage capacity.

Data relating to the total service on a given channel is carried in a dedicated Broadcast Data Service packet. This packet carries the address of an initial teletext page to be accessed and stored automatically on switch-on or channel selection. Date and time in standardized form are also included with provision for a displayable service message.

To permit applications such as the automatic control of video recorders, the broadcast service data packet includes data identifying the origin of a broadcast programme, the Network Identification and a programme label. A method of labelling broadcast programmes is provided using a first announced transmission time for compatibility with existing services. The label is intended for association with published programme information using any medium including printed pages, broadcast data and teletext pages. When teletext pages are used, simple programme selection with a cursor is provided by associating machine codes in a dedicated data packet with the displayed items.

The data for transmission can be scrambled to provide access control for Closed User Groups or Subscription User Groups. The descrambling keys can be addressed to individual users or groups of users by an "over air" addressing system, as can credit tokens for "Pay per View" services. Both scrambling and addressing functions are of very high security and reliability.

A parallel EBU publication specifies the application of the system to CCIR 525 line 60 field television systems [7].

PART B: TRANSMISSION CODING OF TELETEXT IN ANALOGUE COMPOSITE-CODED TELEVISION SYSTEMS

1. TV Lines Usable as Data Lines

Subject to availability, see Figure 1.

1.1 When Multiplexed with a Composite Video Signal

Lines 7 to 22 and 320 to 335.

Note: In some countries lines 7, 318 and 319 may also be used.

1.2 When not Multiplexed with a Composite Video Signal

Any, except field sync and equalising pulse periods.

2. Data Identification

Clock Run-In and Framing Code in appropriate time slot, see Section 9.

3. Signalling Method

Binary NRZ.

4. Data Signal Levels (Negative Modulation)

0 Level Black Level ±2%.
1 Level 66(±6)% of the difference between Black Level and Peak White Level.

5. Bit Rate

444 x nominal f_H (6.9375Mbit/s ±25ppm).

6. Data Timing Reference

Peak Level of penultimate 1 of clock run-in, see Figure 1.

Note: Nominally, the data is inserted with the point of reference at 12.0μs after the half-amplitude point of the leading edge of the line synchronising pulse. However, it may be necessary to depart from this to allow for the retiming of the synchronising pulses on some Networks, particularly as a result of sync reprocessing in some transmitters, so as to ensure that the timing of the data as transmitted is always within the allowable tolerance range (see also [8]).

7. Spectrum of Data Pulses

Skew symmetrical about 0.5 x bit rate, substantially zero by 5MHz.

8. Data Line Content

360 bits as 45 bytes of 8 bits each.

9. Synchronisation

See Figure 2.

9.1 Clock Run-In (bit sync)

Bytes 1 and 2, begins 10101010...even parity.

9.2 Framing Code (byte sync)

Byte 3, 11100100, even parity.

10. Page Format Data Addressing

See Figures 2 and 3.

10.1 Packet Numbers X/Y When Y=0 to Y=29

Bytes 4 and 5 Hamming Protected.
3 bits define Magazine Number X.
5 bits define Packet Number Y.
4 bits Hamming Protection in each byte.

10.2 Page Header Data Lines

Packet numbers X/0, see Figure 2.

10.3 Page Addressing

The Page Address consists of a Page number and a Page Sub-code. The Page Address may take any value as defined in Sections 10.3.1 and 10.3.2 except:

(i) The address FE 3F7E is reserved for use as the default address for the Magazine Inventory Page, see Section 12.5.

(ii) The address FF 3F7F is defined as a Null Page Address and shall not be transmitted in a page header packet Y=0, see Sections 12.2.2, 12.4.2, 13.2.2, 13.3.2, 15.6, and Appendix 5.

10.3.1 Page Number

Bytes 6 and 7 Hamming Protected.
4 bits data plus 4 bits Hamming Protection in each byte.

10.3.2 Page Sub-Code

Bytes 8, 9, 10 and 11 Hamming Protected. 4 bits data plus 4 bits Hamming protection in each byte.
Byte 9 bit 8 is Control Bit C4, see Section 11.1.1, and Figure 2.
Byte 11 bits 6 and 8 are respectively Control Bits C5 and C6, see Sections 11.1.2, 11.1.3, and Figure 2.

Note: See Appendix 5 for Code of Practice for application.

10.4 Page and Magazine Packet Relationships

Following the Page Header Packet with Y=0 of a given page, all subsequent packets with Y=1 to Y=28 inclusive, from the same magazine relate to that same page.

The transmission of a given page begins with, and includes, its Page Header Packet (Y=0). It is terminated by and excludes the next Page Header Packet (Y=0) having the same magazine address but, including the sub-code, a different page address.

Any Packets with Y=29 relate to all pages with the included magazine address and not to a specific page.

Any Packets with Y=30 and Y=31 are not page- or magazine-related.

PART C: PRESENTATION LEVEL ONE

11. Basic Level One: 7-Bit Syntax

Decoder Responds to:

a) Packet numbers X/0 to X/23.
b) Pages 00 to 99, coded BCD.
c) Page Sub-Codes. The 4 digits can take values in the ranges 0 to 3, 0 to 9, 0 to 7 and 0 to 9 respectively.
d) Optionally to packet numbers X/24 to X/29 and 8/30.

The use of this 7-bit syntax is invoked by the data in Packet X/28, see Figure 11. This data may be omitted for some applications, where the 7-bit syntax is used exclusively or is the default condition.

11.1 Control Bits in Page Header Packet X/0 (see Figure 2)

C4 to C14 are active on being set to 1.

Bytes 12 and 13 contain C7 to C14, Hamming protected; for C4 to C6 see Section 10.3.2.

11.1.1 C4 Erase Page

Page to be erased, see Appendix 6.

11.1.2 C5 News Flash

All characters intended for display inset into the TV picture, shall be boxed.

Note: Decoders operating in "mixed" mode also display non-boxed characters.

11.1.3 C6 Sub-Title

All characters intended for display inset into the TV picture, shall be boxed.

Note: Decoders operating in "mixed" mode also display non-boxed characters.

11.1.4 C7 Suppress Header

Header display to be suppressed.

11.1.5 C8 Update Indicator

Following data may be limited to include only updated part of page (see Appendix 6).

11.1.6 C9 Interrupted Sequence

Associated page is not in numerical order of page sequence, allowing the header to be excluded from a rolling header display to avoid discontinuities.

11.1.7 C10 Inhibit Display

Data addressed to rows 1 to 24 is not to be displayed.

11.1.8 C11 Magazine Serial

Magazines are transmitted one at a time in sequence.

11.1.9 C12, C13, C14

No response, see Section 14.

11.2 Page Display

The conventional text page displays 24 rows of 40 characters, with an optional header row which includes 32 characters. A further "commentary row" may be displayed at the top or bottom of the page.

11.2.1 Rows Displayable

24, optionally 25 in Data Packet numbers X/0 to X/24, top to bottom of a magazine X page.

11.2.2 Character-Spaces in Rows 1 to 24

40; transmitted from left to right.

11.2.3 Character-Spaces in Page Header Row 0

32; transmitted from left to right.

11.3 Character Bytes

7 bits plus odd parity bit define a display or control character occupying a character-space.

11.4 Character Sets for Display

a) 94 alphanumeric characters plus SPACE and DELETE as a default G0 set, see Figures 15, 21, 22, 23 and 27.

b) 63 block mosaic characters plus SPACE and 32 alphanumeric characters as a default G1 set. The mosaic characters are displayed with their elements either contiguous or separated, see Sections 11.5.4, 11.5.5 and Figure 18.

Selection between character sets is by means of control characters, see Section 11.5.

11.5 Control Character Set for Spacing Controls Including Display Attributes

Set of 32 control characters, 5 without response at level 1. The decoder defaults to specified attributes at the start of each display row. Some controls have effect immediately, others at the following character-space. The action of a control persists until the end of a row or until the transmission of a further control that modifies its action. See Figure 20.

11.5.1 Foreground Colour

White; Yellow; Cyan; Green; Magenta; Red; Blue. Invoked with the selection of an alphanumeric or mosaic character set. See Figure 20.

11.5.2 Black Background

Invoked by control character 'Black Background'.

11.5.3 New Background

Control character causes the obtaining foreground colour to be adopted as background colour.

11.5.4 Contiguous Mosaic Graphics

Mosaic blocks adjoin one another.

11.5.5 Separated Mosaic Graphics

Each mosaic block is surrounded by a border of the background colour.

11.5.6 Hold-Mosaic

A Held-Mosaic character is displayed in place of the character SPACE corresponding to a control character. The held-mosaic character is defined only during the period when the mosaic character set is invoked. It is the mosaic character with bit 6=1 in its code, most recently transmitted before the control character in the 'held-mosaic' position, provided that there has been no intervening change of display mode, normal/double height or alphanumeric/mosaic. The held-mosaic character is displayed in the original contiguous or separated form.

11.5.7 Conceal

Following characters are to be displayed as SPACES until revealed by a decoder or user operation.

11.5.8 Flash

Following characters are to be displayed normally or as SPACES in alternation, under the control of a timing device in the decoder.

11.5.9 Boxing

Part of a page is to be inserted into the normal television picture. Protection against false operation is provided by double transmission of the control characters, with action taking place between them.

11.5.10 Double Height

Characters are to be stretched vertically to occupy in addition the corresponding character-space in the display row with the next higher address; that row adopts the same display attributes as the previous row and the data in a packet addressed to that row shall be ignored. See also Section 14.5.2.

12. Ancillary Text Related Data

12.1 Linked Pages Related to a Given Page and Intended for Automatic Storage or Processing in the Decoder

Data carried by Packet X/27, see Figure 3. For recommended transmission order of Packets with Y=26, 27, and 28 see Appendix 1.

12.1.1 Clock Run-In, Framing Code and Packet Address

Bytes 1 to 5 as Sections 9 and 10.

12.2 Linked Page Addressing for Exclusively Editorial Applications - Designation Codes

Byte 6, 4 bits data plus 4 bits Hamming protection. Codes 0000 to 0011 designate editorially linked page function and are used as sequence labels for a number of Packets X/27, see Figure 3. For an application example see Appendix 4.

12.2.1 Linked Page Addresses, Designation Codes 0000 to 0011

Bytes 7 to 42 as 6 groups of 6 bytes. Each group of 6 bytes defines a linked page address, the groups are numbered 0 to 5 in order of transmission. See also Section 12.2.3.

12.2.2 Data Group Format Defining an Editorially Linked Page

6 bytes containing:

Relative Magazine Number :	3 bits
Page Number :	8 bits
Page Sub-Code :	13 bits
Hamming Protection :	24 bits

For bit sequence see Figure 3.

When no particular page number is to be specified, the page number FF is transmitted. When no particular page sub-code is to be specified, page sub-code 3F7F is transmitted. When the code FF3F7F is transmitted no page is specified. See also Appendix 5.

12.2.3 Editorial Link Control and Display Row 24 Flag

Byte 43, 4 bits data plus 4 bits Hamming Protection

12.2.3.1 Link Control Data Bit Format

Bit 1	Bit 2	
0	0	Pages not Chained
1	0	Start of Chain of Pages
0	1	End of Chain of Pages
1	1	Within Chain of Pages

Bit 3

0	Data Intended for Direct Display
1	Data for Processing of Variable Length

For pages of data for processing that are chained, link address 0 with designation code 0000 is the next page in the chain. Other link addresses with designation code 0000 and all link addresses in packets with designation codes 0001 to 0011 specify the addresses of starting pages of chains of pages that include data for processing. Chains may be identified by the designation code and the linked page address.

Data bits 1, 2 and 3 above may be reserved for future standardization, when there are no requirements for existing services and products.

12.2.3.2 Display Row 24 Flag

Bit 4:

Set to '0'	Data in packets with Y=24 is not to be displayed.
Set to '1'	Data in packets with Y=24 is to be displayed in row 24.

12.3 Basic Page Check Word

Bytes 44 and 45 of packets with the Designation Code 0000 will contain a Cyclic Redundancy Check on data in packets X/0 to X/25.

For Check Word generation see Figure 8.

12.4 Linked Page Addressing for Compositional Applications

Byte 6, 4 bits data plus 4 bits Hamming protection. Codes 0100 to 0111 designate linked pages function for compositional applications and are used as sequence labels for a number of packets X/27.

12.4.1 Linking Data

Bytes 7 to 42 as 6 groups of 3+3 bytes, each including 18 bits data plus 6 bits Hamming protection. Bytes 43 to 45 include 18 data bits set to '0' plus 6 bits Hamming protection.

12.4.2 Data Group Format Defining a Compositional Linked Page

6 bytes containing:

Relative Magazine Number	3 bits
Page Number	8 bits
Page Sub-Code	13 bits
Link Control Data	12 bits
Hamming Protection	12 bits

For bit sequence and interpretation of the Link Control Data, see Figure 3.

When no particular page number is to be specified the page number FF is transmitted. When no particular page sub-code is to be specified page sub-code 3F7F is transmitted. When the code FF3F7F is transmitted no page is specified and the link control data bits are set to '1'.

12.5 Magazine Inventory Page

This page provides an inventory of the page addresses and number of pages for each address that is currently active in the included magazine. The data is primarily intended to assist memory management in decoders with multipage storage facilities. The data is not intended for direct display, but display can be provided when suitable processing is available.

The data is carried by a page with an address and sub-code defined in an associated packet with Y=29 or with the default value FE3F7E (see Figure 6 part 2).

12.5.1 Clock Run-In, Framing Code and Packet Address

Bytes 1 to 5 as Sections 9 and 10.

12.5.2 Page Header Packet Y=0

12.5.2.1 Control Bits in Header Packet X/0

(see Appendix 6)

Set as follows:

C4	Erase Page	Set as required
C5	News Flash	Set to 0
C6	Sub-Title	Set to 0
C7	Suppress Header	Set to 1
C8	Update Indicator	Set as required, complete page shall always be transmitted
C9	Interrupted Sequence	Set to 1
C10	Inhibit Display	Set to 1
C11	Magazine Serial	Set as required
C12, C13, C14		Have no function in this application and may have any value.

12.5.2.2 Character-Spaces in Page Header Row 0

Suppress Header Control Bit is to be set, the data bytes corresponding to the 32 character-spaces are reserved.

12.5.3 Inventory Data

Carried by packets X=1 to X=16, bytes 6 to 37. Bytes 38 to 45 and Packets 17 to 28 are reserved.

12.5.3.1 Data Format (see Figure 6 part 1)

The Data bytes 6 to 37 of packets with Y=1 to Y=16 are used as 16 two byte data words. Each byte contains 7 active bits plus a parity bit. The position of the data word in the packet and the packet number define a page address. The first data word in the packet with Y=1 corresponds to page 00. The sequence proceeds through the packets with the penultimate data word in the packet with Y=16 corresponding to page FE.

The final data word in the packet with Y=16 is a continuity indicator, transmitted least significant bit first and incremented at every change in the content of the inventory page.

12.5.3.2 **Data Word**

The 14 data bits, commencing with the least significant bit, are allocated as follows:

(a) Number of pages currently included with the defined page address 13 bits.
Maximum number of pages 8190.
Set to all 0s, no pages with this address are included in the service. Nevertheless, pages with this address may be transmitted for other applications.
Set to hexadecimal 0001, only one version of the page with this address is included, it has sub-code 0000.
Set to hexadecimal 0002, two versions of the page with this address are included, default sub-codes 0001 and 0002.
The sequence proceeds to hexadecimal 1FFE, specifying that 8190 versions of the page with this address are included.
Set to hexadecimal 1FFF, reserved.

b) Memory Allocation Flag 1 bit
Set to 0, pages include features such as animation and dynamic effects and should not be stored in separate locations.
Set to 1, for optimum user access, memory space may be reserved.

13. **Broadcast Service Data**

Packet 8/30, transmitted approximately once per second or more frequently if required by the service.

For bit sequence see Figure 3.

13.1 **Clock Run-In Framing code and Packet Address**

Bytes 1 to 5 as Sections 9 and 10.

13.2 **Format 1 Packets**

Packets shall be transmitted within the field blanking period immediately preceding the boundary between clock-seconds.

13.2.1 **Designation Code**

Byte 6, 4 bits data plus 4 bits Hamming protection:

First data bit set to 0 designates multiplexed function as in Section 1.1. First data bit set to 1 designates non-multiplexed function as in Section 1.2.
Data bits 2, 3 and 4 set to 0 designate the functions in Sections 13.2.2 to 13.2.8.

13.2.2 **Initial Teletext Page for Storage in Decoder without User Action**

Bytes 7 to 12 containing:

Absolute Magazine Number	3 bits
Page Number	8 bits
Page Sub-Code	13 bits
Hamming Protection	24 bits

When no particular page number is to be specified, the page number FF is transmitted. When no particular page sub-code is to be specified the page sub-code 3F7F is transmitted. When the code FF3F7F is transmitted, no page is specified.

13.2.3 **Network Identification**

Bytes 13 & 14: The permanently assigned code uniquely defines the network.

13.2.4 **Time Offset Code**

Byte 15: Defines offset, in half hour units, between local time and Co-ordinated Universal Time (UTC). Negative offsets are West of Greenwich. See Figure 4.

13.2.5 **Modified Julian Date**

Bytes 16 to 18: 5 digit number defining Modified Julian Date (MJD) incrementing daily at midnight UTC. Reference point is 31 January 1982, MJD 45000. See Figure 4.

13.2.6 **Co-ordinated Universal Time**

Bytes 19 to 21: 6 digit number defining Co-ordinated Universal Time. The transmission relates to the next following second. See Figure 4.

13.2.7 **1st Short Programme Label**

Bytes 22 and 23: 16 bits define a Programme Label for the currently transmitted programme.

13.2.8 **2nd Short Programme Label**

Bytes 24 and 25: 16 bits define a Programme Label for the currently transmitted programme.

13.2.9 **Status Display**

Bytes 26 to end of packet: This group is coded with odd parity characters from the default primary character set and where appropriate using the characters common to the range of options. It is intended to display a transmission status message.

13.3 Format 2 Packet

When format 1 packets are also present in a given transmission, the data in bytes 7 to 12 and 26 to the end of the packet shall be the same for both formats. Application information for the data in Section 13.3 is included in [9].

13.3.1 Designation Code

Byte 6, 4 bits data plus 4 bits Hamming protection:

First data bit set to 0 designates multiplexed function as in Section 1.1. First data bit set to 1 designates non-multiplexed function as in Section 1.2.
Data bit 2 set to 1 and data bits 3 and 4 set to 0 designate the functions in Sections 13.3.2 to 13.3.7

13.3.2 Initial Teletext Page for Storage in Decoder without User Action

Bytes 7 to 12 containing:

Absolute Magazine Number	3 bits
Page Number	8 bits
Page Sub-Code	13 bits
Hamming Protection	24 bits

When no particular page number is to be specified, the page number FF is transmitted. When no particular page sub-code is to be specified the code 3F7F is transmitted. When the code FF3F7F is transmitted, no page is specified.

13.3.3 Label Channels, Label Up-date Flag and Prepare-to-Record Flag. (see Figure 5 for Bytes 13-26)

Byte 13, 4 bits data plus 4 bits Hamming protection:

Bits 1 and 2 Label Channel Identifier, indicates to which of four parallel data channels the associated label applies.
Data bit 3 Label Update Flag (LUF), set to '1' indicates that the associated label does not relate to the current television programme, but is intended to update the label memories in video recorders. This provides a method of signalling that the programme which is ending its transmission on a particular channel, is being transferred, perhaps after a period of interruption, to another channel. It may also provide a new label for a programme which is postponed beyond the end of the time window of validity of its original label.
Bit 4 Prepare-to-Record Flag (PRF) indicates to a "waiting" PDC recorder, when set to one, that the programme to which the label applies is about to start but has not yet commenced, and, when reset to zero, that the programme has commenced.

13.3.4. Programme Control Status, Sound Channel Mode and PDC Mode Indicator

Byte 14, 4 bits data plus 4 bits Hamming protection:

b1	b2	
0	0	Status not defined
0	1	Monophonic Sound
1	0	Stereo Sound
1	1	Dual Channel Sound

Bit 3: PDC Mode Indicator (MI), set to 1 indicates that the end of transmission of a programme label coincides exactly with the end of transmission of the programme or that service codes take immediate effect. When set to zero, it indicates that recording should continue for 30 seconds after the programme label is no longer transmitted (and is replaced by another valid label), or that the effect of service codes is delayed by 30 seconds.

13.3.5 Programme Identification Data

Bytes 15 to 23, each 4 bits data plus 4 bits Hamming protection. Comprises data bits 1 to 36.

13.3.5.1 Country Identification Data

Data bits 1 to 4 define the row in the code table of Figure 29. For column definition see Section 13.3.5.4.

13.3.5.2 Network Identification or Programme Provider Data

Data bits 5 and 6 define the final 2 bits of the Network Identification or Programme Provider Data Word. For first 6 bits see Section 13.3.5.5.

13.3.5.3 Programme Identification Label

Data bits 7 to 26 identify a programme by its announced transmission date and time:

Bits 7 to 11	Date Day
Bits 12 to 15	Date Month
Bits 16 to 20	Time Hours
Bits 21 to 26	Time Minutes

The complete Label shall be ignored if a value of 3 for the hours units is exceeded when the hours tens has a value of 2, the value of the hours units exceeds 9, the value of the hours tens exceeds 2. This restriction shall not apply when the month has the value 13 or 14 in which case the complete label consists of an arbitrary number. When the month has the value 15 special application-dependent meaning applies to the complete label.

13.3.5.4 Country Identification Data

Data bits 27 to 30 define the column in the code table of Figure 29. For row definition see Section 13.3.5.1.

13.3.5.5 Network Provider or Programme Data

Data bits 31 to 36 define the first 6 bits of the national Network Identification or Programme Provider Data Word. The allocation of codes is the responsibility of national authorities. For final 2 bits see Section 13.3.5.2.

13.3.6 Programme Type/Series Code Data

Bytes 24 and 25, each 4 bits data plus 4 bits Hamming protection.
The groups of 4 bits represent respectively the first and second digits of a hexadecimal number, each group transmitted least significant bit first. The hexadecimal numbers represent entries in the table of Figure 30. When all 8 data bits are set to 0 no Programme Type or Series Code is defined.

13.3.7 Status Display

Bytes 26 to end of packet. See Section 13.2.9.

PART D: PRESENTATION LEVEL TWO

14. Additional Character Repertoires and Display Attributes

Decoder responds as Level 1 plus Packets X/26 and X/28.

For recommended transmission order of Packets with Y=26, 27 and 28 (see Appendix 1).

14.1 Control Bits in Page Header Packet X/0 (see Appendix 6)

14.1.1 C4 TO C11

As Level 1, see Sections 11.1.1 to 11.1.8.

14.1.2 C12, C13 and C14 Primary Character Set Options

Decoder displays text using one of eight options related to the designated or default Primary Character Set, see Figures 14, 17, 25 and 26:

Option Number	C12	C13	C14
1)	0	0	0
2)	0	0	1
3)	0	1	0
4)	0	1	1
5)	1	0	0
6)	1	0	1
7)	1	1	0
8)	1	1	1

14.2 Page Display

14.2.1 Rows Displayed

As Level 1 Section 11.2.1.

14.2.2 Character-Spaces in Display Rows 1 to 24

As Level 1 Section 11.2.2.

14.2.3 Character-Spaces in Display Row 0 Page Header

As Level 1 Section 11.2.3.

14.3 Data Bytes

Carried by Packets with Y=0 to Y=29

14.3.1 Data Packets Other Than Where Y=26, 28 or 29.

As Level 1 Sections 11.3, 12 and 13.

14.3.2 Data Packets Where Y=26, 28 or 29

For these packets, following the clock run-in, framing code, magazine and packet address, there is a designation code in byte 6. The following data is used as a sequence of three-byte groups comprising 18 data bits and 6 Hamming protection bits. For applications see Section 14.6 to end of Section 14.

Packets with Y=26 address a character location within a page. They can invoke a character set and write it in the display. They can also invoke a character set and a latching shift. The character sets may be either display or attribute control characters.

Packets with Y=28 define the coding method and error protection. They also designate character sets and dynamically redefine the colour map.

Packets with Y=29 designate aspects of the display that apply to the magazine defined in the address of the packet with Y=29.

14.4 Character Sets for Display

Four Character Sets, in G0, G1, G2 and G3 code tables may be designated using the data in packets with Y=28, or may be defined as default sets. They are invoked by the data in packets with Y=26.

Each designated G0 set may have up to 8 options defined. These are invoked by the Page Header Control Bits C12, C13 and C14.

See Figure 14 for character set identification.

14.5 Control Character Set for Spacing Controls Including Display Attributes

Set of 32 Control Characters, action as Level 1, see Section 11.5, except as defined in Section 14.5, see also Figure 20.

14.5.1 Foreground Colours

As Level 1 plus black, see Section 11.5.1 and Figure 20.

14.5.2 Size Attributes

Double-Height characters extend downwards, the origin of a character is the upper character position. The double-height and double-size controls are inactive on the bottom row of the defined display area, and the bottom row of a scrolling region.

The whole of a enlarged character is displayed with the attributes that apply to the origin of the character.

Parts of enlarged characters are not displayed: the double-width and double-size controls are inactive in the last character position of a display row.

Attributes set at obscured character positions do not take effect if they would break any of the above rules.

The application of one SIZE attribute control terminates the action of any other SIZE attribute.

At Level 2, where double height or double size characters are included in a given display row, data may be addressed to the row with the next higher address and shall be processed normally, taking into account the above rules. In the absence of such data, the attributes of the previous row are adopted.

14.5.2.1 Double Width

Characters are to be stretched horizontally, to occupy in addition, the next character-space.

14.5.2.2 Double size

Characters are to be stretched horizontally and vertically, to occupy in addition, the character-spaces as in Sections 11.5.10 and 14.5.2.1.

14.6 Character Set Extension and Non-Spacing Control Characters for Display Attributes

Uses Packets with Y=26 to overwrite any character-space. The original character and attribute condition is the editor-defined fallback for Level 1 decoders.

For recommended transmission order of packets with Y=26, Y=27 and Y=28, see Appendix 1.

14.6.1 Clock Run-In, Framing Code and Packet Address

Bytes 1 to 5, see Sections 9 and 10.

14.6.2 Designation Code

Byte 6, 4 bits data plus 4 bits Hamming protection.

Codes 0000 to 1111 are sequence labels for up to 16 packets with Y=26 associated with a given page.

14.6.3 Data Groups

Bytes 7 to 45, as 13 groups of 3 bytes each.

14.6.3.1 Data Group Bit Allocation Format A (Note: other formats are used for non-alphabetic writing systems)

(see Figure 3 part 1)
6 bits for display address
5 bits for mode description
7 bits data
6 bits Hamming protection

14.6.4 Display Addressing - Display Rows 1 to 24

6 display address bits, as in Section 14.6.3 provide 64 combinations. The decimal values 0 to 39 specify character-spaces along a given display row. The decimal values 41 to 63 specify a display row, 1 to 23, value 40 specifies row 24.

A character-space is thus defined explicitly by a data group including a row address, followed by one or more character position data groups.

Although the character-spaces are explicitly addressed, the data groups in Packets with Y=26 shall be transmitted in display order, left to right, top to bottom of the display area.

14.6.4.1 Display Addressing - Display Row 0

The Row Group Mode Description Bits are set to 00111. The row address is set to correspond to row 23 (decimal value 63). Following data groups with display addresses in the range decimal 8 to 39 specify character-spaces in row 0.

When the 7 data bits are set to "0" no Full Row Colour is invoked. When data bits 6 and 7 are set respectively to "01", data bits 1 to 5 define the Full Row Colour according to Figure 12. Other settings of bits 6 and 7 and the associated interpretation of bits 1 to 5 are reserved.

The decimal values 40 to 62 shall not be used. Should they occur the associated three byte data group shall be ignored.

Although the character-spaces are explicitly addressed, the data groups in Packets with Y=26 of this type shall be transmitted in display order, left to right, of the display area.

14.6.5 Display Colours

The Foreground and Background colours of a character cell take precedence over the Full Row and Full Screen colours. Transparent Foreground and Transparent Background colours cause the Full Row or Full Screen colour to be displayed. Full Row colours take precedence over Full Screen colours. Transparent Full Row and Transparent Full Screen permit the display of the video picture where the Foreground and Background colours are also transparent.

14.6.5.1 Foreground Colour

For a character displayed at a character space addressed as in Section 14.6.4. The Mode description bits (see Figure 10) are set to 00000. Data bits 1 to 5 define the Foreground Colour according to Figure 12, when data bits 6 and 7 are set to 0. The effect of this attribute persists to the end of a display row unless overridden by a further control defining the Foreground colour.

14.6.5.2 Background Colour

For a character displayed at a character space addressed as in Section 14.6.4. The mode description bits (see Figure 10) are set to 00011. Data bits 1 to 5 define the Background Colour according to Figure 12, when data bits 6 and 7 are set to 0. The effect of this attribute persists to the end of a display row unless overridden by a further control defining the Background colour.

14.6.5.3 Full Row Colour Including Borders Outside Normal Text Display Area

Invoked when the mode description bits (see Figure 9) of a row address are set to 00001. Data bits 1 to 5 define Full Row colour according to Figure 12. When data bits 6 and 7 are set to 0, the Full Row colour applies only to the addressed row. When data bits 6 and 7 are set to 1, the Full Row colour applies to the area from and inclusive of the addressed row to the bottom of the screen, unless overridden by a further Full Row colour control.

14.6.5.4 Full Screen Colour Including Borders Outside Normal Text Display Area

Invoked when the mode description bits (see Figure 9) of any row address data group are set to 00000. Data bits 1 to 5 define the Full Screen colour according to Figure 12, when data bits 6 and 7 are set to 0.

14.6.6 Character Sets

Default sets may be specified. Otherwise initial designation is by Packet 28, see Section 14.8, or Packet 29, see Section 14.9. See also Figures 11 and 14.

Designation is modifiable by the data in Packet 26, see Section 14.6.6.7.

Equipment intended for operation with only a single group of character sets may ignore this data.

14.6.6.1 Characters Including Diacritical Marks Composed from the Primary and Supplementary Sets

For display at a character-space addressed as in Section 14.6.4. The Mode Description bits, set at the range of values 10000 to 11111 respectively define diacritical marks from column 4 of the G2 supplementary character set, in ascending numerical order. The associated character from the G0 primary character set is defined by the 7 data bits.

Character sets are listed in Figure 14.

14.6.6.2 Characters from the Supplementary Set

For display at a character-space addressed as in Section 14.6.4. The Mode Description bits are set to 01111. The 7 data bits define a character from the supplementary character set.

Character Sets are listed in Figure 14.

14.6.6.3 Block Mosaic Characters (not smoothed)

For display at a character-space addressed as in Section 14.6.4. Mode Description bits are set to 00001. The 7 data bits define a character from the block mosaic character set, when it is the default G1 set or when designated as the G1 set.

14.6.6.4 Block Mosaic Characters (smoothed)

For display at a character-space addressed as in Section 14.6.4. Mode Description bits are set to 00010. The 7 data bits define a character from the smoothed block mosaic character set, when it is the default G3 set or when designated as the G3 set.

14.6.6.5 Latching Shifts to Designated Character Sets

From a display character-space addressed as in Section 14.6.4, Mode Description bits set to 00100 (see Figure 10), the first six combinations of the 7 data bits define one of the designated character sets. The latching shift persists until explicitly cancelled, the transmission of another group with Mode Description bits set to 00100 or the end of a display row. For other data bit combinations see Section 14.6.6.6.

14.6.6.6 Combined Character Set Invocation and Latching

From a display character-space addressed as in Section 14.6.4, Mode Description bits set to 00100 (see Figure 10). Data bit combinations 0000110 to 1111110 invoke and latch a character set defined in Figure 14. The latching shift persists until explicitly cancelled, the transmission of another group with Mode Description bits set to 00100 or the end of a display row.

14.6.6.7 Single Shift to Designated Character sets

At a display character-space addressed as in Section 14.6.4, Mode description bits set to 00101(see Figure 10). The first six combinations of the 7 data bits define one of the designated character sets. For other data bit combinations see Section 14.6.6.8.

14.6.6.8 Combined Character Set Invocation and Single Shift

At a display character-space addressed as in Section 14.6.4, Mode Description bits set to 00101 see Figure 10. Data bit combinations 0000110 to 1111110 invoke and shift to a character set defined in Figure 14.

14.6.6.9 Modified Character Set Designation

The character set designated into the G0, G1, G2 and G3 code tables may be modified from that of packets 28 or 29 by transmitting the Mode Description bits set respectively to 01000, 01001, 01010 and 01011 see Figure 10). The 7 data bits define a character set from Figure 14. The modified designation persists until the end of a display row or until further modification is signalled. It then reverts to the previously obtaining invocations defined in a packet with Y=28 or Y=29, or in the absence of such a packet with Y=28 or Y=29, to the default condition.

14.6.7 Display Attributes

These attributes can act together at a given character space. The action persists to the end of a display row and may be cancelled by the transmission of the same data group with the appropriate bit set to '0', or by a level 1 attribute control code. Invoked by the Mode Description bits set to 01100.

14.6.7.1 Mosaic Graphics Separated or Alphanumerics Underlined

Alphanumeric characters following this control character are displayed underlined and mosaic characters are displayed in the separated mode as in Section 11.5.5 until the receipt of a Cancel-Underline/Contiguous Mosaic Graphics control character or the end of a display row. Activated by data bit 6 set to 1.

14.6.7.2 Boxing/Window

The Boxing attribute acts as Level 1 when the control bits C5 or C6 in the page header packet are set to 1. When neither of these control bits is set to 1, at Level 2 this attribute has the "window" function. In this case it defines an area where the full screen colour becomes transparent, permitting any video picture to become visible, where the foreground and background colours are also transparent. Activated by data bit 2 set to 1.

14.6.7.3 Conceal

Action as Section 11.5.7 at a character space addressed as in Section 14.6.4. Activated by data bit 3 set to 1.

14.6.7.4 Marked Area

The Marked Area starts at a character space addressed as in Section 14.6.4. Activated by data bit 4 set to 1.

14.6.7.5 Invert

Action at a character space addressed as in Section 14.6.4. This attribute exchanges Foreground and Background Colours and inverts the phase of the flashing clock. Activated by data bit 5 set to 1.

14.6.7.6 Double Height

Action as Section 11.5.10 at a character-space addressed as in Section 14.6.4. Activated by data bit 1 set to 1.

14.6.7.7 Double Width

Action as Section 14.5.2.1 at a character-space addressed as in Section 14.6.4. Activated by data bit 7 set to 1.

14.6.7.8 Double Size

Action as Section 14.5.2.2 at a character-space addressed as in Section 14.6.4. Activated by data bits 1 and 7 both set to 1.

14.6.8 Additional Flash Functions

Action at a character-space addressed as in Section 14.6.4 invoked by mode description bits set to 00111.

Action of data bits:

b2	b1	
0	0	Steady
0	1	Normal Flash to Background Colour
1	0	Invert Phase of Flash to Background Colour
1	1	Flash to next Colour Table (1 to 2, 2 to 1, 3 to 4, 4 to 3)

b5	b4	b3	
0	0	0	Slow Rate 1Hz
0	0	1	Fast Rate 2Hz Phase 1
0	1	0	Fast Rate 2Hz Phase 2
0	1	1	Fast Rate 2Hz Phase 3
1	0	0	Incremental Flash, apparent movement to right, 2Hz
1	0	1	Decremental Flash, apparent movement to left, 2Hz
1	1	0	No action
1	1	1	No action

Incremental and Decremental Flash always start with Phase 1

The Invert attribute (see Section 14.6.7.5) applies whatever the condition and thus restores an Invert Flash, invoked as above, to Normal, and vice versa.

14.6.9 Scrolling

Invoked when mode description bits of a row address are set to 00101 (See Figure 9).

Data bits 1 to 5 define the colour of the scrolling region from the colour map. Data bits 6 and 7 are set to 0.

The last row of the scrolling region is defined by the mode description bits of a row address being set to 00110. In this case the data bits 1 to 5 define the Full Row colour from the next row to the border area inclusive. Data bits 6 and 7 are set to 0.

The scrolling function can only be activated when the page also includes a packet with Y=27, with the link control data indicating a chain of pages, see Figure 3 part 3. Data on the first page of a chain for display within the scrolling region and all subsequent pages of the chain may be scrolled through the region under user control. The first page may include data for display above and below the scrolling region. This data is to be displayed throughout the scrolling operation. Data to be scrolled may alternatively be carried on a pseudo page, see Section 15.5. The border of the scrolling region must not be crossed by a double height or a double size character. When the origin of such a character is scrolled out of the scrolling region, the complete character shall disappear from the display.

14.6.10 Cursor Display

The display of a cursor is activated by the transmission of the appropriate mode description row group with the bits set to 00100. The column position of the cursor 0 to 39, left to right, is defined by setting the data bits to correspond with the codes 4/0 to 6/7. Other codes are to be interpreted as 'No Cursor'.

14.6.11 Termination Marker

Since more than one packet with Y=26 may be needed to display a given page, a terminator is provided by setting the Row Address and Mode Description bits all to 1, in a data group occupying bytes 40, 41 and 42 in the final packet with Y=26. There is no response to the data in byte 42. Any unused data groups between the active data groups and the termination group shall be filled with repetitions of the data in the termination group.

14.6.12 Check Word for Packets with Y=26 and Y=28

The 18 data bits of the final three-byte data group in the packet with Y=26 with designation code 1111, have the two most significant bits set to '0' and a 16 bit Cyclic Redundancy Check on the data in packets with Y=26 and Y=28.

Generation of the check word is identical to that of Section 12.3 using the data in packets with Y=28 followed by that in packets with Y=26. The sequence assumes the presence of 16 packets with Y=28 and 16 with Y=26. It is completed by assuming that packets that are not present have the 18 data bits in each 3-byte data group set to '0'. When there is data in a packet with Y=28 but no data in packets with Y=26, only the Termination Marker, (see Section 14.6.11) and the Cyclic Redundancy Check Word will be carried by a packet with Y=26.

14.7 Colour Dynamic Redefinition

The Colour Map may be redefined, Colour Look-Up Table entries specified and an alternative Colour Table invoked for a given page, using data in packets with Y=28. For recommended transmission order of packets with Y=26, 27 and 28, see Appendix 1.

14.7.1 Clock Run-In, Framing Code and Packet Address

Bytes 1 to 5 as in Sections 9 and 10.

14.7.2 Designation Code

Byte 6, 4 bits data plus 4 bits Hamming protection. Data bits set to 0000.

14.7.3 Data Groups

Bytes 7 to 45 used as 13 groups of 18 bits data and 6 bits Hamming protection.

Bits 1 to 8 of the first group of 18 data bits in these packets with Y=28 are set to '0'. Bits 9 to 18 are set according to Figure 11.

The subsequent 12 groups of 18 data bits provide 16 data words of 12 bits each (see Section 14.7.3.1), followed by 4 data words of 5 bits (see Section 14.7.3.2), and a data word of 2 bits (see Section 14.7.3.3), plus two final bits set to '0'.

14.7.3.1 Colour Map Entry Coding

The 16 data words of 12 bits, each define a colour in the Colour Map of Figure 12, proceeding in transmission order from entry 16 to entry 31.

Each 12 bit data word includes 4 bits for each primary colour, red, green and blue, in the transmission order: RRRRGGGGBBBB, with ascending order of bit significance within each 4 bits.

14.7.3.2 Colour Look-Up Table (DCLUT) for Dynamically Redefinable Character Sets

The 4 data words of 5 bits each define, in order the 4 entries in the Colour Look-Up Table (DCLUT of Figure 12), for Dynamically Redefinable Character Sets (DRCS see Section 16). The transmission order is least significant bit first.

14.7.3.3 Invocation of Colour Tables for Use with Spacing Attributes

The 2 bit data word invokes one of the four Colour Tables to be used with spacing attributes, see Figure 12. The transmission order is least significant bit first.

14.8 Designation of Character Sets

Character Sets are designated to the Code Tables G0, G1, G2 and G3 and are defined using the data in packet X/28.

Equipment intended for operation with only a single group of character sets may ignore this data.

For the recommended transmission order of packets with Y=26, Y=27 and Y=28, see Appendix 1.

14.8.1 Clock Run-In, Framing Code and Packet Address

Bytes 1 to 5 inclusive, see Sections 9 and 10.

14.8.2 Designation Code

Byte 6, 4 bits data plus 4 bits Hamming protection. Data bits set to 0001.

14.8.3 Data Groups

Bytes 7 to 45 used as 13 groups of 18 bits data and 6 bits Hamming protection.

The first two data groups are used for this application. The remaining data groups are reserved.

14.8.3.1 Coding for Character Set Designation - Bit Allocation

The 18 data bits of the first three-byte data group are allocated as follows:

(1) Set to '0'	2 bits
(2) Character Set Code of G0 Table	7 bits, see Figure 14
(3) Set to '0'	1 bit
(4) Character Set Code of G1 Table	7 bits, see Figure 14
(5) Set to '0'	1 bit

The 18 data bits of the second three byte data group have the same allocation but (2) designates a G2 Code Table and (4) a G3 Code Table, see Figure 14.

The interpretation of the 7 character code bits is shown in Figure 14.

The bits are transmitted least significant bit first.

In the case of the G0 Set, up to 8 options may be designated with the G0 set and invoked by the page header control bits C12, C13 and C14, see Section 14.1.2.

The designation of character sets to an associated group of code tables must take into account the relationships between them, avoiding incompatibility.

Some codes in Figure 14 permit simultaneous designation of more than one G0 set. Each may have options specified, provided that the total number of options does not exceed 8.

14.9 Data Applicable to All Pages in a Magazine

Data applying to all the pages in a magazine is included in packets with Y=29. Where page applicable data is included in packets associated with a specifically addressed page, this shall take precedence over the corresponding data in packets with Y=29.

14.9.1 Clock Run-In, Framing Code and Packet Address

Bytes 1 to 5 as Sections 9 and 10.

14.9.2 Designation Code

Byte 6, 4 bits data plus 4 bits Hamming protection.

14.9.3 Colour Dynamic Redefinition

The Designation Code is set to 0000.

The Colour Map may be redefined, Colour Look-Up Table entries specified and an alternative Colour Table invoked for all pages in the magazine addressed by a packet with Y=29. The coding details follow those in Sections 14.7.1 to 14.7.3.3.

14.9.4 Designation of Character Sets

The Designation Code is set to 0001.

Character sets may be designated to the Code Tables G0, G1, G2 and G3 for all pages in the magazine addressed by a packet with Y=29. The coding details follow those in Sections 14.8.1 to 14.8.3.1.

14.9.5 Magazine Inventory Page

The Designation Code is set to 0100.

14.9.5.1 Data Groups

Bytes 7 to 45 as 13 groups of 18 bits data and 6 bits Hamming protection.

14.9.5.2 Page Address of Inventory Page

First 2 groups of 3 bytes containing:

Continuity Indicator	2 most significant bits
Set to '0'	1 bit
Page Number	8 bits
Page Sub-Code	13 bits
Continuity Indicator	12 least significant bits
Hamming Protection	12 bits

See Figure 6 part 2.
The remaining 3-byte data groups are reserved.

The Continuity Indicator shall have the same value as in the associated Inventory Page, see Section 12.5.3.1. When this form of a packet with Y=29 is transmitted but no Inventory Page is included, the page and sub-code addresses shall be set to FF3F7F and the Continuity Indicator to 0. The default address for this page when a packet with Y=29 is not transmitted is FE3F7E.

15. Pseudo Pages

Pseudo Pages carry data that is intended to be associated with a standard page or pages. To prevent independent display of a pseudo page without the associated page, control bits C7 (Suppress Header) and C10 (Suppress Display), in the header packet (Y=0) may be set to 1.

15.1 Linking to Pseudo Pages from an Associated Page

Linking to a pseudo page from the associated page is by means of the data in packet X/27 of the associated page (see also Section 12).

15.2 Clock Run-In, Framing Code and Packet Address

Bytes 1 to 5 as in Sections 9 and 10.

15.3 Overwriting Pseudo Pages

15.3.1 Designation of an Overwriting Pseudo Page

There shall be a packet X/28 with the Designation Code set to 0000.

The first group of 18 data bits shall be set designating the overwriting mode, see Figure 11. Other data bits set to '0'.

15.3.2 Invocation of Overwriting Modes

The default character set of an Overwriting Pseudo Page is the G0 primary character set that is the default, or that designated for standard pages. Other character sets may be invoked for a pseudo page, using packets with Y=28, designation code 0001, as in Section 14.8. Character sets are invoked by the transmission of the appropriate Row and Space Mode Description Groups in packets with Y=26 of the pseudo page, see Figure 9, 10 14, and Section 14.6. The invoked character set persists until the end of a display row or until overridden by the transmission of a further invocation in a packet with Y=26.

15.4 Scrolling Data from a Pseudo Page

When the scrolling function of Section 14.6.9 is activated, the data to be scrolled through the scrolling region may be carried by a pseudo page.

15.4.1 Designation of a Scrolling Pseudo Page

There shall be a packet X/28 with the Designation Code set to 0000.

The first group of 18 data bits shall be set designating the scrolling mode, see Figure 11. Other data bits are set to 0.

The number of pseudo pages required for the scrolling function may be linked by using packet X/27 of the pseudo page. The associated page introducing the scrolling function is linked as in Section 15.1.

15.5 Page Format Extension Using Pseudo Pages

The format of a displayed page may be extended, both horizontally and vertically using data carried by pseudo pages. The horizontal extension can be by up to 3 multiples of 40 characters, i.e. 160 characters per displayed row. The vertical extension can be by up to 3 multiples of 25 rows, i.e the page header plus 100 rows, providing 101 rows per displayed page.

15.5.1 Linking to Extended Format Pages from Standard Pages

Linking to a pseudo page for page extension, from a standard page is as in Section 15.1. For this application the standard page may not include any data for display but only a suppressed header and one or more packets with Y=27. It is to be noted that it is not necessary to introduce an extended page with a standard page. The first pseudo page of the group forming the extended page can be acquired directly.

15.6 Designation of Pseudo Pages for Page Format Extension

There shall be a packet X/28 with the Designation Code set to 0000.

The first group of 18 data bits shall be set designating the page format extension mode, see Figure 11, other data bits are set to 0. These bits also define the position of the pseudo page in the array forming the complete page.

The termination of the format extension process is defined by the inclusion in the final pseudo page of the group, of a packet with Y=27, in which the link control data indicates format extension associated with the NULL page address FF3F7F.

15.7 Reformatted Data by Pseudo Pages

An arbitrary data stream may be reformatted into pseudo pages, using the 1024 data bytes available in rows 0 to 25 of a pseudo page. Adequate buffer storage must be available to ensure at least two transmissions of any such pseudo page where the input data stream is subject to dynamic changes.

The reformatting protocols are defined with the specification of the data type involved, or shall be the subject of agreement between the origination and reception ends of the transmission process.

15.7.1 Linking to a Reformatted Data Pseudo Page from a Standard Page

Linking to a pseudo page carrying data to be reformatted, from a standard page is as in Section 15.1. For this application the standard page may not include any data for display but only a suppressed header and one or more packet with Y=27, see Figure 3 part 3. However it is not necessary to introduce a pseudo page carrying data to be reformatted with a standard page. The first pseudo page of a linked group may be acquired directly.

15.7.2 Designation of Pseudo Pages for Carrying Data to be Reformatted

There shall be a packet X/28 with the Designation Code set to 0000.

The first group of 18 data bits shall be set designating the Reformatted Data mode, see Figure 11. Other data bits set to 0.

PART E: PRESENTATION LEVEL THREE

16. Dynamically Redefinable Character sets - Downloading Using Pseudo Pages

Pseudo Pages of this type include data that define downloadable character sets for use with a specified page or pages. To prevent independent display of data intended for downloading, the header control bits C7 (Suppress Header) and C10 (Suppress Display), in the header packet (Y=0) of the pseudo page may be set to 1.

16.1 Linking from Pages for Display to Pseudo Pages for Character Set Downloading

Linking to a pseudo page for character set downloading is by means of the data in packet X/27 of the page for display (see also Section 12).

16.2 Clock Run-In, Framing Code and Packet Address

Bytes 1 to 5 as in Sections 9 and 10.

16.3 Designation of a Pseudo Page for Character Set Downloading

There shall be a packet with Y=28 and the Designation Code set to 0000.

16.3.1 Mode Definition of Pseudo Pages for Character Set Downloading

Two pseudo pages are required for the complete range of DRCS code table addresses.

For code table addresses 2/0 to 4/15 the first group of 18 data bits has bit 8 set to 1 and the remaining bits set to 0.

For addresses 5/0 to 7/15, bits 8 and 1 are set to 1 and the remaining bits are set to 0, see Figure 11 part 3.

16.4 Character Coding for Downloading

Characters are downloaded using Pattern Transfer Units (PTUs) of 20 bytes each. Each packet X/1 to X/24 carries 2 PTUs in a defined format of 20 plus 20 bytes, proceeding in time through the packet.

16.4.1 Byte Coding for Pattern Transfer Units (PTUs)

The data bytes defining a PTU use the transmission codes 4/0 to 7/15. Each byte thus defines the value of 6 bits of a PTU and is called a D-byte.

16.4.2 Dynamically Redefinable Character Sets (DRCS) Character Modes

Mode	Format	PTUs/Character	Bytes/Character
(1)	12x10x1	1	20
(2)	12x10x2	2	40
(3)	6x10x1	0.5	10
(4)	6x10x2	1	20
(5)	6x10x4	2	40
(6)	6x 5x2	0.5	10
(7)	6x 5x4	1	20

Format is: Horizontal Dots x Vertical Dots x Bits/Pixel

Up to 96 PTUs may be downloaded using two pseudo pages and these relate directly to the 96 code table addresses for DRCS, 2/0 to 7/15. Unused packets need not be transmitted and unused addresses may be padded with the character SPACE (2/0).

16.4.3 Downloading Modes

From the number of PTUs required for the various formats (see Section 16.4.2), the following transmission modes are derived and identified:

Format		Mode Identification
12x10x1		0000
12x10x2		0001
6x 5x2 (1st DRCS)	6x 5x2 (2nd DRCS)	0010
6x10x1 (1st DRCS)	6x 5x2 (2nd DRCS)	0011
6x 5x2 (1st DRCS)	6x10x1 (2nd DRCS)	0100
6x10x1 (1st DRCS)	6x10x1 (2nd DRCS)	0101
6x10x2		0110
6x10x4		0111
6x5x4		1000

The Mode Identification Code 1111 indicates that no data is transmitted for the corresponding character and any character already defined persists.

16.4.4 Downloading Mode Invocation

The Downloading Mode may be specified individually for each character. The mode for the character is invoked by the second and following groups of 18 data bits in the packet with Y=28 associated with the pseudo page or pair of pseudo pages.

The first 192 data bits in the data groups are used to transmit the 48 Mode Identification Codes, see Section 16.4.3, required for each pseudo page used for DRCS downloading. The remaining bits are set to 0.

16.4.5 DRCS Code Table Organisation

The packet addresses relate directly to positions in the code table.

The first PTU in packet X/1 of the first of the pair of downloading pseudo pages, includes dot data for character 2/0. The next PTU includes data for character 2/1 and so on.

The second pseudo page begins with the first PTU of its packet X/1 including dot data for character 5/0 and continuing to character 7/15.

16.4.6 Byte Downloading Organisation

The byte organisation in the pseudo page depends upon the character modes and the associated downloading modes to be included in the DRCS, see Figure 13.

16.4.6.1 Character Mode (1) 12x10x1 (Basic Mode) Mode Identification 0000

The dots of a character are loaded 6 at a time from each D-byte, using the 6 least significant bits from codes 4/0 to 7/15. Loading proceeds from the top left hand corner, left to right, row by row, the most significant bit of each 6 corresponding to the left hand dot. One PTU is required for each 12x10x1 character.

16.4.6.2 Character Mode (2) 12x10x2 Mode Identification 0001

The first bit plane is downloaded as for the basic mode, see Section 14.4.6.1. The second bit plane is downloaded using the next 20 D-byte group. The address in the DRCS code table corresponds to the first 20 D-byte group defining the character. Four colours are available for display, from the DRCS Colour Look-Up Table (DCLUT), downloaded as in Section 14.7.3.2. The first bit plane corresponds to the least significant bit of the DCLUT address and the second bit plane corresponds to the most significant DCLUT address bit.

16.4.6.3 Character Mode (6) 6x5x2 - Two Co-Defined Character Sets Mode Identification 0010

Downloading proceeds as for the basic mode, see Section 16.4.6.1, except that alternate D-bytes respectively define equivalent dots of the first and second sets to be downloaded. Two bit planes are downloaded for each character. Four colours are available for display, from the DRCS Colour Look-Up Table (DCLUT), downloaded as in Section 14.7.3.2. The first bit plane downloaded, corresponds to the least significant bit of the DCLUT address and the second bit plane downloaded corresponds to the most significant DCLUT address bit.

16.4.6.4 **Character Mode (3) 6x10x1 and Character Mode (6) 6x5x2 as Two Co-Defined Character Sets Mode Identification 0011**

Downloading proceeds as for the basic mode, see Section 16.4.6.1, except that alternate D-bytes respectively define equivalent dots of the first and second set to be downloaded. For the second of the pair of character sets, two bit planes are downloaded for each character and four colours are available for display, from the DCLUT, downloaded as in Section 14.7.3.2. The first bit plane downloaded corresponds to the least significant bit of the DCLUT address and the second bit plane downloaded corresponds to the most significant DCLUT address bit.

16.4.6.5 **Character Mode (6) 6x5x2 and Character Mode (3) 6x10x1 as Two Co-Defined Character Sets Mode Identification 0100**

Downloading is as in Section 16.4.6.4 except that the first and second character set downloading procedure is interchanged.

16.4.6.6 **Character Mode (3) 6x10x1 - Two Co-Defined Character Sets Mode Identification 0101**

Downloading proceeds as for the basic mode, see Section 16.4.6.1, except that alternate D-bytes respectively define equivalent dots of the first and second sets to be downloaded.

16.4.6.7 **Character Mode (4) 6x10x2 Mode Identification 0110**

Downloading proceeds as for the basic mode, see Section 16.4.6.1, except that the sequence of D-bytes define respectively the least and most significant bits of the DCLUT address. The DCLUT is downloaded as in Section 14.7.3.2.

16.4.6.8 **Character Mode (5) 6x10x4 Mode Identification 0111**

Two PTUs are required to define a character in this mode. Downloading proceeds as for the basic mode, see Section 16.4.6.1, except that the sequence of D-bytes of the first PTU defines respectively the first and second bit planes. The sequence of D-bytes of the second PTU defines respectively the third and fourth bit planes. The four bit planes define the addresses in colour tables 3 and 4 of the colour map, the first bit plane corresponding to the least significant address bit and so on.

16.4.6.9 **Character Mode (7) 6x5x4 Mode Identification 1000**

Each group of four D-bytes within the PTU defines respectively the first, second, third and fourth bit planes of a character. The four bit planes define the addresses in colour table 3 and 4 of the colour map, the first bit plane corresponding to the least significant address bit and so on.

PART F: PRESENTATION LEVEL FOUR

17. Alphageometric Displays

There may be an introductory page that is not part of the alphageometric page. The introductory page shall at least include a header packet with Y=0 and a packet or packets with Y=27, designation codes 0100 to 0111 (see Section 12.4) to provide links to the alphageometric page for display.

These links point to pseudo pages carrying Geometric Instructions and when required pseudo pages for Overwriting. These latter carry alphamosaic characters for insertion into the geometric display. The type of pseudo page is identified by the data in packets with Y=28 of those pages.

17.1 Pages for Alphageometric Display

The data for display is carried by pseudo pages of two types:

(a) Overwriting Pseudo pages. These pseudo pages are as defined in Section 15.3 and carry alphamosaic character data for association with a geometric display.

(b) Pages of reformattable data carrying geometric data. Four modes, with increasing display features are defined corresponding to Service Profiles 0, 1, 2 and 3 of [2].

There are two options for the association of the alphamosaic and geometric components of the page:

Option 1 defines the geometric display plane as transparent to the lower alphamosaic character plane.

Option 2 inserts the alphamosaic characters into the plane of the geometric display. The display may thus be considered to be derived from a single plane.

The selection of a mode defining a profile and Option 1 or 2 is by means of the data in the packet with Y=28 of the pseudo page carrying the geometric data.

17.2 Pseudo Pages Carrying Geometric Data

In a pseudo page carrying geometric data, the header packet with Y=0 shall have the Suppress Header control bit C7 and the Inhibit Display control bit C10 both set to 1.

Packets with Y=1 to Y=25 carry the geometric data according to [2]. The Service Profile, Display Option and method of bit coding is defined by the 18 data bits of the first three byte data group of the packet with Y=28, see Figure 11.

More than one pseudo page may be required for the geometric data for a displayable page. In this case, the pseudo pages are linked by the data in a packet with Y=27.

Unused packets need not be transmitted and incomplete packets shall be filled with the character 0/0.

PART G: PRESENTATION LEVEL FIVE

18. Alphaphotographic Displays

There may be an introductory page that is not part of the alphaphotographic page. The introductory page shall at least include a header packet with Y=0 and a packet or packets with Y=27, designation codes 0100 to 0111 (see Section 12.4) to provide links to the alphaphotographic page for display.

These links point to pseudo pages carrying Pixel data and, when required, pseudo pages for Overwriting. These latter carry alphamosaic characters and geometric patterns for insertion into the photographic display. The type of pseudo page is identified by the data in packets with Y=28 of those pages.

18.1 Pages for Alphaphotographic Display

The data for display is carried by pseudo pages of three types:

(a) Overwriting Pseudo pages. These pseudo pages are as defined in Section 15.3 and carry alphamosaic character data for association with a photographic display.

(b) Geometric Coded pages for association with a photographic display.

(c) Reformattable pages carrying pixel data. The picture coding method is defined by the data in a packet with Y=2 of the pseudo page, according to [10].

There are two options for the association of the alphamosaic, geometric and photographic components of the page:

Option 1 defines the photographic display plane as transparent to the lower alphamosaic and geometric character plane or planes.

Option 2 inserts the alphamosaic characters and geometric pattern into the plane of the photographic display.

The selection of the photographic mode and Option 1 or 2 is by means of the data in the packet with Y=28 of the pseudo page carrying the photographic data.

18.2 Pseudo Pages Carrying Photographic Data

In a pseudo page carrying photographic data, the header packet with Y=0 shall have the Suppress Header control bit C7 and the Inhibit Display control bit C10 both set to 1.

Packets with Y=1 to Y=25 carry the pixel data according to the selected picture coding method.

The Photographic mode, Display Option and method of bit coding is defined by the 18 data bits of the first three byte data group of the packet with Y=28, see Figure 11.

18.2.1 The Method of Picture Coding

The method of picture coding is identified using the second and subsequent three byte data groups in the packet with Y=28 of the pseudo page. Two characters according to ISO 9281 are included in each three byte group of 18 data bits, with the final 4 data bits set to '0'.

More than one pseudo page may be required for the pixel data for a displayable page. In this case, the pseudo pages are linked by the data in a packet with Y=27.

Unused packets need not be transmitted and incomplete packets shall be filled with the character 0/0.

PART H: ADDITIONAL SERVICE OPTIONS

19. Data for Processing Associated with Displayable Pages

The inclusion of data for processing is signalled by means of the data in Packets with Y=27, see Section 12.

19.1 Starting Position of Data for Processing

The data for processing on the Page starts with the character code 1/11, which may be in any of the bytes comprising the page. Any bytes before this code are not for processing but may be displayed.

19.2 Selection of Protocols

The codes following the 1/11 code determine the decoding Protocol that is in use. There may be any number of codes of the form 3/x, followed by any number of codes of the form 2/x, followed by a code of the form 7/x, where x is in the range 0 to 15.

Note: Character code 1/11 is also used in some national implementations to switch character sets.

20. Television Programme Delivery Control Service

Uses packets with Y=26 to carry codes for programming ancillary equipment such as video recorders in order that they respond to the control data as defined in Section 13. These codes can refer to items identifiable by means of a cursor, in the displayable data of the page. Reference should be made to [9].

20.1 Clock Run-In, Framing Code and Packet Address

Bytes 1 to 5 as Sections 9 and 10.

20.2 Designation Codes

Byte 6, 4 bits data plus 4 bits Hamming protection.

Codes 0000 to 1111 are sequence labels for up to 16 packets with Y=26 associated with a given page. The sequence is part of that specified in Section 14.6.2. The data groups defined in this Section follow those of Section 14 (see Figure 7). The terminator and CRC check digit complete the sequence as in Sections 14.6.11 and 14.6.12.

The data specified in this Section shall be transmitted as a continuous sequence of packets with Y=26 and not interleaved with packets with Y=26 providing other functions or with other packets, though other functions may share the first and last packets of such a sequence (see Figure 7).

20.3 Data Groups

Bytes 7 to 45, as 13 groups of 3 bytes each. 18 bits data and 6 bits Hamming protection.

20.4 Programme Delivery Service

Facilitates response to data defined in Section 13.3.3 to 13.3.7 (see also Figures 29 and 30).

20.4.1 Data Group Bit Allocation (See Figure 7)

6 bits data word A, transmitted least significant bit first
5 bits mode description
7 bits data word B, transmitted least significant bit first
6 bits Hamming protection

20.4.2 Source Definition Data Group

Data Word A - Country of Origin, see Section 13.3.5.4. 4 least significant bits specify country of origin. 2 most significant bits are set to 1. When set to '0' the group is not a Source Definition group and subsequent other data groups up to the next Source Definition group shall be ignored.

Mode Description bits set to 01000 invoke the Source Definition function (see Figure 9).

Data Word B - Programme Source: data bits 1 to 6 correspond respectively to data bits 36 to 31 of Section 13.3.5.5. Data bit 7 set to '0' corresponds to the first set of 64 programme sources, set to '1' corresponds to the second set of 64 programme sources.

In a given page, the Source and Date Definition data groups apply to subsequent data groups defining time. Either or both of these data groups shall be retransmitted when the source and/or date within a given page is to be redefined.

20.4.3 Date Definition Data Group

Data Word A - Month, 2 most significant bits are set to '1'. 4 least significant bits correspond to the equivalent bits in Section 13.3.5.3. Decimal values 49 to 60 define months respectively as January to December. The complete Date Definition Data group and subsequent other data groups up to the next Source or Date Definition group shall be ignored if decimal values 48 and 61 to 63 are transmitted or either of the 2 most significant bits are set to '0'. When set to '0' the group is not a Date Definition group and subsequent other data groups up to the next Source or Date Definition group shall be ignored.

Mode Description bits set to 01001 invoke the Date Definition function, see Figure 9.

Data Word B - Data bits 1 to 4 specify the day 'units' in BCD form, bit 1 is the least significant bit. Data bits 5 and 6 specify the day 'tens' in BCD form, bit 5 is the least significant bit. Data bit 7 set to '0', see Figure 7.

The complete Date Definition group and subsequent other data groups up to the next Source or Date Definition group shall be ignored if the following bit values are transmitted:

(a) data bits 1 to 6 corresponding to decimal value 00
(b) data bits 1-4 corresponding to decimal values 13 to 15
(c) data bit 7 set to 1.

20.4.4 Local Time Offset

When within a given page, all hours and minutes defined in Section 20.4.5 are in Co-ordinated Universal Time (UTC) this data group need not be transmitted. When all items within a given page have the same Local Time Offset it need be transmitted once, immediately following the Date Definition group. When a given page includes items with different Local Time Offsets this group is transmitted before each such corresponding Hours and Minutes definition group.

20.4.4.1 Local Time Offset and Cursor Row Definition Group

Data Word A - specifies the row address of the selected cursor position. Decimal values 41 to 63 specify rows 1 to 23 and decimal value 40 specifies row 24. The cursor has no function when located in the header row 0.

Mode Description bits set to 01100 invoke the Local Time Offset definition function, see Figure 9.

Data Word B - Data bits 1 to 7 specify the Local Time Offset in binary coded quarter hour units.

Bit 1 is the least significant bit and defines 2^{-2} hour offset continuing to bit 6 that defines the 2^{3} hour offset. Bit 7 defines the sign of the offset, set to '1' being negative (West of Greenwich) (see Figure 4).

20.4.5 Programme Announced Time Data

There shall be a sequence of pairs of data groups, specifying announced starting time hours and minutes for programmes from a common source that run without a break. The announced finishing time hours and minutes shall be included when there is a break in the continuity of the programmes listed and following the final item listed on the page (see Figure 7).

20.4.5.1 Announced Starting Time Hours and Cursor Row Definition Group

Data Word A - specifies the row address of the selected cursor position. Decimal values 41 to 63 specify rows 1 to 23 and decimal value 40 specifies row 24. The cursor has no function when located in the header row 0.

Mode Description bits set to 01010 invoke the Announced Starting Time Hours definition function, see Figure 9.

Data Word B - Data bits 1 to 4 specify the announced starting time hours 'units' in BCD form, bit 1 is the least significant bit. Data bits 5 and 6 specify the announced starting time hours 'tens' in BCD form, bit 5 is the least significant bit. Data bit 7 (Controlled Access Flag - CAF): set to '0', programme item is for free access, set to '1', programme is for Controlled Access.

The Announced Hours Definition group, the associated Minutes Definition group for Announced Starting and Finishing Time if present shall be ignored if a value of 3 for the hours units digit is exceeded when the hours tens digit has a value of 2, the value of the hours units exceeds decimal 9, the value for the hours tens exceeds 2. These restrictions do not apply when the month has the value 13 or 14, in which case the complete label consists of a arbitrary number; or the value 15, when the label has an application-dependent meaning.

20.4.5.2 Announced Starting and Finishing Time Minutes and Cursor Position in Row

Data Word A - specifies the character-space within a row occupied by the cursor. Decimal values 0 to 39 specify character-spaces 1 to 40.

Mode Description bits set to 00110 invoke the Announced Starting and Finishing Time Minutes definition function (see Figure 10).

Data Word B - Data bits 1 to 4 specify the minutes units in BCD form, with bit 1 the least significant bit. Data bits 5 to 7 specify the minutes tens in BCD form, with bit 5 the least significant bit.

The complete Announced Hours Definition group, the associated Minutes Definition groups for Announced Starting and Finishing Time if present shall be ignored if a decimal value of the minutes units exceeding 9 or minutes tens exceeding 5, is transmitted. They shall also be ignored if the starting and finishing cursor row position do not correspond. These restrictions do not apply when the month has the value 13 or 14, in which case the complete label consists of a arbitrary number; or the value 15, when the label has an application-dependent meaning.

20.4.5.3 Announced Finishing Time Hours, Programme Duration and Cursor Row

Data Word A - specifies the row address of the selected cursor position. Decimal values 41 to 63 specify rows 1 to 23 and decimal value 40 specifies row 24. The cursor has no function when located in the header row 0.

Row Address Group Mode Description bits set to 01011 invoke the Announced Finishing Time Hours definition function, see Figure 9.

Data Word B - Data bits 1 to 4 specify the Announced Finishing Time Hours 'units' in BCD form, bit 1 is the least significant bit. Data bits 5 and 6 specify the Announced Finishing Time Hours 'tens' in BCD form, bit 5 is the least significant bit. Data bit 7: set to '0' announced finishing time is defined as above; set to '1': Programme Duration hours and minutes is defined.

The complete Announced Starting Time Hours Definition group, the associated Minutes Definition group and the Announced Finishing Time Definition groups if present shall be ignored if a value of 3 for the hours units digit is exceeded when the hours tens digit has a value of 2, the value of the hours units exceeds decimal 9, the value for the hours tens exceeds 2. They shall also be ignored if the cursor row position in the respective starting and finishing time groups do not correspond. This restriction does not apply when the month has the value 13, 14 or 15, see Section 20.4.3

20.4.6 Series Code Definition Group

Follows the Programme Timing Data.

Data Word A - set to 110000 defines that the corresponding programme is one of a series. Other Row Address Group values are reserved.

Mode Description bits set to 01101 invoke the Series Code definition function.

Data bits 1 to 7 form a unique code for all programmes in the series, and correspond with the 7 least significant bits of the corresponding data group in the packet 8/30 format 2 in which the most significant bit has the value '1'.

21. Page-Associated Ancillary Label Data

Uses packets with Y=25 to carry a number of LABELS relating to the data in the associated page.

21.1 Clock Run-in, Framing Code and Packet Address

Bytes 1 to 5 as Sections 9 and 10.

21.2 Label Separators

Any Control Character from position 0/0 to 0/7 from Figure 20. Following the standard protocol for packets with Y=1 to Y=24, Control Character 0/7 (alpha numeric white) is the default starting condition for packets with Y=25.

21.3 Label Sequence Terminator

Any Control Character from position 1/0 to 1/7 from Figure 20. The interpretation of data in a given packet with Y=25, following a terminating control character is reserved.

21.4 Label Character Coding

The alpha numeric characters used in the label are those of the default or designated G0 character set including the default or specified option. The display colour defined by the separating control character applies to the display of the next label carried by the packet. Control Characters from Figure 20, 0/8 to 0/15 and 1/8 to 1/15 may form part of a label.

22. Conditional Access Teletext Service - Page format data

There may be an introductory page of non-scrambled text. When no introductory text for display is required, this page shall at least include the header packet with Y=0 and a packet or packets with Y=27 to provide links to the conditional access service.

Links are provided in a packet with Y=27, designation codes 0100 to 0111 (see Section 12.4). These point to pages with scrambled text and user equipment addressing pages, as identified by data in packets with Y=28 of those pages (see also Figure 31).

22.1 Pages with Scrambled Text or Scrambled Data

For the purpose of scrambling, two types of pages are defined:

(a) Pages other than those containing Reformatted Data or Terminal Equipment Addressing Data as in Figure 11. The scrambling process is initialised at the start of each packet. Unused packets need not be transmitted.

(b) Pages containing Reformatted Data, see Figure 11. The scrambling process is initialised at the start of each page.

22.1.1 Pages Not Including Reformatted Data and Not for Terminal Equipment Addressing

The data for transmission in bytes 6 to 45 of packets with Y=1 to Y=25, plus the 18 data bits in each three byte data group for transmission in packets with Y=26, is scrambled, using an enciphering algorithm. The numbers of the packets included in a scrambled text page are specified as in Section 22.2.2.3.

22.1.1.1 Parity Protected 7-bit Data

To provide a sequence of complete bytes for scrambling when 7 bit data is used, a most significant bit is added. The resulting bytes are scrambled and the respective bit masked before the odd parity bit added.

22.1.1.2 Data in Packets with Y=26

To provide a sequence of complete bytes for scrambling, the 18 data bits have 6 most significant bits added. The resulting 3 bytes are scrambled and the respective 6 bits masked before Hamming protection bits are calculated and added.

22.1.2 Pages Including Reformatted Data

The data for transmission in bytes 14 to 37 of packets with Y=0 and bytes 6 to 45 of packets with Y=1 to Y=25 are scrambled using an encryption algorithm. The number of bytes included in the page of scrambled data is indicated according to Section 22.2.2.3.

22.1.2.1 Parity Protected 7-bit Data

To provide a sequence of complete bytes for scrambling when 7 bit data is used, a most significant bit is added. The resulting bytes are scrambled and the respective bit masked before the odd parity bit is added.

22.2 Page Key

Descrambling of a scrambled page is by means of a Page Key contained in a packet with Y=28 of a scrambled page.

22.2.1 Page Key Packet - Designation Code

Byte 6, 4 bits data plus 4 bits Hamming protection. Data bits set to 0010.

22.2.2 Page Key Packet - Data Groups

Bytes 7 to 45 used as 13 groups of 18 bits data plus 6 bits Hamming protection See Figure 32(a).

22.2.2.1 Page Key Packet - Page Type Definition Code

This data is not encrypted. The first group of 18 data bits shall be set to designate the page type (see Figure 11).

22.2.2.2 Page Key Packet - 8 Data Groups - Bit Allocation

This data is encrypted with Current System Key.

(1) Service Modes 2 bits

Bit 2	Bit 1	
0	0	256 Services Non-Tiered
0	1	64 Services Tiered
1	0	256 Services with Credit Tokens
1	1	Not Assigned

(2) Set to 0 6 bits

(3) Current System Key 56 bits

(4) Service Identification Number 8 bits

Service Mode 1 or 3:

8 bits define service number, 0 to 255.

or

Service Mode 2:

6 most significant bits of 8 bit group define service number 0 to 63.

The two least significant bits define the service tier:

Bit 2	Bit 1	
0	0	Basic Tier
0	1	Basic + Premium Tier
1	0	Basic + Premium + Extra Tier
1	1	Not Assigned

(5) Page Key 56 bits

(6) Key Value Credit in Token Units

8 bits: fraction part
8 bits: whole part

22.2.2.3 Page Key Packet - 4 Data Groups

This data is not encrypted.

(1) Continuity Indicator — 7 bits
Incremented by 1 for each subsequent page with the same service number

(2) Repeat Indicator — 1 bit
Set to 1 indicates page to be repeated

(3a) For Text Pages

Packet Flags — 26 bits

Set to 1 if the packet is present. A flag may indicate a sequence of Packets with Y=26. Least significant packet number is transmitted first.

Set to 0 — 1 bit

or

(3b) For Reformatted Data

Data Length — 10 bits

Indicates data length in bytes to be descrambled as a decimal number (0=1024 bytes)

Set to 0 — 17 bits

(4) Scrambling Method — 5 bits
(see Figure 33(b))

(5) In Use System Key Label — 8 bits

Set to 0 — 8 bits

(6) Cyclic Redundancy Check Word — 16 bits
(see Figure 8)

For text pages see section 22.1.1 and 3(a) above. The character spaces in packets with Y=0 are assumed to contain the character SPACE (2/0). For Reformatted Data, see Sections 22.1.2 and (3b) above, the check word is calculated over the specified data length.

22.3 User Addressing Pages

Access to the Page Key contained in a packet with Y=28 of a scrambled page, is by means of the Current and New System Keys. This page contains:

(1) Shared User Data Packets encrypted with the Shared Distribution Key

(2) Unique User Data Packets encrypted with a key that is unique to the user's equipment

(3) System Key Packet encrypted with the New System Key

The Shared User Data Packets are transmitted relatively frequently and the Unique User Data Packets relatively infrequently.

22.3.1 User Addressing Page - Designation Code

There shall be a packet with Y=28, with the designation code in byte 6 set to 0010. The first group of 18 data bits shall be set to define the page as a Terminal Equipment Addressing Page, see Figure 11. For the remaining data bits in this packet see Sections 22.3.1.1, 22.3.1.2, 22.3.1.3 and 22.3.1.4.

22.3.1.1 System Key Packet - Data Groups

Bytes 7 to 45 used as 13 groups of 18 bits data plus 6 bits Hamming protection. See Figure 32(b).

22.3.1.2 System Key Packet

This data is not encrypted.

(1)	Encryption Method	8 bits
(2)	Set to 0 (see Figure 33(a))	8 bits

22.3.1.3 System Key Packet

This data is encrypted with the New System Key

(1)	New System Key	56 bits
(2)	Current System Key	56 bits
(3)	Set to 0	16 bits

22.3.1.4 System Key Packet

This data is not encrypted

(1)	New System Key Label	8 bits
(2)	Current System Key Label	8 bits
(3)	Set to 0	56 bits

22.3.2 Shared User Packets - Designation Code

Packet with Y=1 to Y=25, byte 6. 4 bits data plus 4 bits Hamming protection. Data bits set to 0000

22.3.2.1 Shared User Packets - Data Groups

Bytes 7 to 45 used as 13 groups of 18 bits data plus 6 bits Hamming protection. See Figure 34.

22.3.2.2 Shared User Packets - Data Groups - Bit Allocation

This data is not encrypted.

(1)	Shared User Address	20 bits
(2)	Set to 0	6 bits

Followed by data defined in Section 22.3.2.3

22.3.2.3 **Shared User Packets - Data Groups - Bit Allocation**

This data is encrypted with the Shared Distribution Key, see Section 22.3.3.3

(1)	New System Key	56 bits
(2)	User Enabling Bits	152 bits

0=disabled; 1=enabled

22.3.3 **Unique User Packets**

Packets with Y=1 to Y=25. Byte 6, 4 bits data plus 4 bits Hamming protection. Data bits set to 0001.

22.3.3.1 **Unique User Packets - Data Groups**

Bytes 7 to 45 used as 13 groups of 18 data bits plus 6 bits Hamming protection. See Figure 34.

22.3.3.2 **Unique User Packets - Data Groups - Bit Allocation**

This data is not encrypted

(1)	Unique User Address	32 bits
(2)	Set to 0	2 bits

Followed by data defined in Section 22.3.3.3

22.3.3.3 **Unique User Packet - Data Groups - Bit Allocation**

This data is encrypted with the User Equipment Unique Key

(1)	Service Mode (see Section 22.2.2.2)	2 bits
(2)	Service Reference Number	2 bits
(3)	Current or New Shared Address	20 bits
(4)	Unique Equipment Key	56 bits
(5a)	Service Modes 1 and 2:	
	7 Service Numbers of 8 bits	56 bits
(5b)	Service Mode 3:	
	Total credit tokens Purchased for 2 services:	
	1st Service number	8 bits
	Credit Tokens Purchased	20 bits
	2nd Service Number	8 bits
	Credit Tokens Purchased	20 bits
(6)	Current or New Shared Distribution Key	56 bits
(7)	Current or New User Enabling Bit Position	8 bits

22.3.4 **Initial Page Numbers of Services**

Packets with Y=1 to Y=25. Byte 6, 4 bits data plus 4 bits Hamming protection. Data bits set to 0010.

22.3.4.1 **Service and Associated Initial Page Numbers - Data Groups**

Bytes 7 to 45 used as 13 groups of 18 data bits plus 6 bits Hamming protection. See Figure 34.

22.3.4.2 **Service and Associated Initial Page Numbers - Bit Allocation**

This data is not encrypted.
Each group of 18 data bits includes

(1)	Service Number	8 bits
(2)	Initial Page Number	8 bits
(3)	Set to 0	2 bits

Any unused groups in a packet are set to 0.

22.3.5 **Independent Data Services - Data Channels and Addresses**

Packets with Y=1 to Y=25. Byte 6, 4 bits data plus 4 bits Hamming protection. Data bits set to 0011.

22.3.5.1 **Data Groups**

Bytes 7 to 45 used as 13 groups of 18 data bits plus 6 bits Hamming protection

22.3.5.2 **Data Channel Number - Bit Allocation**

This data is not encrypted.
First group of 18 data bits:

(1)	Data Channel	4 bits see Section 24.3.
(2)	Set to 0	14 bits

22.3.5.3 **Service Number and Address - Bit Allocation**

This data is not encrypted.
Each pair of Groups of 18 data bits includes:

(1)	Service Number	8 bits
(2)	Address Length (AL)	3 bits
(3)	Address	24 bits
(4)	Set to 0	1 bit

Group repeated for each Service Number. Any unused groups in a packet are set to 0.

NOTES TO SECTION 22

SECURITY OF CONDITIONAL ACCESS TELETEXT SERVICES

The security of the user addressing process may be optimised by the use of "error extension" techniques. Should any bit of the ciphertext have been changed, this causes the message to be totally corrupted when decrypted with the correct key.

In order to provide the property of "error extension" a cipher feedback technique containing a "one-way function" is used with a multiple of encipherments called "rounds". Each round reverses the order of the previous ciphertext bytes, as shown in Figure 35. A typical one-way function having good security is shown in Figure 36.

Cipher Feedback Algorithm

The secret key K is loaded into the 64 bit key register K. The 64 bit key is derived from a 56 bit key that forms the 56 least significant bits. For reformatted data pages and data not in page format, the 8 least significant bits of the 56 are used to look up a corresponding 8 bit value from look-up-tables, LUT in Figure 36. This value is used as the 8 most significant bits of the 64 bit key. For textual page data, the 8 most significant bits are the magazine and row address of each packet forming the page.

The register R is first loaded with a 64 bit secret initial condition I, that is constant for the particular security device in the equipment. It is a random number having an impulse autocorrelation function. This data word I is loaded into the register R at the beginning of each round of the encryption or decryption process.

The encryption and decryption processes are represented in Figure 35, the switch being placed in the appropriate positions. The message to be encrypted or decrypted is placed in register A and after the appropriate number of rounds appears in register B. The data in register A is taken, byte by byte and the EXCLUSIVE-OR function with the keystream is performed. It is then placed in the B register and the output from the switch is placed in the R register. The previous contents of the B and R registers are shifted along, byte by byte until all the bytes appear in the B register. This process constitutes one round. The next round starts by placing the contents of the B register in the A register but in reverse byte order. At least three rounds are required to produce good ciphertext.

One Way Function

A suitable one way function is shown in Figure 36. It has a 256 x 8 bit look-up-table (LUT) in nine positions. This table contains truly random 'ones' and 'zeros'.

The 64 bit key and the 64 bit contents of register R are added modulo 256. The resulting 64 bit value is applied to 8 identical look-up tables. A different 1 bit output is taken from each table and these form an 8 bit value. This 8 bit value is applied to a modulo 256 accumulator. This causes each output byte to be influenced by the previous bytes generated during each round of the main algorithm.

The accumulator memory is cleared to zero at the start of each round. The output of the accumulator is applied to a ninth lookup table, identical to the others. Its output forms the key stream of Figure 35.

Text Scrambling

The algorithm can also be used to scramble or descramble the user data by placing the switch in Figure 35 in the appropriate position. Only one round is required. To perform either function, the input data is placed in register A and the result appears in register B.

PART I: INDEPENDENT DATA SERVICES

23. Data Transport Protocol

Packets carry information unrelated to, and completely independent of, any accompanying service organised as magazines of pages. See Figure 41.

23.1 Clock Run-In and Framing code

Bytes 1 to 3 as Section 9.
Bytes 4: see Section 23.3.

23.2 Designation Code

Byte 5, 4 bits data plus 4 bits Hamming protection. Data bits set to 1111 designate Independent Data Service Packet.

23.2.1 Transmission Multiplexing

Television signal data lines carrying these Packets may be included amongst the data lines of a teletext service or may be transmitted using otherwise unused lines. These data lines may always be added at any point in the transmission chain, provided that a new data channel is used (see also Section 23.3).

23.3 Data Channel Addressing

Byte 4, 4 bits data plus 4 bits Hamming protection provides 16 Data Channels. These are numbered 0 to 15 and correspond to bit values 0000 to 1111. The least significant bit is transmitted first.

For the services defined in Section 23 four data channels are allocated:

Data Channel Number	Address Bit Values in Transmission Order
8	0001
9	1001
10	0101
11	1101

Note that data channel 0, defined by the data bits being set to 0000, is used for the Broadcasting Service Data Packet, see Section 13.

23.4 Format Type (FT)

Byte 6, 4 bits data plus 4 bits Hamming protection.
Format Type A, defined by:
Bit 1...set to 0
Bit 2...set to 1: repeat packet facility applies, see Section 23.4.3
Bit 2...set to 0: no repeat facility
Bit 3...set to 1: explicit continuity indicator included
Bit 3...set to 0: continuity indicator is implicit
Bit 4...set to 1: Data Length Byte in Use
Bit 4...set to 0: Data Length Byte not in use

23.4.1 Service Packet - Interpretation and Address Length (IAL)

Byte 7, 4 bits data plus 4 bits Hamming protection. The first three bits define the number of immediately following Hamming coded bytes which are allocated to defining the service packet address. All three bits set to 0 indicate that there is no service packet address within the data line. Each increment in binary value adds 4 bits to the address length up to a maximum of 24 bits. All three bits set to 1 is reserved for future extensions.

The fourth bit set to 0 defines data as independent of the contents of any other channel or address. The fourth bit set to 1 indicates that interpretation of the data may require the use of data in other channels or with other addresses as defined by the application.

23.4.2 Service Packet Addresses

When present bytes 8 to 13, see Section 23.4.1.

NOTE: When differentiated by the appropriate address length data in byte 7, the less significant bytes of an address may constitute another complete address in the same data channel. Thus, for example, the 24-bit address ABC123 can co-exist with the 20-bit address BC123 and the 8-bit address 23.

23.4.3 Service Packet - Repeat Indicator (RI)

This byte follows the Service Packet Address and is only present when the Format Type bits are appropriately set, see Section 23.4. The first 4 bits are set to 0 when a new packet of that service data channel is first transmitted and shall be incremented modulo-16 on subsequent repeats.

The next three bits are reserved for future extensions. The last bit is set to 0 to indicate that no further repeats of the current packet should be expected. This last bit shall be set to 1 when a further repeat is to be expected.

23.4.4 Packet Continuity Indicator (CI)

This byte follows the service packet address or the Service Packet Repeat Indicator, if present. It is only present when the Format Type bits are appropriately set, see Section 23.4. It represents an 8-bit number which is incremented modulo-256 with each new packet of the same address on the same data channel. It is not incremented on repeated transmissions of the same packet.

23.4.5 Data Length Byte (DL)

This byte follows the Service Packet Address or the Service Packet Repeat Indicator or Packet Continuity Indicator if they are present. It is only present when the Format Type bits are appropriately set, see Section 23.4.

The two most significant bits are not defined. The remaining six bits define the number of 8-bit bytes of user data intended to be delivered to the user. The count is taken from the start of the User Data Byte Group and includes any dummy bytes, see Section 23.4.6.

The DL byte is included when it is necessary to send an incompletely filled packet. Any remaining bytes of the user data group are not defined but are subject to the CRC, see Section 23.4.7.

The six data bits defining the data byte length may be set to 0, to keep a data service channel open when there is no data for delivery to the user.

23.4.6 User Data Group

The remaining data bytes in the data line, excepting the last two, constitute the data carried for users of the service bearing that Service Packet Address on that data channel. The number of bytes available depends upon the address length, whether the repeat facility is used, and whether the continuity indicator is implicit or explicit. Thus there are between 28 and 36 data bytes available.

Certain forms of coding may give rise to long strings of 0s or 1s. It is desirable to remove these from the transmitted data field to ensure reliable operation of all equipment that may process the signal. When within any user data group a sequence of eight consecutive bytes containing all 0s or eight consecutive bytes containing all 1s occurs, taken together with its CI byte if present, a following dummy byte will be inserted. This dummy byte is included in the calculation of the CRC, (see Section 23.4.7) but is otherwise ignored by the decoder.

NOTE: Decoders must be designed to recognise these dummy bytes. However their inclusion may in the future no longer be necessary and it would be desirable to omit them to increase efficiency. It is therefore recommended that decoders should be capable of convenient modification or adjustment when this occurs.

23.4.7 Cyclic Redundancy Check Word

The last two bytes contain a Cyclic Redundancy Check on the user data group (see Section 23.4.6) and on any Continuity indicator (CI) or Data Length (DL) byte if present (see Sections 23.4.4 and 23.4.5).

23.4.7.1 Check Word Generation

The data to be checked is considered as a polynomial in x with the highest degree term transmitted first and the term of degree zero last. This is divided, using modulo-2 arithmetic by the polynomial:

$$x^{16} + x^{9} + x^{7} + x^{4} + x^{0}$$

The remainder from this process, with the highest term transmitted first, is the CRC.

When an implicit continuity indicator is signalled by the third message bit of the FT byte, the transmitted CRC is modified such that the described generation process results in the register containing the 8-bit continuity indicator byte twice, with the least significant bit at the right-hand end.

23.4.7.2 Check Result

The register of Figure 42 is set to 0s. The serial data followed by the CRC is then entered. The check is satisfied if the register again contains all 0s.

NOTE CONCERNING TRANSMISSION SEQUENCE:

For any Service Packet Address, the corresponding serial data stream is divided into User Data Groups. These must be transmitted in the correct sequence, which is monitored by the continuity indicator. Provided that the Repeat Indicator is used, each group may be repeated any number of times before the next is sent. There may or may not be an interval between consecutive data-lines with the same Service Packet Address.

Data lines carrying different Service Packet Addresses may be combined in any order to form a Data channel, provided that the sequence for each Service Packet Address is not disturbed.

Data-lines from different Data Channels may be combined in any order provided that the sequence within each contributing source is not disturbed.

24. Conditional Access for Block Mode Data

Data in the User Data Group (see Section 23.4.6) of a number of Independent Data Service Packets are linked to form Data Blocks. They may contain Messages concerning access that are not Encrypted, Encrypted Messages concerning access and User Data to be communicated.

24.1 Block Separator

Byte 1 of a data block.
Blocks of data are separated by the transmission of the character hex 10 (DLE). If the character DLE occurs within the Data Block it shall be repeated to indicate that it is not a block separator.

24.2 Block Formats

Two alternative formats are defined.
Format A is defined in Section 24.3 and
Format B in Section 24.4.

24.3 Block Format A

"User Data" is the data stream originated by a sender and intended for delivery to a specified recipient or group of recipients. "Messages" are groups of data concerned with the access to User Data and are for controlling the decoder or placing it in operation. A suitable encryption algorithm is shown in Figure 35.

24.3.1 Block Type

Byte 2 of a data block defines the block type.
This byte is of the form 04/0x where x may have a value o:
0, 1, 2, 3, 4, 5, 6 or 7.

Block Type Code	Interpretation
04/00	Block contains User Data not Scrambled; see Figure 37(a)
04/01	Block contains Key Message not Encrypted, and the Encrypted Key Message
04/02	Service Numbers and Sequence Numbers, not encrypted and Scrambled User Data.
04/03	System Key Message Block
04/04	Shared User Message Block
04/05	Unique User Message Block
04/06	Service Address Message Block for Independent Data Services
04/07	Service Address Message Block for Page Format Services

24.3.2 Primary Block Key Messages

Block Type Code 04/01. See Figure 37(b).

24.3.2.1 Block Key Message Bit Allocation

This data is not encrypted
In Use System Key Label 8 bits
followed by data defined in Section 24.3.2.2.

24.3.2.2 Block Key Message - Bit Allocation

This data is encrypted with the Current System Key

(1) Service Modes 2 bits

Bit 2	Bit 1	
0	0	256 Services Non-Tiered
0	1	64 Services Tiered
1	0	256 Services with Credit Tokens
1	1	Not Assigned

(2) Set to 0 6 bits
(3) Current System Key 56 bits
(4) Service Identification Number 8 bits

Service Mode 1 or 3: 8 bits define service numbers 0 to 255.
Service Mode 2: 6 most significant bits of 8 bit group define service number 0 to 63. The two least significant bits define the service tier:

Bit 2	Bit 1	
0	0	Basic Tier
0	1	Basic + Premium Tier
1	0	Basic + Premium + Extra Tier
1	1	Not Assigned

(5) Block Key 56 bits
(6) Key Value Credit in Token Units: 8 bits fraction part, 8 bits whole part

24.3.2.3 Block Key Message - Bit Allocation

This data is not encrypted.
Scrambling Method 5 bits See Figure 33(b)
Set to 0 3 bits

24.3.3 Secondary Block Messages and Scrambled User Data

Block Type Code 04/02. See Figure 37(c)

24.3.3.1 Service and Sequence Numbers - Bit Allocation

This data is not encrypted
Service Identification Number 8 bits
Sequence Number 8 bits
The Sequence Number may be used as the cipher initial variable.

24.3.3.2 Scrambled User Data

The rest of this data block contains the scrambled data (maximum 1024 bytes) intended for receipt by the addressee(s).

24.3.4 System-Key Message Block

Block Type Code 04/03. See Figure 37(d).

24.3.4.1 System-Key Message Block Bit Allocation

This data is not encrypted

(1) Encryption Method 8 bits
(2) New System Key Label 8 bits
(3) Current System Key Label 8 bits
Followed by data defined in Section 24.3.4.2.

24.3.4.2 System-Key Message Block Bit Allocation

This data is encrypted with the New System Key

(1) New System Key	56 bits
(2) Current System Key	56 bits

24.3.5 Shared-User Message Block

Block Type Code 04/04. See Figure 37(e).

24.3.5.1 Shared-User Message Block - Bit Allocation

This data is not encrypted

(1) Shared User Address	20 bits
(2) Set to 0	4 bits

Followed by data defined in Section 24.3.5.2.

24.3.5.2 Shared-User Message Block - Bit Allocation

This data is encrypted with the Shared Distribution key, see Section 24.3.6.2.

(1) New System Key	56 bits
(2) User Enabling Bits 0=disabled; 1=enabled	152 bits

24.3.6 Unique-User Message Block

Block Type Code 04/05. See Figure 37(f).

24.3.6.1 Unique-User Message Block - Bit Allocation

This data is not encrypted

Unique User Address	32 bits

Followed by data defined in Section 24.3.6.2.

24.3.6.2 Unique-User Message Block - Bit Allocation

This data is encrypted with the Unique Equipment Key

(1)	Service Mode (see Section 24.3.2.2)	2 bits
(2)	Service Reference Number	2 bits
(3)	Current or New Shared Address	20 bits
(4)	Unique Equipment Key	56 bits
(5a)	Service Modes 1 and 2: 7 Service Numbers of 8 bits	56 bits

or

(5b)	Service Mode 3: Total credit tokens purchased for 2 services:	
	1st Service Number	8 bits
	Credit Tokens Purchased	20 bits
	2nd Service Number	8 bits
	Credit Tokens Purchased	20 bits
(6)	Current or New Shared Distribution Key	56 bits
(7)	Current or New User	8 bits

24.3.7 Service Address Message Block - Independent Data Service

Block Type Code 04/06. See Figure 37(g)

24.3.7.1 Service Address Message Block - Bit Allocation

This data is not encrypted

(1)	Service Number:	8 bits
(2)	Address Length (AL) as Section 23.4.1.	3 bits
(3)	Set to 0	5 bits
(4)	Service Address up to	24 bits

This group is repeated for each service number

24.3.8 Service Address Message Block - Page Format Service

Block Type Code 04/07. See Figure 37(h)

24.3.8.1 Service Address Message Block - Magazine Number - Bit Allocation

This data is not encrypted
Byte following Block Type Code

(1)	Magazine Number	3 bits
(2)	Set to 0	5 bits

This byte is not repeated for each service number.

24.3.8.2 Service Address Message Block - Initial Page Number - Bit Allocation

This data is not encrypted

(1)	Service Number	8 bits
(2)	Initial Page Number	8 bits

This group is repeated for each service number.

24.4 Block Format B

User Data is the data stream originated by a sender and intended for delivery to a specified recipient or group of recipients, see Figure 38. Messages are groups of data concerned with the access to User Data and are for controlling the decoder or placing it in operation, see Figure 38. A suitable encryption algorithm is shown in Figure 39, see also the Notes to Section 24.

24.4.1 Block Type

Byte 2 of a data block defines the block type. This byte is of the form 5/X where X may have the hexadecimal value of 0, 7, 8, 9, A, B, C, D, E or F.

Block Type Code	Interpretation
5/0	Non-scrambled Channel and Terminator
5/7	Common User-Data
5/8	User-Data Key Message
5/9	Key-Conversion Message
5/A	Shared System-Key Message
5/B	Group User-Data
5/C	Unique System-Key Message
5/D	Shared Equipment-Key Message
5/E	Over-Air-Credit Message
5/F	Unique User-Data

Groups of bytes in Messages are transmitted with the least significant byte first. Groups of bits in Messages defining a Mask are transmitted with mask bit 0 first.

24.4.2 Non-Scrambled Channel

Bytes following Block Type Code 5/0 up to the next block separator (DLE) do not include scrambled or encrypted data. This block type is used to terminate a previous block, when there is no other data for inclusion.

24.4.3 Common User Data Block

Block Type Code 5/7, see Figure 40(b).

24.4.3.1 Common User Data Block - Bit Allocation

This data is not encrypted	
In Use System Key Label	1 byte
Cipher Initial Variable	1 byte

24.4.3.2 Common User Data Block - User Data

Any number of bytes scrambled by cipher stream using method 2 in Output Feedback Mode, see Figure 33(b).

24.4.4 Group User Data Block

Block Type Code 5/B, see Figure 40(c).

24.4.4.1 Group User-Data Block - Bit Allocation

This data is not encrypted
Shared User Address 3 bytes
Cipher Initial Variable 1 byte

24.4.4.2 Group User-Data Block - User Data

Any number of bytes scrambled by cipher stream using method 2 in Output Feedback Mode, see Figure 33(b).

24.4.5 Unique User-Data Block

Block Type Code 5/F, see Figure 40(d).

24.4.5.1 Unique User-Data Block - Bit Allocation

This data is not encrypted
Unique User Address 5 bytes
Cipher Initial Variable 1 byte

24.4.5.2 Unique User-Data Block - User Data - Bit Allocation

Any number of bytes scrambled by cipher stream using method 2 in Output Feedback Mode, see Figure 33(b).

24.4.6 User-Data Key Message Block

Block Type Code 5/8, see Figure 40(e).

24.4.6.1 User-Data Key Message Block - Bit Allocation

This data is not encrypted
Decoder Secure Module Address 1 byte
In Use System Key Label 1 byte
User Data Key Label 1 byte

24.4.6.2 User-Data Key Message Block - Bit Allocation

This data is encrypted with current system key using encryption method 2 in Differential Code Book Mode, see Figure 33(a).
Part Current System Key 5 least significant bytes
Sub-service 1 byte
Item Value:
fractional part of value: 1 byte
whole unit part of value: 1 byte
User Data Key: 8 bytes

24.4.7 Key-Conversion Message Block

Block Type Code 5/9, see Figure 40(f).

24.4.7.1 Key-Conversion Message Block - Bit Allocation

This data is not encrypted

New System Key Label	1 byte
Current System Key Label	1 byte

24.4.7.2 Key-Conversion Message Block - Bit Allocation

This data is encrypted with the new system key using encryption method 2 in Differential Code Book Mode, see Figure 33(a).

Current System Key	8 bytes

24.4.8 Shared System-Key - Message Block

Block Type Code 5/A, see Figure 40(g).

24.4.8.1 Shared System-Key - Message Block - Bit Allocation

This data is not encrypted

Shared User Address	3 bytes

24.4.8.2 Shared System-Key - Message Block - Bit Allocation

This data is encrypted with the Shared Equipment Key using encryption method 2 in Differential Code Book Mode, see Figure 33(a).

Part Shared Equipment Key:	7 least significant bytes
In Use System Key Label:	1 byte
User Enabling Mask:	32 bytes
In Use System Key:	8 bytes

24.4.9 Unique System-Key Message Block

Block Type Code 5/C, see Figure 40(h).

24.4.9.1 Unique System-Key - Message Block - Bit Allocation

This data is not encrypted

Unique User Address	5 bytes

24.4.9.2 Unique System-Key Message Block - Bit Allocation

This data is encrypted with the Unique Equipment Key using encryption method 2 in Differential Code Book Mode, see Figure 33(a).

Part Unique Equipment Key:	7 least significant bytes
Current System Key Label:	1 byte
Sub-service Mask:	16 bytes
Current System Key:	8 bytes

24.4.10 **Shared Equipment-Key - Message Block**

Block Type Code 5/D, see Figure 40(j)

24.4.10.1 **Shared Equipment-Key - Message Block - Bit Allocation**

This data is not encrypted
Unique User Address 5 bytes

24.4.10.2 **Shared Equipment-Key - Message Block - Bit Allocation**

This data is encrypted with the unique equipment key using encryption method 2 in Differential Code Book Mode, see Figure 33(a).

Part Unique Equipment Key:	4 least significant bytes
Shared Address:	3 bytes
Enabling Bit Pointer:	1 byte
Sub-service Mask:	16 bytes
Shared Equipment Key:	8 bytes

24.4.11 **Over-air Credit Message Block**

Block Type Code 5/E, see Figure 40(k).

24.4.11.1 **Over-air Credit Message Block - Bit Allocation**

This data is not encrypted
Unique User Address 5 bytes

24.4.11.2 **Over-air Credit Message Block - Bit Allocation**

This data is encrypted with the unique equipment key using encryption method 2 in Differential Code Book Mode, see Figure 33(a).

Previous Total Credit:	4 bytes
Unique Equipment Key:	8 bytes
New Total Credit:	4 bytes

NOTES TO SECTION 24

SIMPLE BLOCK ENCIPHERMENT ALGORITHM

Encryption Method 2 Figure 33(a)

Current Standardization activity on data encipherment is based on the use of a 64-bit cipher in one of four modes. The key word length is at least 48 bits.

An encipherment algorithm is proposed which is relatively simple to implement in software or hardware, including VSLI, with adequate security for commercial broadcasting applications. It uses 64-bit blocks and a 48-bit key, extendable to 64-bits.

The operation uses a device, called a permuter, which under the command of a 2-bit control input, converts an 8-bit input word to an 8-bit output word. The conversion is by means of one of four stored permutations of the 256 input states to 256 output states. Because these are permutations, not random 'look-up tables', the operation is reversible, each output state corresponding to one and only one input state for a given control word. Thus for every permuter there is a complementary permuter which acts in the reverse direction.

A convenient embodiment of the permuter is a 1024 by 8-bit ROM. It has a 10 bit input, 2 bits being assigned to the control function and the remainder are the 8-bit input word. 24 permuters are required for full-speed operation. It is recommended that for commercial broadcasting applications, all the permuters are identical but the method describes the general case where they can all be different.

In Figure 39 the permuters are shown as 8-by-8 squares with 8 inputs on the left-hand edge and 8 outputs on the right-hand edge. They are in banks of 8 so that they handle 64 bits at once. The ordered 64-bit input is applied to the 64 input points using a fixed but irregular (e.g.random permutation of the 64 items) distribution. The output of the first bank of permuters (a-h) forms the input to the second bank (j-r). It is desirable that each permuter in the second bank has one input from each of the permuters in the first bank. The same consideration applies when coupling the second bank to the third bank of permuters (s-z). This is shown in Figure 39 by simple transposition. Although a more random fixed permutation would be of advantage, it is not considered necessary for this application. The output 64 bits are assembled using another fixed but irregular distribution. The 48-bit key is applied to the 24 permuters such that each receives 2 unique control bits in a fixed and not necessarily irregular way. The principles can be readily extended to a 64 bit key by adding another bank of permuters, using the same pattern.

By reading Figure 39 from right to left, with complementary permuters, but using the original control bits from the key word, the reverse process takes place to decipher the 64-bit block. The same key is used as that for the original encipherment.

NOTES ON TERMINOLOGY APPLICABLE TO SECTIONS 22 AND 24

A number of equivalent terms are used in current descriptions of controlled access systems and the encipherment of data. In Sections 22 and 24 a practical degree of uniformity has been employed in respect of the range of formats. However the following notes will assist when relating these sections to other documents and standards.

1. In broadcasting applications generally the term "Scrambling" is used for the operation of rendering programme or other material for transmission of no value to an unauthorised recipient. The complementary process is "Descrambling". This meaning is used in this specification. The terms encryption/decryption and encipherment/decipherment are in use for aspects of these functions.

2. In broadcasting applications generally, the term "Encryption" is used for the operation of rendering a "Descrambling Key" (i.e. a data word) only accessible to authorised recipients. The complementary process is "Decryption".

3. The term "Encipherment" and its complement "Decipherment" is used for the process of using a cipher (i.e a Key) to carry out the processes o: Scrambling/Descrambling and Encryption/Decryption.

4. The term "System Key" is used in this specification. An alternative term is "Period Key".

5. It is necessary to define and label transmitted keys as being "Current' or "New". Alternative terms are respectively "Result" and "Source".

6. The Electronic Code Book (ECB) and the Output Feed Back technique are the encipherment modes for a 64-bit block cipher as defined in [11].

PART J: APPENDICES

APPENDIX 1

RECOMMENDED ORDER OF TRANSMISSION FOR PACKETS WITH Y=26, Y=27 AND Y=28

To permit most efficient operation of the decoder it is recommended that following the transmission of a page header packet (Y=0), any packets with Y=27, Y=28 and Y=26 are transmitted, in that order.

If a further header packet (Y=0) is transmitted, following the transmission of packets with Y=27, Y=28 and Y=26, then those packets must be re-transmitted.

APPENDIX 2

DECODER MEMORY BEHAVIOUR

Although this specification does not explicitly introduce any limitations based on the expected size or speed of the decoder memory, certain decoders may have limitations in these respects as follows:

1. The number of attributes applicable to any one display row may be limited to 40.

2. The DRCS memory may be limited to 16k bits.

3. Up to 20ms may be required to erase the decoder memory after the receipt of a page header packet (Y=0). Thus it may be necessary for this period to elapse, after transmission of a page header packet before more data relating to that page is transmitted.

APPENDIX 3

HAMMING PROTECTED DATA

Certain data bytes are protected by Hamming Codes, two forms are used:

1. Hamming (8,4) - Bytes with four data bits and four protection bits.

   In this form bits b1, b3, b5 and b7 are the protection bits; bits b2, b4, b6 and b8 carry the data.

   The Parity Checks Pn are:

   P1 b8, b6, b2, b1
   P2 b8, b4, b3, b2
   P3 b6, b5 b4, b2
   P4 bits 1 to 8 inclusive

2. Hamming (24,18) - Groups of three bytes with 18 data bits and 6 protection bits.

In this form bits b1, b2, b4, b8, b16, b24 are the protection bits; bits b3, b5, b6, b7, b9, b10, b11, b12, b13, b14, b15, b17, b18, b19, b20, b21, b22, b23 carry the data.

The Parity Checks Pn are:

P1 all odd numbered bits 1 to 23 inclusive
P2 b2, b3, b6, b7, b10, b11, b14, b15, b18, b19, b22, b23
P3 b4, b5, b6, b7, b12, b13, b14, b15, b20, b21, b22, b23
P4 bits numbered b8 to b15 inclusive
P5 bits numbered b16 to b23 inclusive
P6 bits numbered b1 to b24 inclusive

APPENDIX 4

CODES OF PRACTICE FOR OPTIONAL USER-FRIENDLY PAGE ACCESS METHODS

METHOD 1 - "FLOF"

A. INTRODUCTION

The object of this Code of Practice is to facilitate the addition of new service features, the design of receivers to exploit them and the introduction of the concepts to the market.

The intention is to provide ease of page selection, comprehensive use of the data base and a reduction in page acquisition time.

This Code of Practice is compatible with the EBU TELETEXT SPECIFICATION but is not a part of that specification. It includes information applicable to broadcasters and receiver designers.

B. OBJECTIVES

1. Simple User Control
2. Easier Selection of Information
3. Reduced Page Access Time
4. Compatibility with Existing Products in the Field
5. Compatibility with Existing Data Base Structures
6. Minimum Transmission Overheads
7. Moderate Editorial Overheads
8. Optimum Cost Effectiveness
9. Flexibility in Use
10. Unambiguous Operation
11. Compatibility with Decoders Having Storage Facilities for Any Number of Pages

C. TRANSMITTED PACKETS

In addition to the packets with Y=0 to Y=23, used for level one display, the service features included in this code of practice require the following extension packets:

Packets with Y=24 Page Data Extension Packet
In this application, this packet contains user 'prompt' information for display, provided by the editor. It associates a given key on the user's control unit with a linked page address included in packets with Y=27, see Section 12.2.

Packets with Y=27 Designation Code 0000 Page Service Data Packet

This packet contains the addresses of linked pages, link control information, display row 24 flag and error detection data, see Section 12.2.

Packet 8/30 Television Service Data Packet

Format 1 of this packet applies and contains the address of the 'Initial Teletext Page', 'Status Message', 'Time Offset from Universal Co-ordinated Time','Universal Co-ordinated Time', 'Modified Julian Date' and 'Television Programme Group Label'. When a given category of the above data is not included, fall-back codes will be included.

D. EXTENSION PACKET APPLICATION

D.1 Packet 8/30

D.1.1 The data defined in Sections 13.1 to 13.2.9 shall be transmitted.

D.1.2 Decoders intended for use according to this code of practice shall process the designation code (Section 13.2.1), recognising multiplexed or non multiplexed functions.

D.1.3 Decoders intended for use according to this code of practice shall acquire the initial teletext page on switch-on or on changing channel, see Section 13.2.2.

D.1.4 Decoders intended for use according to this code of practice may optionally process these data items:

- Network Identification (Section 13.2.3)
- Time Offset Code (Section 13.2.4)
- Modified Julian Date (Section 13.2.5)
- Co-ordinated Universal Time (Section 13.2.6)

D.1.5 Television Programme Label data (Sections 13.2.7 and 13.2.8) Decoders intended for use according to this code of practice are not required to process these data items.

D.1.6 Status Display (Section 13.2.9) Decoders intended for use with according to this code of practice may display the status message on switch-on and on changing channel. It is not intended to be presented in the teletext mode but is inserted in a box in the normal television picture display. Start Box and End Box control characters are not transmitted. The box must therefore be generated by the decoder. The display of the message shall be terminated after a suitable period. User controls may be provided to reactivate the display for a further period and to deactivate the status display facility.

D.2 Packets with Y=27 Automatic Page Acquisition

A decoder intended for use according to this code of practice shall process the linked page addresses (Section 12.2) to acquire pages automatically. The maximum number of pages stored is limited by the decoder memory capacity.

D.2.1 Coloured Keys - Prompt Mode

A decoder intended for use according to this code of practice will provide four keys on the user's control unit, associated with the first four linked page addresses, in transmission order. These keys shall be respectively coloured red, green, yellow and cyan and relate to the associated displayable prompts that may be transmitted in a packet with Y=24.

D.2.2 Link Address Number 4

The fifth link address is not used in the functions defined above but may be used for additional Automatic Page Acquisition.

D.2.3 Link Address Number 5

A decoder intended for use with this code of practice will provide an INDEX KEY on the user's control unit. The sixth link address is associated with this key and the linked page shall carry suitable introductory material to assist the user. The use of the Index Key is not associated with a prompt transmitted in a packet with Y=24.

D.2.4 Display Row 24 Flag (Section 12.2.3.2)

Data bit 4 set to 1:

Packet with Y=24, if present, is to be displayed at the bottom of the associated page. Such a packet 24 may include the prompts as defined above.

Data bit 4 set to 0:

Packet with Y=24 is not to be displayed but may be present for other applications.

(The functions of data bits 1, 2 and 3 of the Link Control Data are as defined in Section 12.2.3.1 and are not part of this code of practice).

Decoders compatible with this code of practice shall process the Display Row 24 Flag bit 4 as described above.

D.2.5 Basic Page Check Word (Section 12.3)

Decoders intended for use according to this code of practice may optionally process this check word.

D.3 Packets with Y=24

This packet is used in this code of practice to assist the user in page selection. The relationship between the displayed prompts and the users control keys should be clear.

Up to four prompts can be included in this packet, respectively distinguished by the inclusion of the colours red, green, yellow and cyan. The display should be such that a prompt can be distinguished by position as well as by colour.

The number of characters used in the prompts is only limited by the availability of 40 character codes in packets with Y=24.

The relationship between prompts transmitted in a packet with Y=24 and the link addresses in packets with Y=27 is as defined in Section D.2.1 and D.2.4.

E. SERVICE COMBINATIONS

The following fall-back conditions are defined:

E.1 No Packet 8/30

Multiplexed operation is assumed, with an initial page address 100, page sub-code being interpreted as 'don't care'. No status message is to be displayed.

E.2 No Packet with Y=27 and No Packet with Y=24

The index key will cause the initial page to be displayed; the coloured keys will be disabled.

E.3 Packet with Y=27 but No Packet with Y=24

At least an index link in the appropriate link number shall be provided.

E.4 A Packet with Y=24 included, other than for prompts in conformity with this code of practice

A packet with Y=24 may be included in any sequence of data. It shall only be displayed when the Display Row 24 Flag Bit is set to 1, see Section D.2.4.

F. CONFORMANCE

F.1 To conform with this code of practice the transmission shall include:

- a packet 8/30 including the data specified in Section 13.2;
and
- a packet with Y=27 including the data specified in Section 12.2;
and
- a packet with Y=24 including data as specified in D.3.

Note: The inclusion of prompts in a packet with Y=24 of a given page is under editorial control since some material may not be suitable, e.g. due to rapidly changing content.

F.2 To conform with this code of practice a decoder shall:

- in addition to packets with Y=0 to Y=23, at least acquire packets with Y=24, Y=27 and 8/30;

and

- at least process the data in packet 8/30 as specified in Section D.1.2 and D.1.3;

and

- at least process the data in packets with Y=27 as specified in Sections D.2 but excepting Sections D.2.2 and D.2.5.

and

- at least display the data in the packet Y=24 as specified in Section D.3.

G. ADDITIONAL DECODER FEATURES

Certain decoder features have been identified that do not require the transmission of additional data and do not need to be taken into account in the editorial processes. They do not form part of this code of practice but are included for the guidance of equipment designers.

G.1 Decoder Display When there is No Transmitted Packet with Y=24

When the link addresses in a packet with Y=27 are not associated with prompts and no packet with Y=24 is transmitted, the decoder may generate a display. It is recommended that this may include the magazine and page numbers of the first four link addresses (numbers 0 to 3) in a packet with Y=27. Any page sub-code should not be displayed.

To utilise this facility, the link address number 0, displayed in red and relating to the red key, may be used editorially defining the 'next logical page'; the link number 1, displayed in green and relating to the green key, may be used editorially defining a 'browse' among various pages. The position and mode of this display is optional but the relationship to the keys should be clear.

G.2 Previous Page

It is recommended that a 'Previous Page' key be included in the user controls. This key should toggle between the currently selected page and the page previously displayed.

G.3 Sub-title Key

It is recommended that a key be included to provide simple access to the sub-title service.

G.4 Other Methods of Page Selection

Notwithstanding the inclusion of the data defined in this code of practice in the transmission and the inclusion of the related keys on a user's control unit, other methods of page selection may still be provided. While this code of practice includes a range of features appropriate to an enhanced service, it does not preclude other functions, either included in the transmission or in the decoder, that provide further features.

METHOD 2 - "TOP"

A. INTRODUCTION

The "TOP" (Table of Pages) System specified in [11] and described below is an addition to the teletext service which can be offered to the teletext user by the service provider. A user-friendly page access such a teletext transmission cycle can be arranged of suitably-equipped decoders. The selection of the pages is accomplished by special function keys on the user's teletext television remote-control unit. TOP also facilitates users rapid orientation in the teletext service structure together with an improved user guidance.

The TOP System Code of Practice is compatible with the EBU TELETEXT SPECIFICATION but is not part of that specification. It includes information applicable to broadcasters and receiver designers.

B. OBJECTIVES

The TOP system is intended to fulfill the following objectives

1. Simple user control
2. Rapid orientation with in the teletext service structure
3. Reduced page access time
4. Better use of the decoder data base
5. Direct page access facilities
6. Minimum transmission overhead
7. Moderate editorial overhead
8. Low additional costs for providers and viewers
9. Compatible with multipage decoders
10. Additional features improving user's guidance

C. MAIN PRINCIPLE

The basic idea underlying the TOP System is to arrange the pages within a teletext transmission cycle according to specific themes comparable to the structure of themes established by ordinary file-card boxes. All "news" pages, for example, are assigned to a specific file-card box; further "blocks" of pages are conceivable: one for "sport", one for "service", one for "TV programme preview" and so on. Correspondingly, as it is also customary for file-card boxes, a further sub-division is provided: each "block" is composed of different "groups", for instance, the "news" block might be subdivided into the groups "politics", "economics" and "culture".

- *User-controlled selection of pages*

In accordance with the partition into blocks and groups, the selection of pages is established by way of four specially-marked keys on the decoder remote-control unit:

1st key ("+"): leads to the next page in the "file-card" box

2nd key (e.g. "red"): leads to the first page of the next group

3rd key (e.g. "blue"): leads to the next block and

4th key ("-"): leads back to the page(s) last seen.

In the commentary row (25th text row) at the bottom of the display screen, two fields, in the same colour as used by the corresponding keys, serve as guide for the user. This commentary row generated by the decoder announces the title of the block just selected, the title of the next group in that block and the title of the next block. In addition, the TV programme-preview pages can directly be selected by pressing a special key on the remote-control unit.

- *Direct page access*

In place of a step-by-step keying-in from one block to the next and from one group to the next, direct page access may also be offered by the TOP System. By way of a "guide" page listing all the blocks together with their groups a user can mark the desired group within that page to have direct access to the pages of this group.

In addition, specific pages can be marked by the teletext editor in order to generate a special "review" page for direct access by the viewer. Thus the editor can provide a simple and comfortable access for pages, which are particularly important or frequently viewed by the viewers.

- *Additional features*

By evaluating the TOP tables included in the teletext transmission cycle additional announcements such as "Page not included", "Please wait", "Multipage with 4 sub-pages" can be issued by the decoder in the commentary row without having to await the appearance of the page demanded.

By use of TOP the waiting time for requested pages may also be considerably reduced. Where an appropriate design of multi-page memory decoder is used. Stored pages in the vicinity of a selected page which have a high probability of viewer interest within a group or a block may be stored while the viewer is reading the last-selected page.

TOP contributes, to providing user-friendly guidance through the multitude of pages within a complex-structured teletext programme, and also to optimally exploitating of the storage capacity offered by the teletext decoder.

D. IMPLEMENTATION

TOP is based on the inclusion of four kinds of "Table" pages within the teletext transmission cycle:

- the BASIC TOP TABLE,
- the PAGE-LINKING TABLE,
- the MULTI-PAGE TABLE and
- the ADDITIONAL INFORMATION TABLE.

D.1 Basic TOP table

In the BASIC TOP TABLES all teletext pages included in the transmission cycle are listed together with special flags set by the teletext editor for identifying blocks, groups, programme-preview pages and subtitles.

D.1.1 Structure

All pages with decimal page numbers admissible in the teletext system (from 100 to 899) are placed in the BASIC TOP TABLE, each with a distinct position whitin a coordinate system; thus, for example, the position for page 100 is allocated to column 0 of row 1.

The relation between the page number and the position coordinates in the Basic TOP Table is according to the following formula:

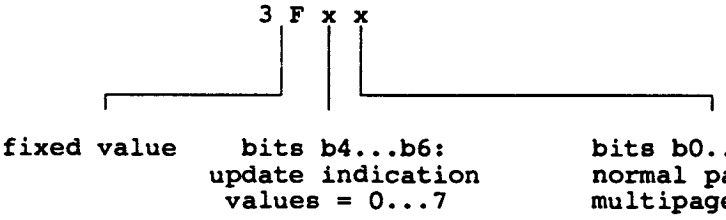
$$N = 100 + C + 40 \times (R-1)$$

where N = decimal page number (100...899)
R = row address (1...20)
C = column address (0...39)

D.1.2 Coding

The transmission codes for the BASIC TOP TABLE are formed from the source codes by applying the (8,4) Hamming code.

The composition of the page sub-code of the BASIC TOP TABLE is as follows:



The seven most-significant bits of the subcode are permanently set to logical "1"; accordingly, the page sub-code can have values from 3F00 to 3F7F.

D.2 Page-linking table

The PAGE-LINKING TABLE contains a list of page numbers on which other tables of the TOP system are transmitted. In addition to the page numbers, the PAGE-LINKING TABLE also contains a list of the various TOP tables types MULTI-PAGE TABLE or ADDITIONAL INFORMATION TABLE).

D.2.1 Structure

The PAGE-LINKING TABLE is part of the teletext page carrying the BASIC TOP TABLE. Use is made of rows 21 and 22 which are not utilized by the BASIC TOP TABLE. Up to five page numbers and the corresponding table indications may be given in each of these two rows. Altogether, it is possible to address 2 x 5 = 10 additional TOP tables in row 21 and 22.

D.2.2 Coding

The coding of the page numbers together with the table identification is according to [11]. The transmission codes are formed from the source codes by applying the (8,4) Hamming code. If fewer than ten table-page numbers are entered into the table, the replacement signal "don't care" is put into the first byte of the fields not required.

D.3 Multi-page table

The MULTI-PAGE TABLE indicates all multi-pages currently transmitted with identification of the numbers of sub-pages used in each case.

D.3.1 Structure

The MULTI-PAGE TABLE is composed in accordance with the BASIC TOP TABLE by way of a coordinate system allocating a distinct position for each page of the 8 normal teletext magazines.

D.3.2 Coding

Coding of the MULTI-PAGE TABLE is in accordance with the code table given in [11]. The transmission codes are formed from the source codes by applying the Hamming (8,4) code.

D.4 ADDITIONAL INFORMATION TABLE

For specific teletext pages, the ADDITIONAL INFORMATION TABLE contains additional indications, such as, for example, the title of a page and, in some cases, a so-called direct selection code.

D.4.1 Structure

The format of the page(s) containing the ADDITIONAL INFORMATION TABLE(S) is adapted to that of the normal teletext pages. An ADDITIONAL INFORMATION TABLE makes use of 22 rows of a teletext page each having 40 columns. Each row may carry additional information for two individual teletext pages. In summary, from row 1 to 22, 22 x 2 = 44 additional items of information can be indicated.

D.4.2 Coding

The information contained in the ADDITIONAL INFORMATION TABLE is coded according to [11].

For bytes 0 to 7 and 20 to 27, the transmission code is formed from the source code by applying the Hamming (8,4) code; for bytes 8 to 19 and 28 to 39, the transmission code is obtained by adding an odd parity bit to the 7-bit source code.

If fewer than 22 rows of the page containing the ADDITIONAL INFORMATION TABLE are used, the transmission of the unused rows may be dispensed with. In cases where the second field in the last row is not used, the "end" sign has to be entered. Otherwise, the 1st field of the next following row must be marked with "don't care" and the second field with "end". Any rows still following the "end" sign are invalid.

Titles are entered at the left-hand edge of the title field, any remaining unneeded parts of the field are filled up with the sign "space" (code: 2/0). In titles, the sign "slash" (code: 2/15) should not be used.

A maximum of two different pages may contain the same direct-selection code; the repetition of the same page numbers is not permissible.

The use of bytes 3 to 6 and 23 to 26 in rows 1 to 22 is reserved and not yet defined.

E. TRANSMISSION

At the sending end the TOP tables are generated in accordance with the details specified in sections C.1 to C.4.

When inserting a teletext page into the transmission cycle, the teletext system must first insert that page and, susequently, up-date the TOP tables. When removing a page from the cycle, the teletext system must act inreverse: first up-dating the TOP tables and thereafter removing the corresponding pages. This prevents a decoder from awaiting the arrival of a page listed in the TOP tables after this page is no longer included in the cycle. The modification or up-dating of the BASIC TOP TABLE or one of the other TOP tables mentioned in the PAGE-LINKING TABLE is signalled to the decoding side by changing the numerical value in the sub-code area (bits b4, b5, b6) in the page-header of the BASIC TOP TABLE (see C.1.2).

The BASIC TOP TABLE or, at least, the header of the page carrying that table should be refreshed at suitable time intervals, in order to convey any changes and up-dates of the TOP tables.

E.1 Serial mode

E.1.1 Basic TOP table

One BASIC TOP TABLE is transmitted for the complete teletext service. All displayable pages (having page numbers from 100 to 899) are marked in the BASIC TOP TABLE according to their current status. Rows 1 to 21 or 1 to 22 are transmitted completely; the page number for the transmission of the BASIC TOP TABLE is 1FO 3Fxx.

E.1.2 Multi-page table

For the complete teletext service, only one MULTI-PAGE TABLE may be included in the transmission cycle.

If a MULTI-PAGE TABLE is transmitted in the transmission cycle, the page number (including the sub-code) and the identification of that table must be entered in the PAGE-LINKING TABLE. All multi-pages having decimal page numbers (100...899) are marked in the MULTI-PAGE TABLE in accordance with the number of associated sub-pages. Rows 1 to 20 are transmitted in their entirety.

E.1.3 Additional information table

Additional information for all pages included in the transmission cycle is transmitted by use of a ADDITIONAL INFORMATION TABLE or, if necessary, by use of several of these tables.

The page number(s) (including the sub-code) under which the ADDITIONAL INFORMATION TABLE(S) are transmitted have to be taken from the PAGE-LINKING TABLE.

E.2 Parallel mode

E.2.1 Basic TOP table

For each teletext magazine an independent BASIC TOP TABLE has to be included in the transmission cycle.

Pages currently included in the magazine in question are marked in its BASIC TOP TABLE. Any rows of the BASIC TOP TABLE that are not relevant for the magazine in question, need not be transmitted.

The individual BASIC TOP TABLES are transmitted under page number YF0 3F7xx where Y represents the magazine number concerned.

E.2.2 Multi-page table

For each magazine included in the teletext transmission cycle, an independent MULTI-PAGE TABLE may be transmitted in the same or in another magazine.

Also in the "Parallel mode", a MULTI-PAGE TABLE can contain multi-page identifications for several magazines included in the transmission cycle.

If an allocated MULTI-PAGE TABLE is transmitted in connection with an individual magazine, the page number (including the sub-code) together with the identification of that table must be included in the PAGE-LINKING TABLE transmitted in the magazine in question.

All multi-pages with decimal page numbers of the allocated magazine are marked in the MULTI-PAGE TABLE in accordance with the number of associated sub-pages.

Any rows of the MULTI-PAGE TABLE that are not relevant for the allocated magazine(s) need not be transmitted.

E.2.3 Additional information table

For each magazine, independent additional information may be transmitted by use of an ADDITIONAL INFORMATION TABLE or, if necessary, by use of several tables in the same or in another magazine.

In the "Parallel mode", the ADDITIONAL INFORMATION TABLE can also contain additional information for several magazines transmitted in the the transmission cycle.

If additional information for a magazine is transmitted on one (or possibly several) ADDITIONAL INFORMATION TABLE(S), the page number(s) (including the sub-code) together with the identification(s) of these table(s) must be included in the PAGE-LINKING TABLE transmitted in the magazine in question.

F. RECEIVER REQUIREMENTS

F.1 Basic TOP table

Renewed read-in of BASIC TOP TABLE is necessary if the reception of that table is incomplete or erroneous.

In the case of the "parallel" magazine transmission, only those rows and columns of the BASIC TOP TABLE that carry relevant information for each individually transmitted magazine may be utilized.

F.2 Page-linking table

The bytes following a "don't care" sign or an "end" sign in the same field of the PAGE-LINKING TABLE are of no significance for the receiver.

The PAGE-LINKING TABLE has to be read in anew after every recognition of a sub-code change signalled in the page-header of the BASIC TOP TABLE. Renewed read-in is also necessary in the event of incomplete or erroneous reception.

F.3 Multi-page table

If the receiver detects for a specific page a multi-page identification, this is only valid if the page is simultaneously identified as a multi-page in the BASIC TOP TABLE.

The MULTI-PAGE TABLE has to be read in anew after every recognition of a sub-code change signalled in the page-header of the BASIC TOP TABLE. Renewed read-in is also necessary in the event of incomplete or erroneous reception.

In the case of "parallel" magazine transmission, only those rows and columns of the MULTI-PAGE TABLE that carry relevant information for the allocated magazine(s) may be utilized

F.4 Additional information table

If the receiver detects a page carrying an ADDITIONAL INFORMATION TABLE the information is only valid for the page in question if the page is simultaneously marked in the BASIC TOP TABLE as a page with additional information.

If the receiver detects several currently valid pages identified by the same direct-selection code, that page with the smallest page number should be allocated to the direct-selection code.

The block title together with the titles of the associated groups and the titles of the pages identified by a direct-selection code form a unit which should be represented together for user information.

Renewed read-in is required in the event of faulty reception of the ADDITIONAL INFORMATION TABLE; until error-free reception, the page numbers in question could be displayed in place of the text carrying the user guidance (commentary row, title pages).

The ADDITIONAL INFORMATION TABLE has to be read in anew on every recognition of a sub-code change signalled by the page-header of the BASIC TOP TABLE; renewed read-in is also required in the case of incomplete or erroneous reception.

The bytes following a "don't care" sign or an "end" sign in the same field of the ADDITIONAL INFORMATION TABLE are of no significance for the receiver.

APPENDIX 5

RECOMMENDED CODE OF PRACTICE FOR USE OF PAGE AND SUB-CODE ADDRESSES

There is a need for page headers to be available without any following data for time filling and page terminating applications. There is also a need for a page address to be available for internal use in decoders that will not occur in transmission. The following rules are recommended.

1. Any page address up to and including hexadecimal FE with a sub-code up to and including 3F7E, can be used for a page carrying data and can be specified as a linked page.

2. Pages address number FF in any magazine, with any sub-code in the range 0000 to 3F7E may be used for time filling and as a terminator. Pages with these addresses will not carry data for acquisition by a decoder.

3. Page header packets with the page address FF, sub-code 3F7F, will not be transmitted. This address will occur as a null link in packets with Y=27 and 8/30.

APPENDIX 6

PAGE HEADER PACKET CONTROL BITS
C4 ERASE PAGE AND C8 UPDATE INDICATOR

The use of these control bits is subject to editorial judgement. The following is the expected effect.

1. When a page is selected for immediate display, that complete page is placed in memory.

2. Subsequent transmission of a page will overwrite the initially stored page. Any packets not overwritten will remain in memory for display.

3. Although ideally it would be desirable for all stored pages to be maintained updated, where a page is stored for subsequent rather than immediate display, the overwriting may only occur when a page is displayed.

4. The Update bit C8 is used by the editor specifically to indicate that an update has occurred. The expected effect in the decoder is that, where a page display has been cancelled by an appropriate user key, ("cancel page", "picture" etc.), the setting of the Update bit will cause a prompt, which may involve automatic redisplay of the page. An application where this is standard practice is for News Flashes. The unnecessary or inappropriate setting of the Update bit can cause annoying redisplay of a page or News Flash that a user wishes to cancel. The setting of the Update bit is thus an editorial decision.

5. When the Erase bit C4 is set, that page is expected to be erased completely and a new page written into memory.

6. The effect of both of these bits applies to packets 1 to 28 inclusively.

APPENDIX 7

INDEPENDENT DATA SERVICES (DATAVIDEO FORMAT)

This protocol is based closely upon the specification given in Section 23 but with the variations indicated below:

Data channel addressing

Change only the numbers of allocated data channels:

5	1010
6	0110
13	1011
14	0111

§ 23.4 Packet Address

Bytes 6, 7, 8, 4 bits data plus 4 bits Hamming protection.

§ 23.5 Control bytes

Bytes 9 (CI) and 10 (CO), 4 bits data plus Hamming protection.

§ 23.5.1 Packet continuity indicator

It represents a 6-bit number which is incremented modulo-64 with each new packet of the same address on the same data channel. It is not incremented on repeated transmissions of the same packet. Repeated packets may be interleaved with newly transmitted ones; in order to distinguish such repeated packets from new packets in case there is a discontinuity due to packet-losses, the interleaving pace must not be greater than 32.

Packet continuity index is transmitted in byte 9 and the first two data bits of byte 10; the least significant bit is transmitted first.

§ 23.5.2 Masking indicator

Bit M, which is the third data bit of byte 10, indicates the presence of "masking": i.e.. when it has value 1, this means that bytes 11 to 45 (useful data + CRC) are EX-ORed with the sequence (in hexadecimal notation):

AF AA 81 4A F2 EE 07 3A 4F 5D 44 86 70 9D 83 43 BC 3F

EO F7 C5 CC 82 53 B4 79 F3 62 A4 71 B5 71 31 10 08.

It may be common practice to transmit the same packets once masked and once unmasked: this removes the adverse effects of critical bit combinations. Of course, masked and unmasked packets, when the information content is the same, are transmitted with the same continuity index.

§ 23.5.3 Packet type indicator

Bit L, which is the fourth data bit of byte 10, defines the packet type. It is used by higher levels of the protocol ar therefore it may be defined in a different way, according the type of protocol used. In one version of the protocol, this bit, when it is set to 1, indicates the presence, in th user data group, of a "packet length indicator". This is contained in byte 11, and indicates in binary code (least significant bit transmitted first, the last three bits reserved for future use) the number of following useful byte in the data body. In another version of the protocol, Bit I allows to distinguish between packets containing useful data (L=0) and "control packets", i.e. packets containing service information such as access control information. The structu of such packets is defined by higher levels of the protocol, and it is not part of the present specification.

§ 23.6 User data group

The remaining data bytes in the line, except the last two, (byte 11 t 43) constitute the data carried for users of the service, bearing tha Packet Address in that Data Channel. There are 33 data bytes available.

§ 23.7 Cyclic Redundancy Check Word

The last two bytes contain a Cyclic Redundancy Check on the User Data group.

§ 23.7.1 Check Word Generation

The data to be checked is considered as a polynomial in x wi the highest degree term transmitted first and the term of degree zero last.

This is divided, using modulo-2 arithmetic, by the polynomia

$x16 + x12 + x5 + 1$

The remainder from this process, with the highest term transmitted first, is the CRC. Before transmission the bits are complemented (i.e. XORed with FF hex).

§ 23.7.2 Check result

The register of figure 24 is set to Os. The serial data followed by the CRC is then entered. The check is satisfied if the register again contains all Os.

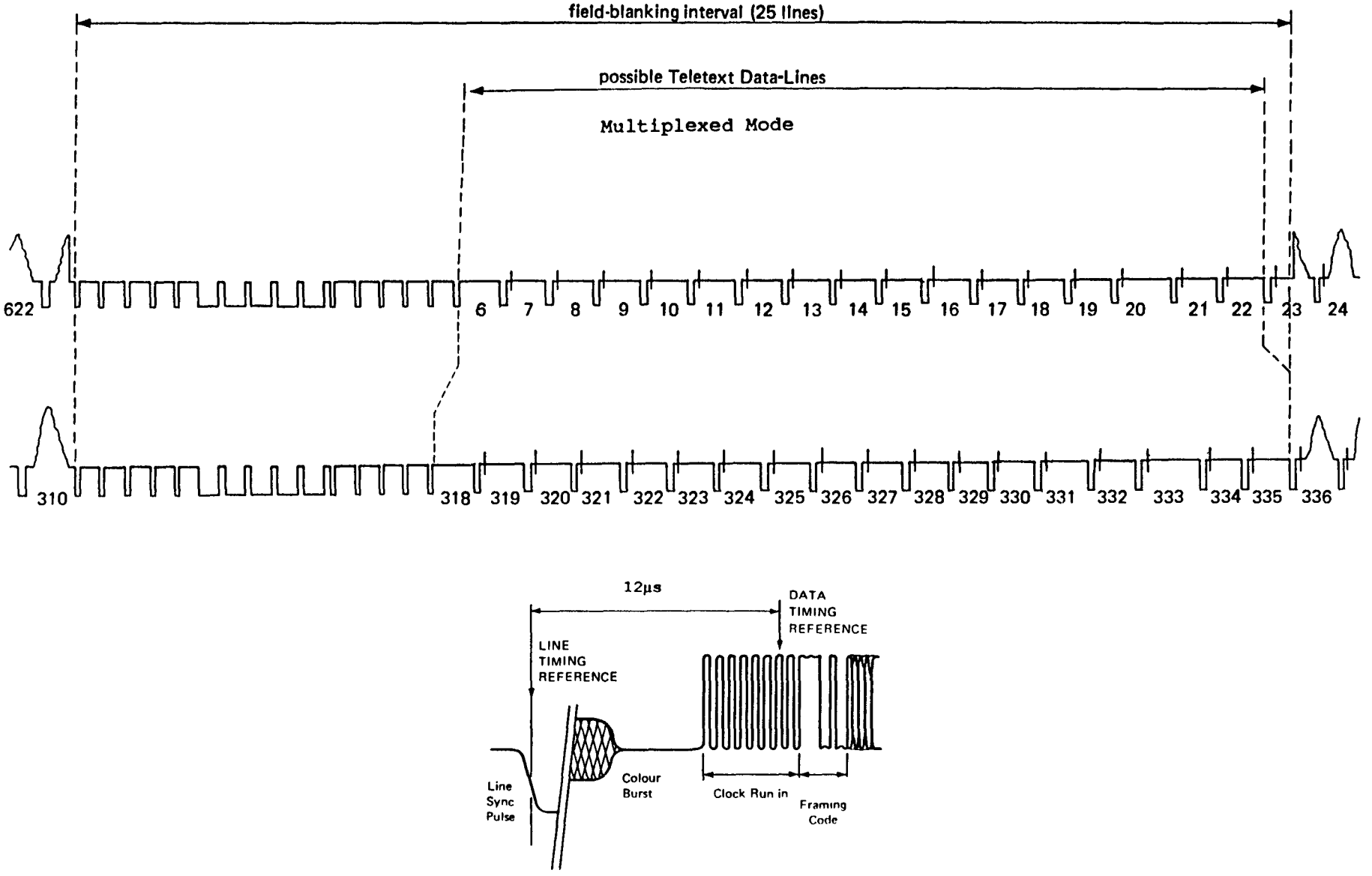
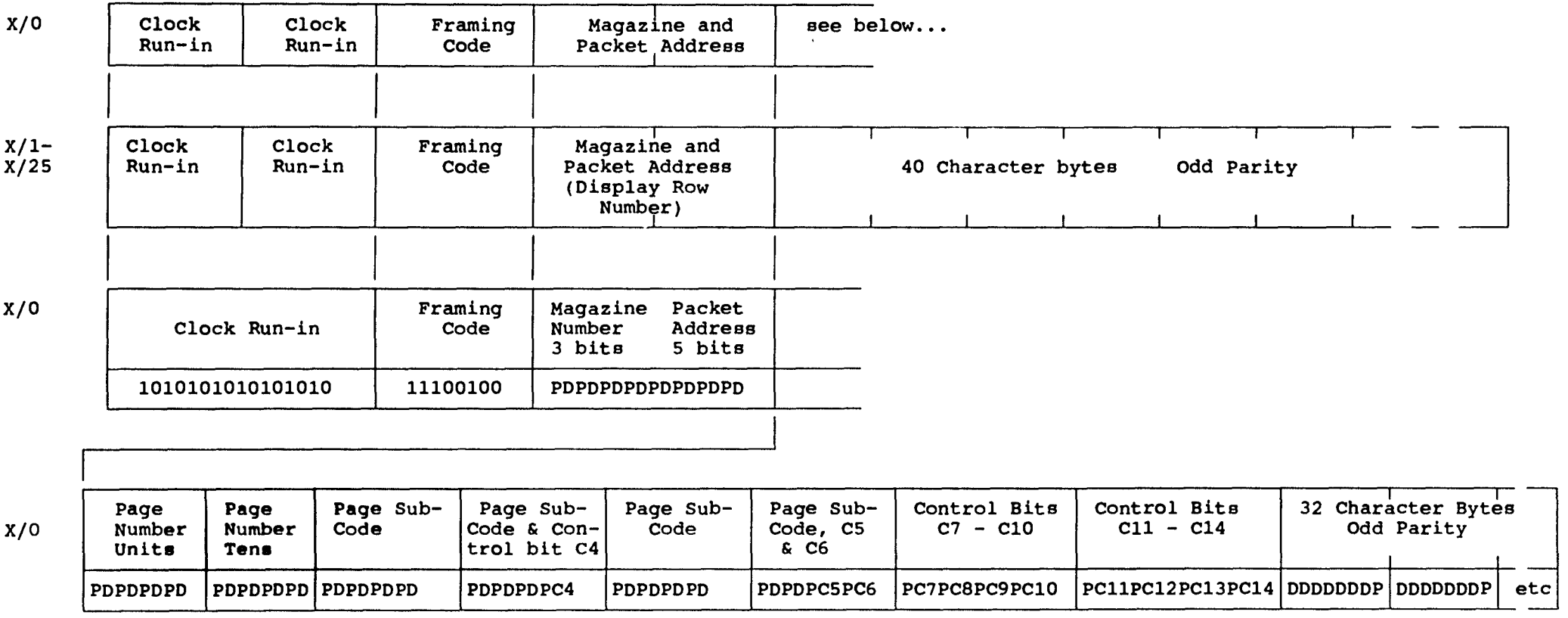
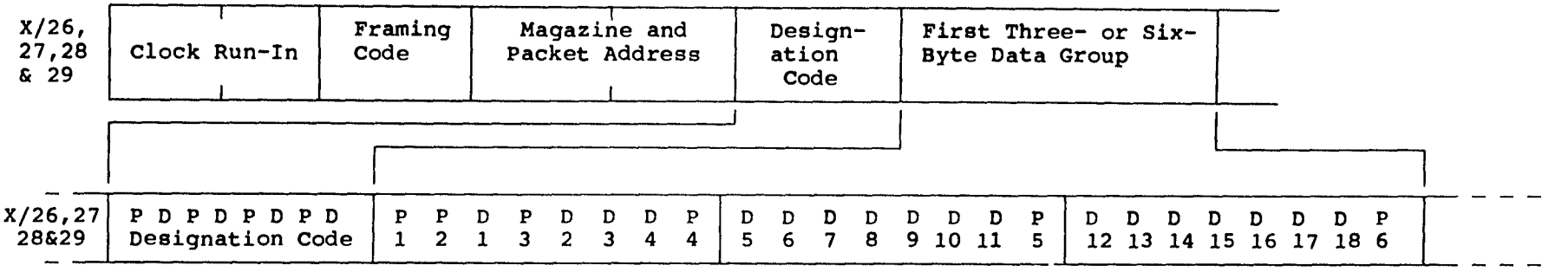


Figure 1 **TELEVISION SIGNAL LINE NUMBERS AND DATA TIMING**



NOTE In all cases the LEAST SIGNIFICANT BIT is transmitted first.
P = Hamming(8,4) Protection bit, D = Data bit in sequence PDPDPDPD in any byte.
Odd parity bytes are coded DDDDDDDP in any byte

Figure 2 **FORMAT OF PACKETS X/0 TO X/25**



Packet X/26: D1-D6 Address, D7-11 Mode, D12-D18 Data, P1-P6 Hamming(24,18) protection bits
Packets X/28 & 29: 13 Three Byte Data Groups in each Packet P= Hamming Bit D=Data Bit

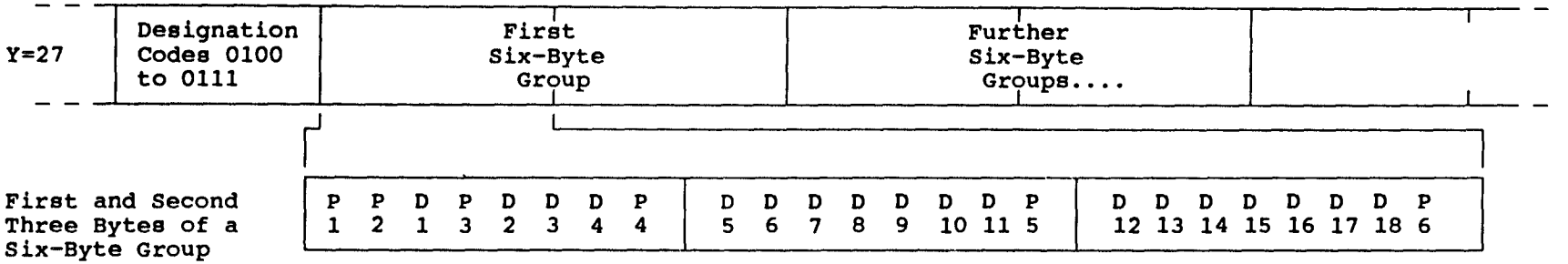
X/27	Designation Codes 0000 to 0011 (for codes 0100 to 0111 see Fig.3 parts 2&3)	First Group of Six Bytes containing Relative Magazine number, Page number and Page Sub-Code	Five further Groups of Six Bytes each plus byte 43 containing link control Data	When Designation Code is 0000, final two bytes are a basic page check digit

8/30 Format 1	P D P D P D P D Designation Code X 0 0 0	One Six-Byte Group Coded as X/27, Designation Codes 0000 to 0011. See NOTE	Network Ident, Time Offset, Mod Julian Date, Co-Ordinated Universal Time, 1st and 2nd Short Programme Labels, bytes 26 to end of packet, Data for Direct Display

8/30 Format 2	P D P D P D P D Designation Code X 1 0 0	One Six-Byte Group Coded as X/27, Designation Codes 0000 to 0011. See NOTE	Programme Identification Data	Data for Direct Display Bytes 26 to end of packet

NOTE These six bytes have the same format as bytes 6 to 11 of the page header packet, see Figure 2. The bits corresponding to the Control Bits C4, C5 and C6 in the page header packet are used in this sequence to change the magazine number from that in bytes 4 and 5 of the packet X/27. Setting any of these bits to '1' complements the corresponding magazine number bit.

Figure 3 part 1 **FORMAT OF PACKETS X/26, X/27, X/28, X/29 AND 8/30**



P = Hamming(24,18) Protection Bit, D = Data Bit

First Three Bytes of a Six-Byte Group
Data Bits 1 - 11: Link Control Data (see Figure 3 part 3),
Data Bits 12 - 14: Relative Magazine Number (see NOTE),
Data Bits 15 - 18: Page Number Tens

Second Three Bytes of a Six-Byte Group
Data Bit 1: Set to 0,
Data Bits 2 - 5: Page Number Units,
Data Bits 6 - 18: Page Sub-code

NOTE The three Relative Magazine bits change the magazine number from that in bytes 4 and 5 of the packet X/27. Setting any of these bits to 1 complements the corresponding magazine bit.

In all cases the LEAST SIGNIFICANT bit is transmitted first

Figure 3 part 2 **FORMAT OF PACKETS X/27 DESIGNATION CODES 0100 TO 0111**

PACKETS WITH Y=27 DESIGNATION CODES 0100 TO 0111

Data bit 1 of the second three bytes of a six-byte group:

set to 0: the interpretation in the Table below applies.
set to 1: the interpretation of bits 1 to 10 below is reserved

Data bits 1 to 11 of the first three bytes of a six-byte group:

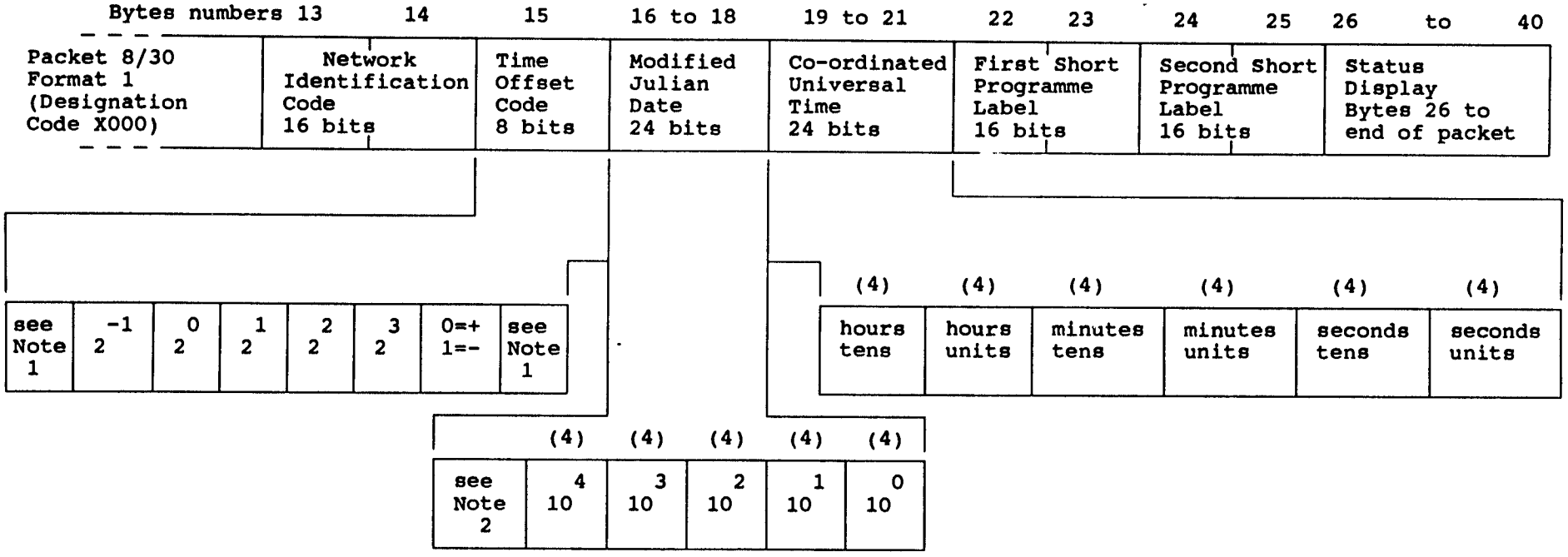
Bit 11 - set to 0: the interpretation of bits 1 to 10 below applies.
- set to 1: the interpretation of bits 1 to 10 is reserved

Bit 10	Bit 9	
0	0	Linked pages not chained
0	1	Linked pages chained, start of chain
1	0	Linked pages chained, end of chain
1	1	Linked pages chained, within a chain

Bit 8	Bit 7	
0	0	Linked page data format 7 bits plus parity bit
0	1	Interpretation reserved, bits 6 to 1 below also reserved.
1	0	
1	1	Linked page contains data in 8 bit format

Bits 6 to 1	
000000	Not a pseudo page
000001	Pseudo page for overwriting
000010	Pseudo page for scrolling
000011	Pseudo page for DRCS downloading, 1st group
000100	Pseudo page for DRCS downloading, 2nd group
000101	Pseudo page for reformatted data
000110	Pseudo page for page format extension
000111	Pseudo page for idiographic character downloading, 1st group
001000	Pseudo page for idiographic character downloading, 2nd group
001001	Pseudo page for geometric data
001010	Pseudo page for photographic data
001011	Pseudo page for musical sound data
001100 to 111110	Interpretation reserved
111111	No linked page; page address FF3F7F transmitted.

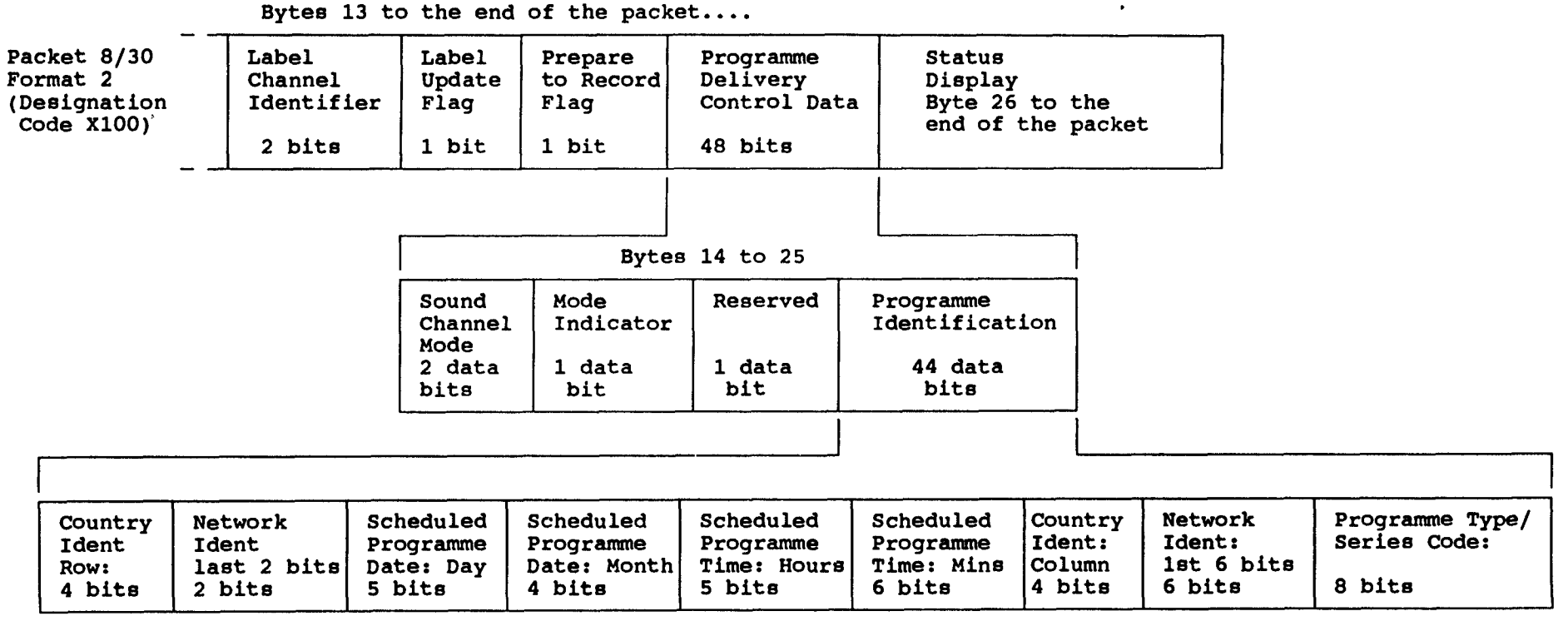
Figure 3 part 3 **LINK CONTROL DATA FOR COMPOSITIONAL APPLICATIONS**



Note 1 These bits are reserved.

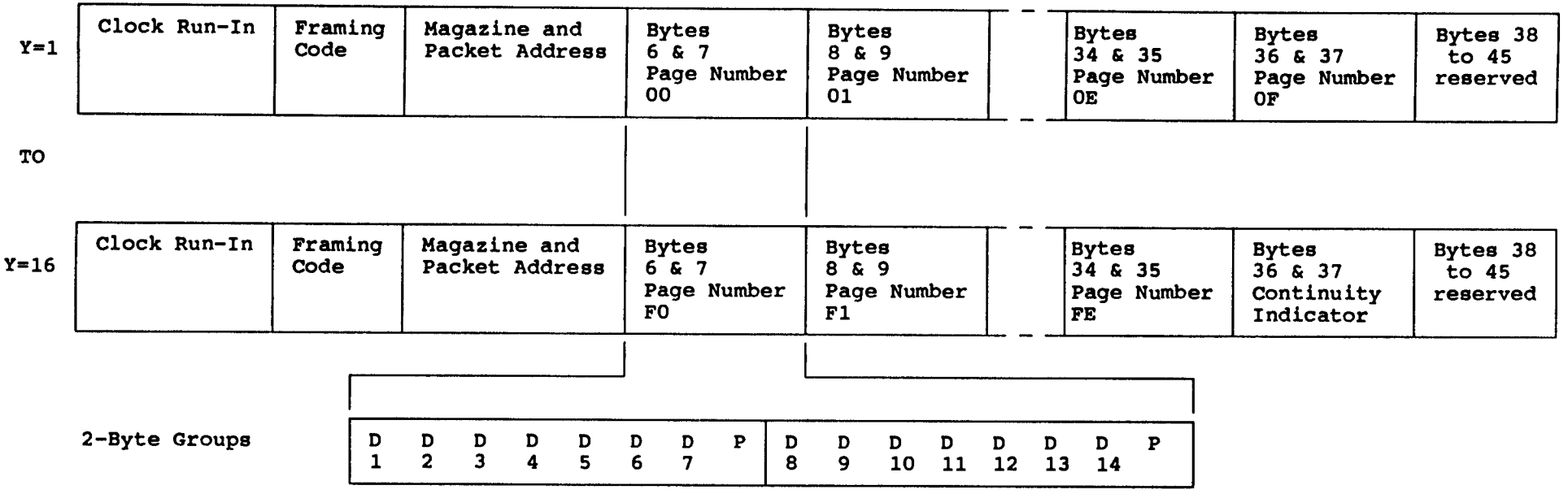
Note 2 Each 4-bit number is incremented by one prior to transmission. The pairs of 4-bit numbers are assembled into bytes and the bytes are transmitted least significant bit first.

Figure 4 **BROADCAST SERVICES DATA PACKET FORMAT 1 : BIT ALLOCATION**



NOTE: Each byte contains 4 bits data plus 4 bits Hamming(8,4) protection.
The data bits in each data word are transmitted most significant bit first.
Groups of 4 data bits are assembled, with Hamming(8,4) protection bits, into bytes.

Figure 5 **BROADCAST SERVICE DATA PACKET FORMAT 2 : BIT ALLOCATION**



D = data bit P = parity bit

D1 to D13 = number of currently transmitted pages of respective page address, least significant bit first, and D14 = Memory Allocation Flag except for Continuity Indicator where D1 to D14 represent a binary number incremented at each change in the page content.

Bytes 38 to 45 are reserved.

Packets with Y=17 to Y=26 are reserved.

Figure 6 part 1 **FORMAT OF MAGAZINE INVENTORY PAGE**

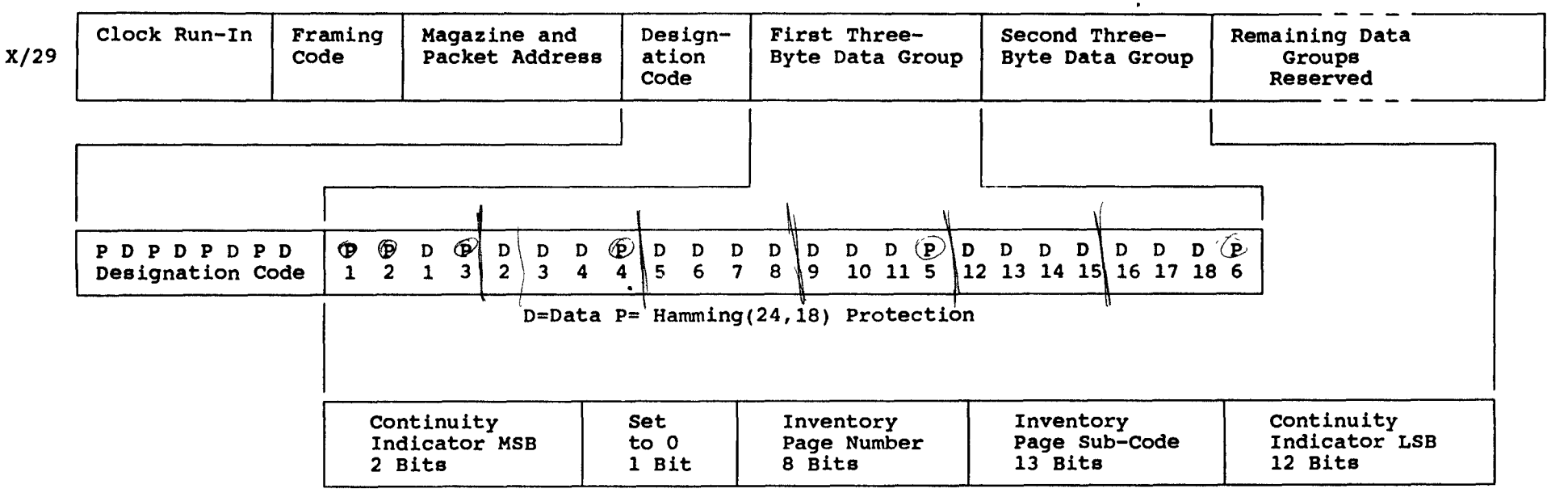
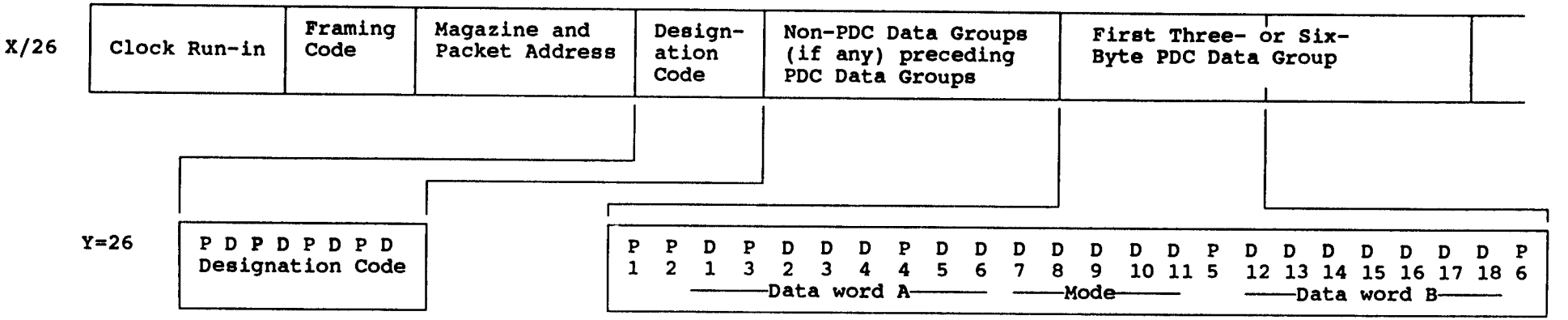


Figure 6 part 2 **FORMAT OF PACKET X/29 FOR A MAGAZINE INVENTORY PAGE**

First PDC packet X/26



Bits D1 - D6 Data Word 'A'
Bits D7 - D11 Mode
Bits D12 - D18 Data Word 'B'
Bits P1 - P6 Hamming(24,18) Protection

Last PDC packet X/26

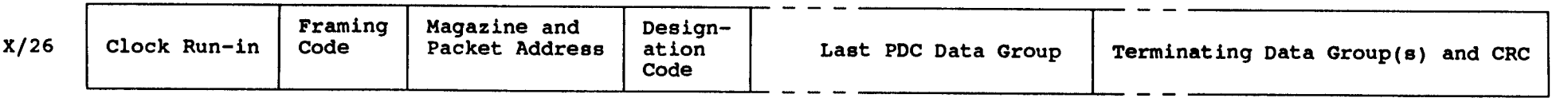
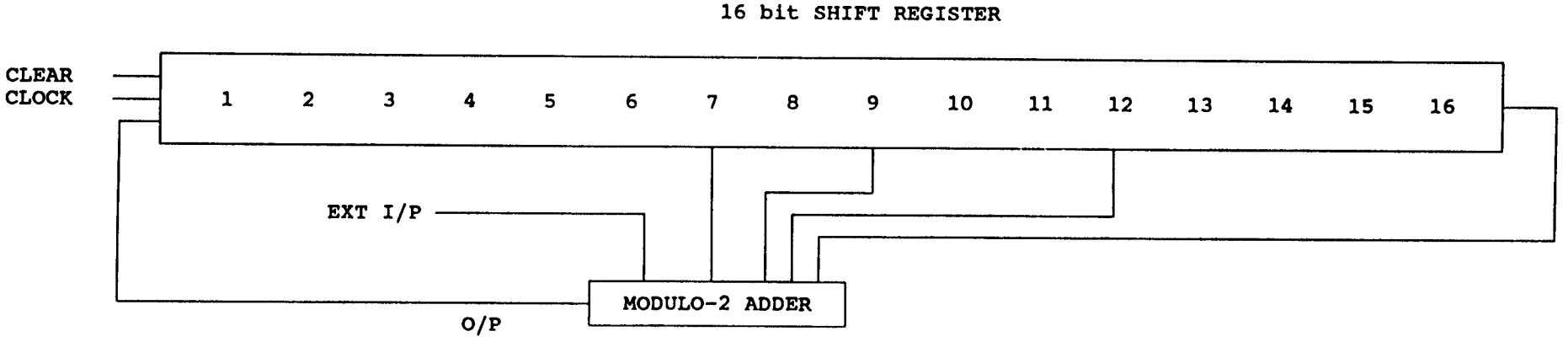


Figure 7 **FORMAT OF PACKETS WITH Y=26 CARRYING PDC DATA**



In the example shown a 16 bit shift register has as input the modulo-2 sum of an external input and the contents of the 7th, 9th, 12th and 16th stages of the register. Initially the register is cleared to "all zeros". During a sequence of 8192 clock pulses, the first 24 character bytes (192 bits) of the page header packet and the following character bytes of packets with Y up to 25, in conventional transmission order, form the input. Any absent packets are considered to contain the character SPACE (2/0) throughout. In each byte, the bit order is b8 to b1 inclusive. This order, that is the reverse of that used in the transmission sequence, is to facilitate decoder operation where the data used is stored in the page memory.

At the transmitting end of the generating process the contents of the register are the basic page check word and it is transmitted along the register beginning with the bit held in the first stage.

The transmission order for the two byte group resulting from the 16 bit cyclic redundancy check on the page is bits 9 to 16 followed by bits 1 to 8 inclusive.

Figure 8 **CHECK WORD GENERATION**

MODE	FUNCTION AND DATA BITS 1 to 7
00000	**FULL SCREEN COLOUR** Bits 1 to 5 least significant bit first invoke an entry from the Colour Map. Bits 6 and 7 are set to 0
00001	**FULL ROW COLOUR** Bits 1 to 5 least significant bit first invoke an entry from the Colour Map. Bits 6 and 7 set to 0 single row; Bits 6 and 7 set to 1 contiguous rows; Other Codes, ignore data bits
00010 & 00011	**USED BY SANSKRIT-RELATED LANGUAGES** Further information is available in a supplementary specification [3]
00100	**SET CURSOR POSITION** Cursor position, left to right is defined by codes 4/0 to 6/7, other codes are to be interpreted as 'No Cursor'
00101	**START SCROLL REGION** Data bits 1 to 5 defines full row scroll region colour, bits 6 and 7 set to 0
00110	**END SCROLL REGION** Data bits 1 to 5 define full row colour from next row to lower border area inclusively, bits 6 and 7 set to 0
00111	**ADDRESSES DISPLAY ROW 0** When data bits are set to 0 Section 14.6.4.1 applies
01000	**PDC DATA** Row Address bits define Country, Data bits 1 to 6 define Source
01001	**PDC DATA** Row Address bits define Date Months, Data bits 1 to 6 define Day
01010	**PDC DATA** Row Address bits define Cursor Row, Data bits 1 to 6 define Starting Time Hours
01011	**PDC DATA** Row Address bits define Cursor Row, Data bits 1 to 6 define Finishing Time Hours
01100	**PDC DATA** Row Address bits define Cursor Row, Data bits 1 to 6 define Local Time Offset
01101	**PDC DATA** Row Address bits invoke Series Code Function, Data bits 1 to 7 provide 'Series Code'
01110 to 11110	**NOT ASSIGNED** Ignore data bits
11111	**TERMINATOR** For packets with Y = 26

Figure 9

PACKETS WITH Y = 26
ROW ADDRESS GROUP 40 to 63
MODE DESCRIPTION CODE

MODE	FUNCTION AND DATA BITS 1 to 7
00000	**FOREGROUND COLOUR** Bits 1 to 5 least significant bit first, invoke an entry from the colour map. Bits 6 and 7 are set to 0
00001	**G1 SET** Bits 1 to 7 define the character. Block Mosaic is default character set
00010	**G3 SET** Bits 1 to 7 define the character. Smoothed Mosaic is the default character set
00011	**BACKGROUND COLOUR** Bits 1 to 5 least significant bit first, invoke an entry from the colour map. Bits 6 and 7 are set to 0
00100	**LATCHING SHIFT** See Figure 10 part 2
00101	**SINGLE SHIFT** See Figure 10 part 3
00110	**PDC DATA** Address bits define Cursor Position in Row, Data bits 1 to 7 see Section 20.4.5.2
00111	**ADDITIONAL FLASH CONTROLS** See Section 14.6.8
01000	**G0 SET MODIFIED DESIGNATION** Bits 1 to 7 define a character set, see figure 14
01001	**G1 SET MODIFIED DESIGNATION** Bits 1 to 7 define a character set, see figure 14
01010	**G2 SET MODIFIED DESIGNATION** Bits 1 to 7 define a character set, see figure 14
01011	**G3 SET MODIFIED DESIGNATION** Bits 1 to 7 define a character set, see figure 14
01100	**NON-SPACING ATTRIBUTES** See Section 14.6
01101	**1st DRCS** Bits 1 to 7 define a character from the 1st DRCS
01110	**2nd DRCS** Bits 1 to 7 define a character from the 2nd DRCS
01111	**CHARACTERS FROM G2 SET** Bits 1 to 7 define a character from the G2 Supplementary Set
10000 to 11111	**DIACRITICAL MARKS FROM COLUMN 4 OF G2 SET** Bits 1 to 7 define the associated G0 Primary Set Character

Figure 10 part 1

PACKETS WITH Y = 26
CHARACTER-SPACE ADDRESS GROUP 0 to 39
MODE DESCRIPTION CODES

DATA BITS 1 TO 7	FUNCTION when space mode description bits are set to 00100
0000000	Latching Shift to Invoked or Default G0 Character Set
0000001	Latching Shift to Invoked or Default G1 Character Set
0000010	Latching Shift to Invoked or Default G2 Character Set
0000011	Latching Shift to Invoked or Default G3 Character Set
0000100	Latching Shift to 1st DRCS
0000101	Latching Shift to 2nd DRCS
0000110 to 1111110	Invocation of and Latching to character sets defined in Figure 14
1111111	Cancel Latching Shift or Invocation and Latching Shift

The effect of a shift or combined invocation and shift is cancelled by transmission of a further shift or a combined invocation and shift.

Figure 10 part 2 **PACKETS WITH Y = 26**

LATCHING SHIFTS AND COMBINED INVOCATION AND LATCHING SHIFTS

DATA BITS 1 to 7	FUNCTION when space group mode description bits are set to 00101
0000000	Single Shift to Invoked or Default G0 character set
0000001	Single Shift to Invoked or Default G1 character set
0000010	Single Shift to Invoked or Default G2 character set
0000011	Single Shift to Invoked or Default G3 character set
0000100	Single Shift to 1st DRCS
0000101	Single Shift to 2nd DRCS
0000110 to 1111110	Invocation of and Single Shift to character sets defined in Figure 14
1111111	Reserved

The effect of a shift or combined invocation and shift is cancelled by transmission of a further shift or a combined invocation and shift.

Figure 10 part 3 **PACKETS WITH Y=26**

SINGLE SHIFTS AND COMBINED INVOCATION AND SINGLE SHIFT

Figure 10 parts 2 & 3

18	17	16	15	Bit Numbers
0	0	0	0	8 bit bytes, 7 bits data and 1 parity bit
0	0	0	1	8 bit bytes, with 8 data bits each
0	0	1	0	3 groups of 8 bit bytes, 18 data bits, 6 Hamming bits
0	0	1	1	8 bit bytes, 4 data bits, 4 Hamming bits
				The interpretation of other combinations of bit values is reserved

Figure 11 part 1 Interpretation of the first group of 18 data bits in a packet with Y=28 of a page with designation code 0000 or 0010

8	7	6	5	4	3	2	1	Bit Numbers
0	0	0	0	0	0	0	0	Basic Page with Standard Character Position and Row Format
0	0	1	*	*	*	*	*	Overwriting Pseudo Page
0	1	0	*	*	*	*	*	Scrolling Pseudo Page
0	*	*	0	0	0	0	0	Page with Standard Character Position and Row Format
0	*	*	1	*	*	*	*	Page Format Extension, Not Last of Group
0	*	*	0	*	*	*	*	Page Format Extension, Last of Group
0	*	*	*	*	*	0	0	Page Format Extension, Left Hand Page
0	*	*	*	*	*	0	1	Page Format Extension, 2nd from Left Page
0	*	*	*	*	*	1	0	Page Format Extension, 3rd from Left Page
0	*	*	*	*	*	1	1	Page Format Extension, 4th from Left Page
0	*	*	*	0	0	*	*	Page Format Extension, Top Row of Pages
0	*	*	*	0	1	*	*	Page Format Extension, 2nd from Top Row
0	*	*	*	1	0	*	*	Page Format Extension, 3rd from Top Row
0	*	*	*	1	1	*	*	Page Format Extension, 4th from Top Row
1	0	0	0	0	0	0	0	DRCS Downloading, First Group
1	0	0	0	0	0	0	1	DRCS Downloading, Second Group
1	0	0	0	0	0	1	0	Idiographic Character Downloading, 1st Group
1	0	0	0	0	0	1	1	" " " 2nd Group [4]
1	0	0	0	0	1	0	0	Reformatted Data
1	0	0	0	0	1	0	1	Terminal Equipment Addressing Page
1	0	0	0	0	1	1	1	Musical Sound Data [5]
1	0	0	0	1	0	0	0	Geometric Data Profile '0' Option 1
1	0	0	0	1	1	0	0	Geometric Data Profile '0' Option 2
1	0	0	0	1	0	0	1	Geometric Data Profile '1' Option 1
1	0	0	0	1	1	0	1	Geometric Data Profile '1' Option 2
1	0	0	0	1	0	1	0	Geometric Data Profile '2' Option 1
1	0	0	0	1	1	1	0	Geometric Data Profile '2' Option 2
1	0	0	0	1	0	1	1	Geometric Data Profile '3' Option 1
1	0	0	0	1	1	1	1	Geometric Data Profile '3' Option 2
1	0	0	1	0	0	0	0	Photographic Data Option 1
1	0	0	1	1	0	0	0	Photographic Data Option 2
* = Dont Care Value								The interpretation of other combinations of bit values is reserved

Figure 11 part 2 Interpretation of the first group of 18 data bits in a packet with Y=28 of page with designation code 0000 or 0010

This interpretation is only assigned to the values of bits 1 to 8, when bits 9 to 14 are set to 0.

Figure 11 part 1 & 2

COLOUR TABLE AND NUMBER		COLOUR	DOWNLOADING BIT COMBINATIONS		
			R	G	B
COLOUR TABLE NUMBER 1	0	Black	0000	0000	0000
	1	Red	1111	0000	0000
	2	Green	0000	1111	0000
	3	Yellow	1111	1111	0000
	4	Blue	0000	0000	1111
	5	Magenta	1111	0000	1111
	6	Cyan	0000	1111	1111
	7	White	1111	1111	1111
COLOUR TABLE NUMBER 2	8	Transparent	DONT CARE Values		
	9	Reduced Intensity Red	0111	0000	0000
	10	Reduced Intensity Green	0000	0111	0000
	11	Reduced Intensity Yellow	0111	0111	0000
	12	Reduced Intensity Blue	0000	0000	0111
	13	Reduced Intensity Magenta	0111	0000	0111
	14	Reduced Intensity Cyan	0000	0111	0111
	15	Grey	0111	0111	0111
COLOUR TABLE NUMBER 3	16 to 23	Redefinable, Default entries are 0 to 7			
COLOUR TABLE NUMBER 4	24 to 31	Redefinable, Default entries are 0 to 7			

D CLUT	
0	Default Black
1	Default Red
2	Default Green
3	Default Yellow

The downloading bit combinations are transmitted least significant bit first in the order red, green, blue. Reduced Intensity Yellow, as an example, is transmitted as 1110 1110 0000.

Figure 12 **COLOUR MAP**

CHARACTER MODE 1 (basic) Mode Identification: 0000; 12 cols. x 10 rows x 1

20 D-byte Group of a Packet [A,B,C,D....T]: One PTU

Column bits 12-7	6-1	Rows	Dot positions defined as 1 will be displayed in Foreground Colour. Dot positions defined as 0 will be displayed in Background Colour.
A	B	1	
C	D	2	
E	F	3	
:	:	:	
S	T	10	

CHARACTER MODE 2 Mode Identification: 0001; 12 x 10 x 2
2 PTUs for a character

20 D-byte Group of Packet N [A1,B1,C1,D1....T1]: One PTU

Column bits 12-7	6-1	Rows	Dots are defined by a bit in Character Code "X1" and an equivalent bit from Character Code "X2". The bit from "X1" specifies the least significant bit from the DRCS Colour Look-Up Table (DCLUT)
A1	B2	1	
Character C1	D2	2	
Code "X1" E1	F2	3	
:	:	:	
S1	T2	10	

Next 20 D-byte Group of Packet N [A2,B2,C2,D2....T2]: One PTU

Column bits 12-7	6-1	Rows	The bit from "X2" specifies the most significant bit of the DRCS Colour Look-Up Table (DCLUT).
A2	B1	1	
Character C2	D1	2	
Code "X2" E2	F1	3	
:	:	:	
S2	T1	10	

CHARACTER MODE 3 Mode Identification: 0101; Two sets of 6 x 10 x 1

20 D-byte Group of a Packet N [A,X,B,X,C,X....J,X]: One PTU

1st DRCS Column bits 12-7	2nd DRCS 6-1	Rows	Dots positions defined as 1 will be displayed in Foreground Colour. Dots positions defined as 0 will be displayed in Background Colour.
A	-	1	
B	-	2	
C	-	3	
:	:	:	
J	-	10	

20 D-byte Group of a Packet N [X,A,X,B,X,C,....X,J]: One PTU

1st DRCS Column bits 12-7	2nd DRCS 6-1	Rows
-	A	1
-	B	2
-	C	3
:	:	:
-	J	10

Figure 13 part 1 **DATA FORMAT FOR DRCS DOWNLOADING** –

CHARACTER MODE 4 Mode Identification: 0110; One set 6 x 10 x 2
(see Section 16.4.6.7)

20 D-byte Group of a Packet [A1,A2,B1,B2,C1,C2....J1,J2]: One PTU

Column bits 12-7	6-1	Rows	Dots are defined by equivalent pair from -1 and -2. Bits respectively from -1 and -2 specify the least- and most-significant bits from the DRCS Colour Look-up Table (DCLUT)
A1	A2	1	
B1	B2	2	
C1	C2	3	
:	:	:	
J1	J2	10	

CHARACTER MODE 5 Mode Identification: 0111; One set 6 x 10 x 4
Two PTUs required for a character

20 D-byte Group of a Packet N [A1,A2,B1,B2,C1,C2....J1,J2]: One PTU

Column bits 12-7	6-1	Rows	
	A1	A2	1	
Character	B1	B2	2	
Code X1	C1	C2	3	
	:	:	:	
	J1	J2	10	

Next 20 D-byte Group of a Packet N [A3,A4,B3,B4,C3,C4....J3,J4]: One PTU

Column bits 12-7	6-1	Rows	The combination of bits 4,3,2,1 is used as the binary address to colour tables 3 and 4 of the colour map, figure 12.
A3	A4	1	
Character	B3	B4	2	
Code X1	C3	C4	3	
	:	:	:	
	J3	J4	10	

Figure 13 part 2 **DATA FORMAT FOR DRCS DOWNLOADING**

CHARACTER MODE 6 Mode Identification: 0010; Two sets 6 x 5 x 2

20 D-byte Group of a Packet N [A1,X,A2,X,B1,X,B2,X,C3,X,.....X,E2,X]: One PTU

Column bits 12-7	6-1	Rows	
	A1	X	1
Character of	A2	X	2
the First	B1	X	3
Set	:	:	:
	E2	X	10

Dots are defined by equivalent pair 1 and 2.
1 specifies the least significant bit from the DRCS Colour Look-up Table.
2 specifies the most significant bit from the DRCS Colour Look-up Table.

Next 20 D-byte Group of a Packet N [X,A1,X,A2,X,B1,X,B2,X,C3,.....X,E2,]: One PTU

Column bits 12-7	6-1	Rows	
	X	A1	1
Character of	X	A2	2
the Second	X	B1	3
Set	:	:	:
	X	E2	10

Dots are defined by equivalent pair 1 and 2.
1 specifies the least significant bit from the DRCS Colour Look-up Table.
2 specifies the most significant bit from the DRCS Colour Look-up Table.

CHARACTER MODE 7 Mode Identification: 1000; One set 6 x 5 x 4

20 D-byte Group of a Packet N [A1,A2,A3,A4,B1,B2....E3,E4]: One PTU

Column bits 12-7	6-1	Rows	
	A1	A2	1
Character	A3	A4	2
Code X1	B1	B2	3
	:	:	4
	E1	E2	10

The combination of bits 4,3,2,1 is used as the binary address to colour tables 3 and 4 of the colour map, figure 12.

Figure 13 part 3 **DATA FORMAT FOR DRCS DOWNLOADING**

SET	CODE	NAME AND CODE TABLE FIGURE NUMBER
0 to 5	0000000 to 0000101	Reserved for other applications
6	0000110	1st Latin Primary Set 15&17
7	0000111	1st Latin Supplementary Set 16
8	0001000	Block Mosaic Set 18
9	0001001	Smoothed Mosaic Set 19
10	0001010	Arabic Primary Set 21
11	0001011	Arabic Supplementary Set 21
12	0001100	Cyrillic Primary Set 23,25&26
13	0001101	Cyrillic Supplementary Set 24
14	0001110	Reserved
15	0001111	Reserved
16	0010000	Greek Primary Set 27
17	0010001	Greek Supplementary Set 28
18	0010010	Reserved
19	0010011	Reserved
20	0010100	Hebrew Primary Set 22
21	0010101	Hebrew Supplementary Set
22 to 37	0010110 to 0100101	Reserved
38	0100110	2nd Latin Primary Set 15&17
39	0100111	2nd Latin Supplementary set
40	0101000	3rd Latin Primary Set 15&17
41	0101001	3rd Latin Supplementary Set
42	0101010	Cyrillic and Latin Primary sets 26
43 to 54	0101011 to 0110110	Reserved
55	0110111	4th Latin Primary Set 15&17
56	0111000	4th Latin Supplementary Set
57 69	0111001 to 1000101	Reserved
		Yugoslav (& other former states)
70	1000110	" Latin Primary Set
71	1000111	" Latin Supplementary Set
72 to 75	1001000 to 1001011	Reserved for other applications
		Yugoslav (& other former states)
76	1001100	" Cyrillic Primary Set
77	1001101	" Cyrillic Supplementary Set
78 to 127	1001110 to 1111111	Reserved for other applications

Entries identified as "Reserved for other applications" may not designate a character set. Entries identified as "Reserved" have been allocated to other character sets or writing systems.

Note: Set 70 is identical to Set 6 and Set 71 is identical to Set 7

Figure 14 **DESIGNATION OF CHARACTER SETS**

b4	b3	b2	b1		0	1	2	3	4	5	6	7
				b7	0	0	0	0	1	1	1	1
				b6	0	0	1	1	0	0	1	1
				b5	0	1	0	1	0	1	0	1
0	0	0	0	0			SP	0	@	P	`	p
0	0	0	1	1			!	1	A	Q	a	q
0	0	1	0	2			"	2	B	R	b	r
0	0	1	1	3			#	3	C	S	c	s
0	1	0	0	4			¤	4	D	T	d	t
0	1	0	1	5			%	5	E	U	e	u
0	1	1	0	6			&	6	F	V	f	v
0	1	1	1	7			'	7	G	W	g	w
1	0	0	0	8			(	8	H	X	h	x
1	0	0	1	9			)	9	I	Y	i	y
1	0	1	0	10			*	:	J	Z	j	z
1	0	1	1	11			+	;	K	[	k	{
1	1	0	0	12			,	<	L	\	l	|
1	1	0	1	13			-	=	M	]	m	}
1	1	1	0	14			.	>	N	^	n	~
1	1	1	1	15			/	?	O	_	o	

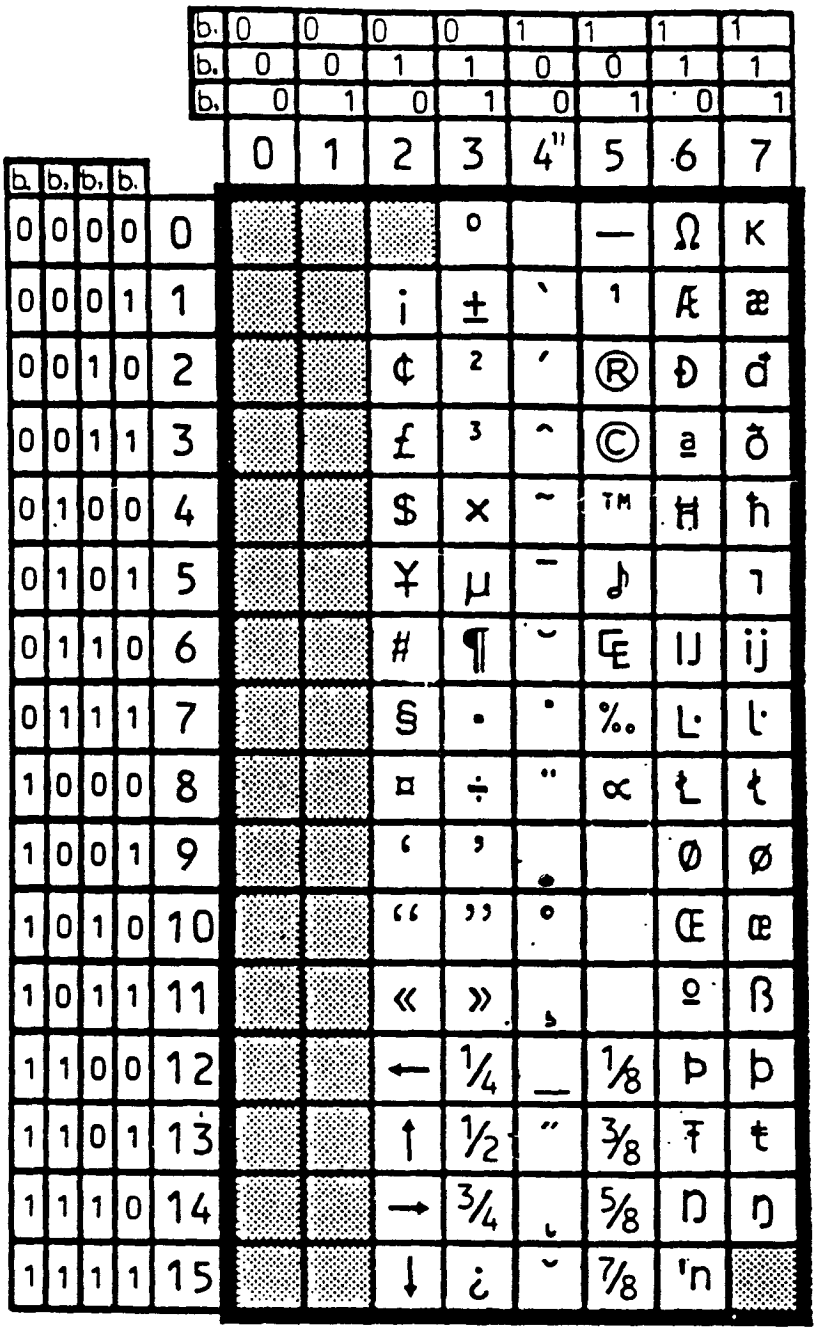
Notes:

Optional variations apply to marked positions (see Figure 17).

The character in position 2/0 is to be interpreted as SPACE.

The character in position 7/15 occupies an area equivalent to that of any character which does not include a descender. It is thus a rectangle surrounded by the background colour.

Figure 15 **LATIN ALPHABET PRIMARY CHARACTER SET G0 CODE TABLE**



Notes:

Column 4 contains diacritical marks for association with G0 set characters.

The character in position 7/15 occupies an area equivalent to that of any character which does not include a descender. It is thus a rectangle surrounded by the background colour.

The character in position 2/0 is to be interpreted as SPACE.

The characters in positions 5/6, 5/7 and 5/8 are in addition to those specified in ISO 6937/2.

The character in position 5/6 represents the European Currency symbol.

Blank positions are "transparent" permitting the display of any character otherwise overwritten.

Figure 16 **LATIN ALPHABET SUPPLEMENTARY CHARACTER SET G2 CODE TABLE**

	TABLE POSITION	CZECH/ SLOVAK	ENGLISH	FRENCH BELGIAN	GERMAN	ITALIAN	POLISH
1	2/3	#	£	é	#	£	#
2	2/4	ů	$	ï	$	$	ń
3	4/0	č	@	à	§	é	ą
4	5/11	ť	←	ë	Ä	°	ż
5	5/12	ž	½	ê	Ö	ç	Ś
6	5/13	ý	→	ù	Ü	→	Ł
7	5/14	í	↑	î	^	↑	ć
8	5/15	ř	#	#	_	#	ó
9	6/0	é	—	è	°	ù	ę
10	7/11	á	¼	â	ä	à	ż
11	7/12	ě	‖	ô	ö	ò	ś
12	7/13	ú	¾	û	ü	è	ł
13	7/14	š	+	ç	ß	ì	ź

TABLE POSITION	PORTUGUESE SPANISH	RUMANIAN	SERBIAN CROATIAN SLOVENIAN	SWEDISH FINNISH	TURKISH
2/3	ç	#	#	#	TL
2/4	$	¤	$ (see note)	¤	ğ
4/0	¡	Ţ	Č	É	İ
5/11	á	Â	Ć	Ä	Ş
5/12	é	Ş	Ž	Ö	Ö
5/13	í	Ă	Đ	Å	Ç
5/14	ó	Î	Š	Ü	Ü
5/15	ú	ı	ë	_	ğ
6/0	¿	ţ	č	é	ı
7/11	ü	â	ć	ä	ş
7/12	ñ	ş	ž	ö	ö
7/13	è	ă	đ	å	ç
7/14	à	î	š	ü	ü

The character TL is the Turkish currency sign

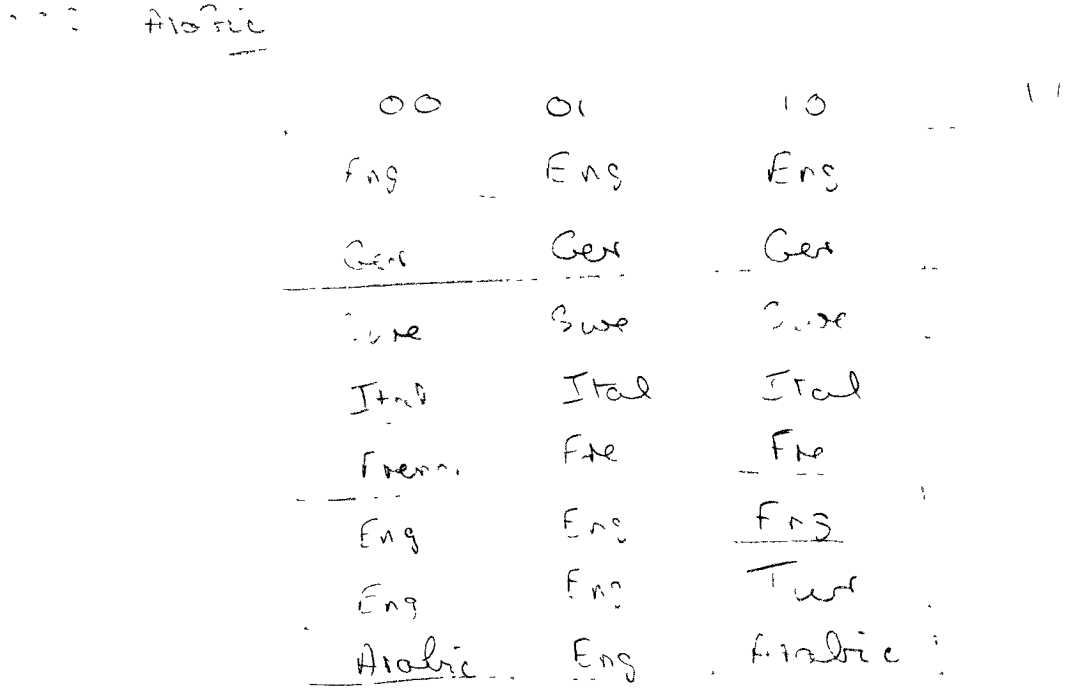
Note: Ë has been implemented in some intregrated circuits

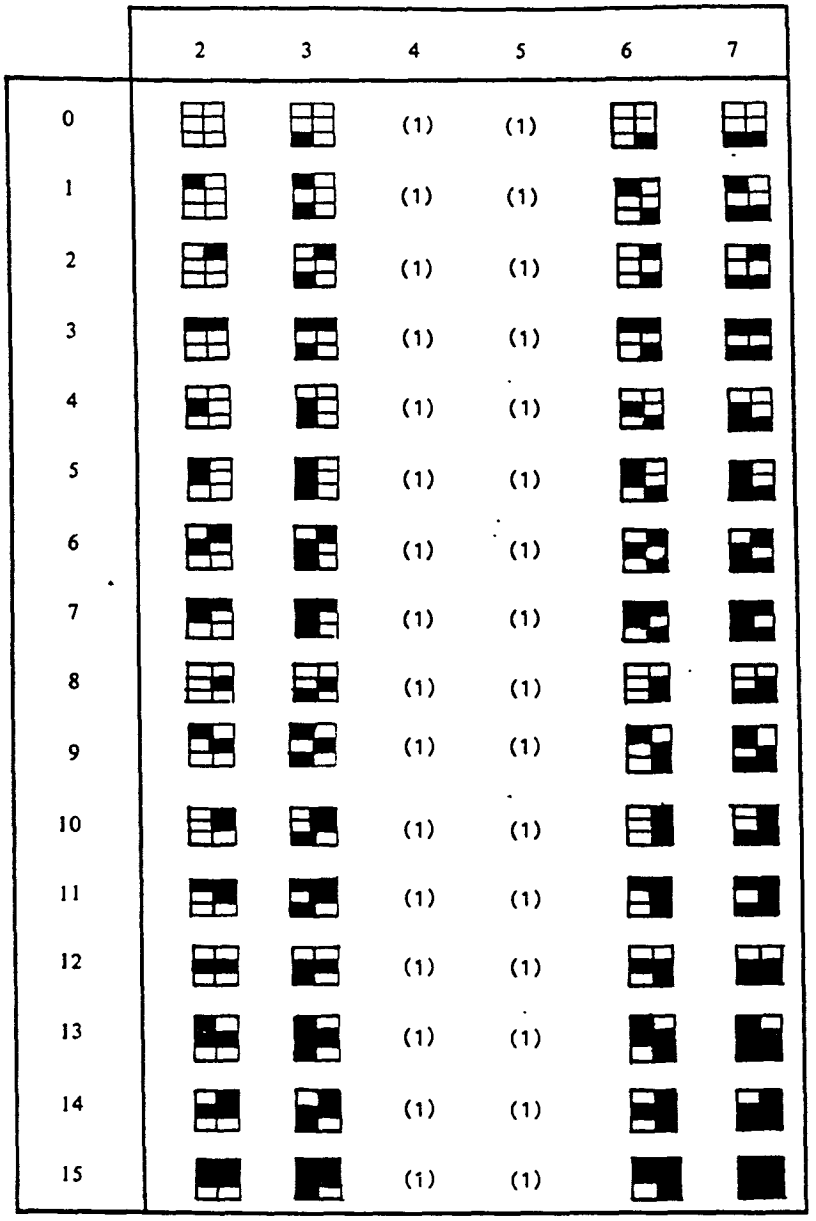
Figure 17 part 1 **LATIN ALPHABET OPTIONAL VARIATIONS**

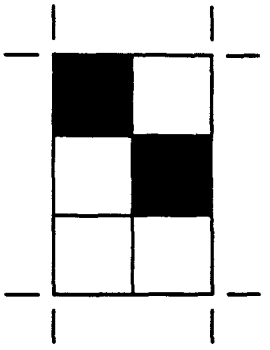
OPTION NUMBER AND C12 C13 C14		CHARACTER SET NUMBER AND ASSOCIATED ALPHABETS			
		6	38	55	70
1	000	English	Polish	English	
2	001	German	German	German	Albanian
3	010	Swedish Finnish	Swedish Finnish	Swedish Finnish	Hungarian
4	011	Italian	Italian	Italian	
5	100	French	French	French	Slovakian
6	101	Portugese Spanish		Portugese Spanish	
7	110	Czech Slovak	Czech Slovak	Turkish	Serbian Croatian Slovenian
8	111	Reserved	Reserved	Rese ved	Rumanian

See Figure 14 Character Set Numbers for codes in packets with Y=28

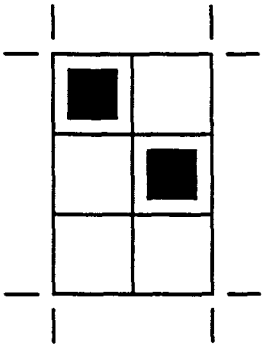
Figure 17 part 2 LATIN ALPHABET G0 CHARACTER SET OPTIONS







Contiguous graphics



Separated graphics

Background colour

Foreground colour

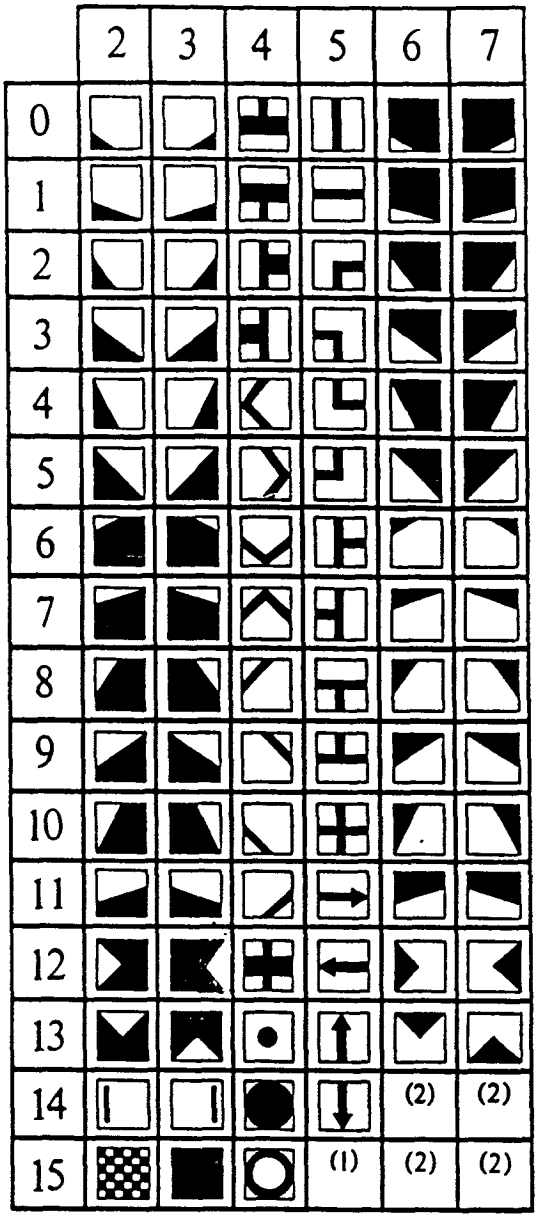
Notes:

Columns 4 and 5, indicated by (1), contain the corresponding characters from the G0 set.

Shaded areas of characters in columns 2, 3, 6 and 7 are displayed in the foreground colour.

Bit allocations are the same as for the Primary character set, see Figure 15.

Figure 18 **MOSAIC GRAPHICS G1 CHARACTER SET** (shown in contiguous form)



Notes:

The bit allocations are the same as for the Primary character set, see Figure 15.

The character at position 2/15 represents the activation of alternate dots o: the matrix.

(1) This character permits display of Background colour.

(2) No character is assigned to these codes. Should they occur, the Level 1 character shall be displayed.

Figure 19 **G3 CODE TABLE**
SMOOTHED MOSAIC GRAPHIC CHARACTER SET (shown in contiguous form), and **LINE DRAWING CHARACTER SET**

	0	1
0	Alpha Black (4)	Mosaic Black (4)
1	Alpha Red	Mosaic Red
2	Alpha Green	Mosaic Green
3	Alpha Yellow	Mosaic Yellow
4	Alpha Blue	Mosaic Blue
5	Alpha Magenta	Mosaic Magenta
6	Alpha Cyan	Mosaic Cyan
7	Alpha White (1)	Mosaic White
8	Flash	Conceal (2)
9	Steady (1,2)	Contiguous Mosaic (1,2)
10	End Box (1,3)	Separated Mosaic (2)
11	Start Box (3)	(5)
12	Normal Height (1,2)	Black Background (1,2)
13	Double Height	New Background (2)
14	Double Width (4)	Hold Mosaic (2)
15	Double Size (4)	Release Mosaic (1)

Notes:

(1) Presumed at the start of each display row
(2) Action "Set At", others are "Set After"
(3) Two consecutive codes transmitted, action takes place between them
(4) No action at level 1
(5) Used in connection with Data for Processing Associated with Displayable Pages (see Section 19.2), and in some countries for language switching.

Figure 20 **CODE TABLE OF CONTROL CHARACTERS FOR SPACING ATTRIBUTES**

					0	1	2	3	4	5	6	7
				b7	0	0	0	0	1	1	1	1
				b5	0	0	1	1	0	0	1	1
				b6	0	1	0	1	0	1	0	1
	b4	b3	b2	b1								
0	0	0	0	0			SP	0	ة	ذ	-	ى
1	0	0	0	1			!	1	ء	ر	ف	ـعـ
2	0	0	1	0			,,	2	ـبـ	ز	ق	ـغـ
3	0	0	1	1			£	3	ب	ـسـ	ك	ـفـ
4	0	1	0	0			$	4	ـتـ	ـشـ	ل	ف
5	0	1	0	1			٪	5	ت	ـصـ	م	ـقـ
6	0	1	1	0			ف	6	ـثـ	ـضـ	ن	ق
7	0	1	1	1			ي	7	ا	ط	ه	ك
8	1	0	0	0			)	8	ـبـ	ظ	و	ـلـ
9	1	0	0	1			(	9	ة	ـعـ	ى	ل
10	1	0	1	0			*	:	ـتـ	غ	ـيـ	ـمـ
11	1	0	1	1			+	؛	ـثـ	ـشـ	ث	م
12	1	1	0	0			،	>	ـجـ	ـخـ	ج	ـنـ
13	1	1	0	1			-	=	ـحـ	ـحـ	ح	ن
14	1	1	1	0			.	<	ـخـ	ـخـ	خ	لا
15	1	1	1	1			/	؟	د	#	ـيـ	■

Figure 21 **ARABIC G0 PRIMARY CHARACTER SET**

					0	1	2	3	4	5	6	7
				b7	0	0	0	0	1	1	1	1
				b5	0	0	1	1	0	0	1	1
				b6	0	1	0	1	0	1	0	1
	b4	b3	b2	b1								
0	0	0	0	0				٠	à	P	é	p
1	0	0	0	1			ع	١	A	Q	a	q
2	0	0	1	0			آ	٢	B	R	b	r
3	0	0	1	1			أ	٣	C	S	c	s
4	0	1	0	0			ؤ	٤	D	T	d	t
5	0	1	0	1			إ	٥	E	U	e	u
6	0	1	1	0			ئ	٦	F	V	f	v
7	0	1	1	1			ئ	٧	G	W	g	w
8	1	0	0	0			ـچـ	٨	H	X	h	x
9	1	0	0	1			ـچـ	٩	I	Y	i	y
10	1	0	1	0			ج	غ	J	Z	j	z
11	1	0	1	1			ـپـ	غ	K	ë	k	â
12	1	1	0	0			ـتـ	ـلا	L	ê	I	ô
13	1	1	0	1			پ	ـم	M	ù	m	û
14	1	1	1	0			ژ	ـه	N	î	n	ç
15	1	1	1	1			گ	ه	O	ح	o	

ARABIC G2 SUPPLEMENTARY CHARACTER SET

	2	3	4	5	6	7
0		0	@	P	א	ך
1	!	1	A	Q	כ	ם
2	"	2	B	R	ך	מ
3	£	3	C	S	ל	ן
4	$	4	D	T	ם	נ
5	%	5	E	U	ן	ס
6	&	6	F	V	ס	ע
7	'	7	G	W	מ	ף
8	(	8	H	X	נ	פ
9	)	9	I	Y	ס	ץ
10	*	:	J	Z	ף	צ
11	+	;	K	←	פ	(a)
12	,	<	L	½	צ	‖
13	-	=	M	→	ק	¾
14	.	>	N	↑	ר	÷
15	/	?	O	#	ש	■

Notes:

The character (a) in position 7/11 is the Shekel currency sign

Bits 1 to 4 define rows, bits 5 to 7 define columns.

Figure 22 **HEBREW CHARACTER SET**

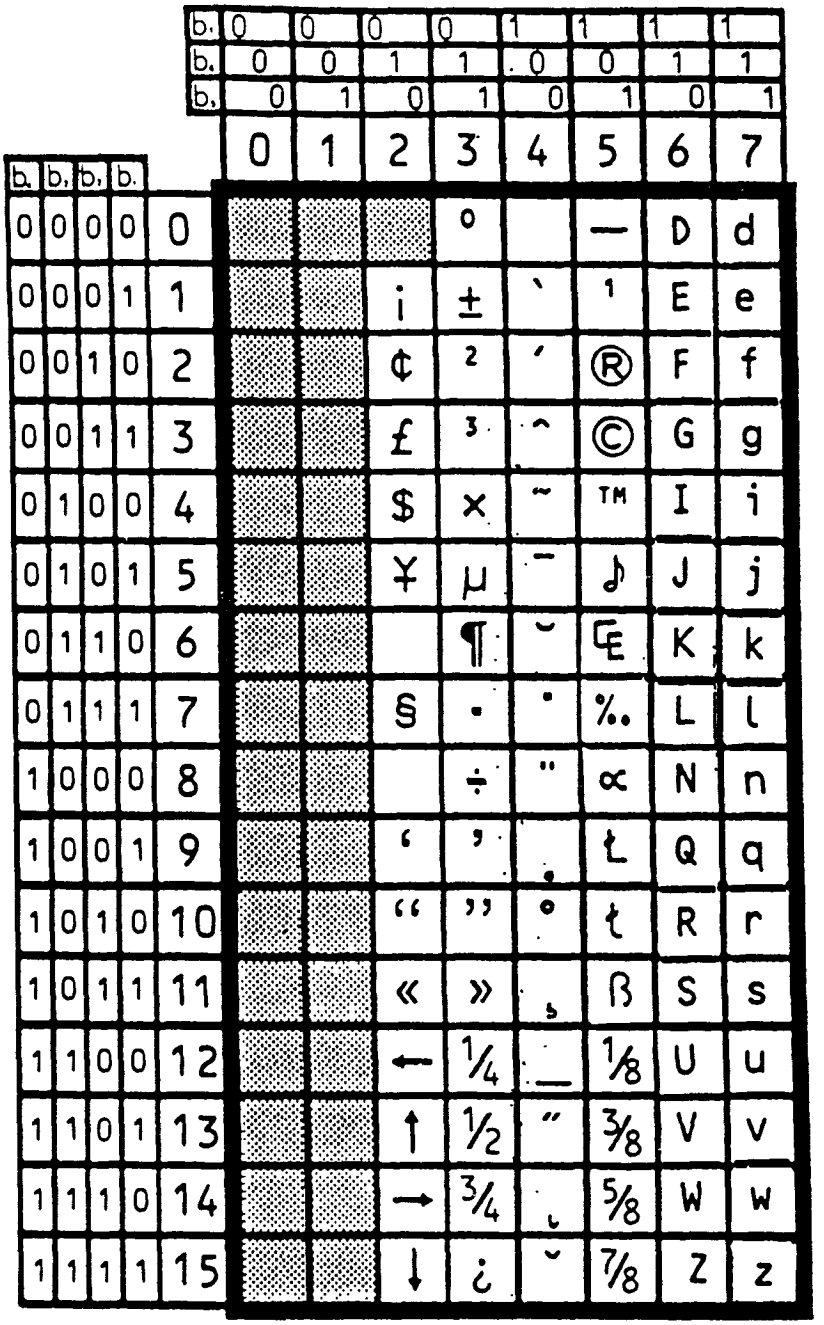
b7	b6	b5	b4		b3=0 b2=0 b1=0	b3=0 b2=0 b1=1	b3=0 b2=1 b1=0	b3=0 b2=1 b1=1	b3=1 b2=0 b1=0	b3=1 b2=0 b1=1	b3=1 b2=1 b1=0	b3=1 b2=1 b1=1
					0	1	2	3	4	5	6	7
0	0	0	0	0				0	Ж	П	ж	п
0	0	0	1	1			!	1	А	(1)	а	(1)
0	0	1	0	2			"	2	Б	Р	б	р
0	0	1	1	3			#	3	Ц	С	ц	с
0	1	0	0	4			$	4	Д	Т	д	т
0	1	0	1	5			%	5	Е	У	е	у
0	1	1	0	6			&	6	Ф	В	ф	в
0	1	1	1	7			'	7	Г	(1)	г	(1)
1	0	0	0	8			(	8	Х	(1)	х	(1)
1	0	0	1	9			)	9	(1)	(1)	(1)	(1)
1	0	1	0	10			*	:	(1)	З	(1)	з
1	0	1	1	11			+	;	К	Ш	к	ш
1	1	0	0	12			,	(1)	Л	(1)	л	(1)
1	1	0	1	13			-	=	М	(1)	м	(1)
1	1	1	0	14			.	(1)	Н	Ч	н	ч
1	1	1	1	15			/	?	О	(1)	о	(1)

Notes:

The character in position 2/0 is to be interpreted as SPACE

Characters marked (1) are National variations, see Figure 2!

Figure 23 **CYRILLIC ALPHABET PRIMARY CHARACTER SET COMMON CHARACTERS G0 CODE TABLE**



b7	b6	b5	b4		0	1	2	3	4	5	6	7
					0	1	2	3	4	5	6	7
0	0	0	0	0				°		—	D	d
0	0	0	1	1			¡	±	ˋ	¹	E	e
0	0	1	0	2			¢	²	´	®	F	f
0	0	1	1	3			£	³	ˆ	©	G	g
0	1	0	0	4			$	×	˜	™	I	i
0	1	0	1	5			¥	µ	¯	♪	J	j
0	1	1	0	6				¶	˘	Ę	K	k
0	1	1	1	7			§	·	˙	‰	L	l
1	0	0	0	8				÷	¨	∝	N	n
1	0	0	1	9			‘	’	¸	Ł	Q	q
1	0	1	0	10			“	”	˚	ł	R	r
1	0	1	1	11			«	»	˛	ß	S	s
1	1	0	0	12			←	¼	˝	⅛	U	u
1	1	0	1	13			↑	½	˝	⅜	V	v
1	1	1	0	14			→	¾	˛	⅝	W	w
1	1	1	1	15			↓	¿	ˇ	⅞	Z	z

Notes:

Column 4 contains diacritical marks for association with another character addressed to the same presentation position.

The character in position 2/0 is to be interpreted as SPACE.

The character in position 5/6 represents the European Currency symbol.

Blank positions are "transparent", permitting the display of any character otherwise overwritten.

Figure 24 **CYRILLIC SUPPLEMENTARY CHARACTER SET G2 CODE TABLE**

CODE TABLE POSITION	SERBIAN CROATIAN (Option 1)	RUSSIAN BULGARIAN (Option 2)
2/6	&	И
4/0	Ч	Ю
4/10	J	Й
5/1	Ќ	Я
5/6	В	Х
5/7	Ґ	В
5/8	Љ	Ь
5/9	Њ	Ъ
5/11	Ћ	Ш
5/12	Х	Э
5/13	Ђ	Щ
5/14	Ш	Ч
5/15	Џ	Н
6/0	ч	ю
6/10	j	й
7/1	ќ	я
7/6	в	х
7/7	ґ	в
7/8	љ	ь
7/9	њ	ъ
7/11	ћ	п
7/12	х	э
7/13	ђ	щ
7/14	ш	ч

Figure 25 **CYRILLIC G0 CHARACTER SET: OPTIONAL VARIATIONS**

OPTION NUMBER AND C12 C13 C14	ASSOCIATED ALPHABETS
1 000	Serbian, Croatian, Macedonian (Cyrillic) see Figure 23 and 25
2 001	German (Latin) see Figure 15 and 17
3 010	Swedish/Finnish (Latin) see Figure 15 and 17
4 011	Italian (Latin) see Figure 15 and 17
5 100	Bulgarian/Russian (Cyrillic) see Figure 23 and 25
6 101	Serbian/Croatian (Latin) see Figure 15 and 17
7 110	Czechoslovak (Latin)see Figure 15 and 17
8 111	Ruthenian/Ukranian (Cyrillic) see Figure 23 and 25

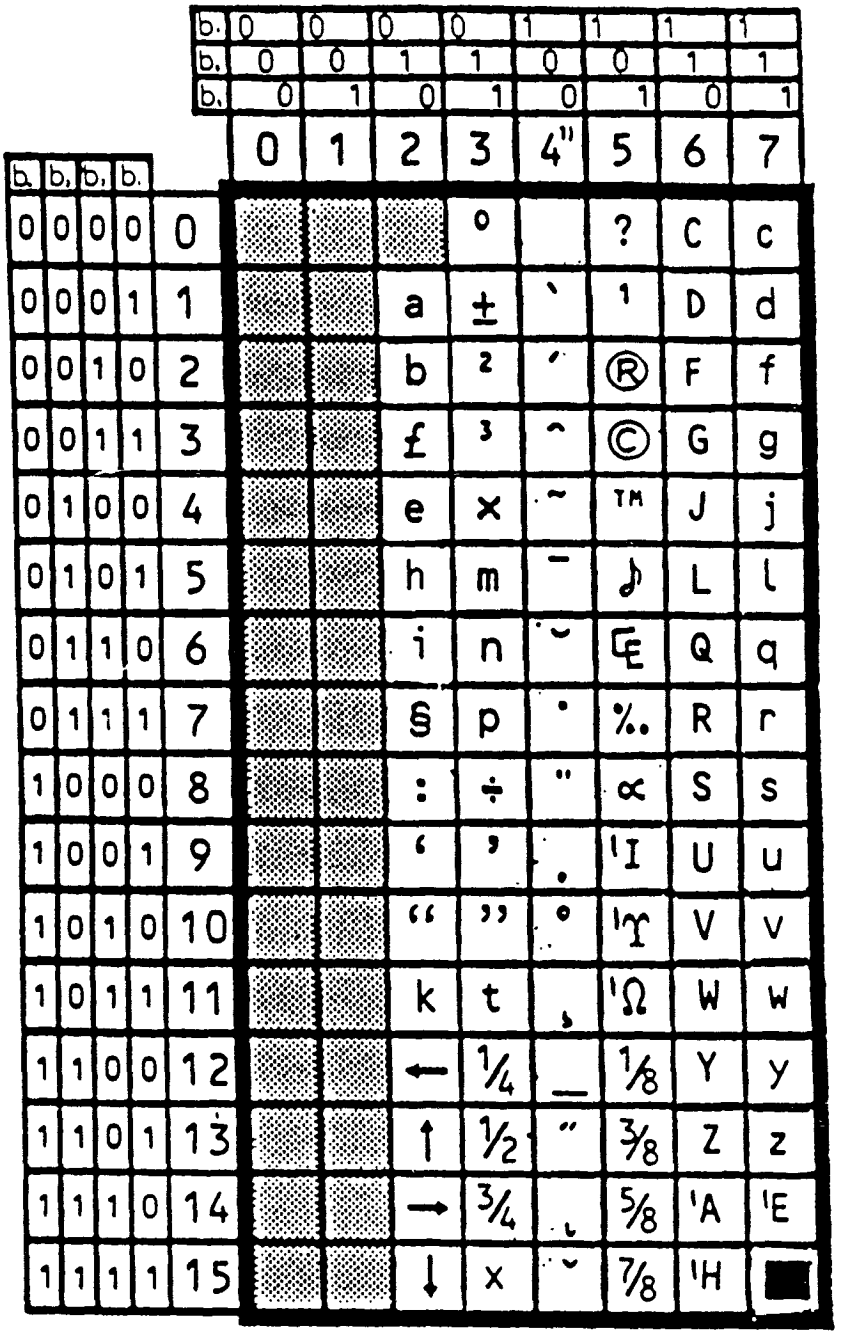
See Figure 14 character Set 36 for code in packets with Y=28

Figure 26 **CYRILLIC AND LATIN ASSOCIATED G0 CHARACTER SET OPTIONS**

	2	3	4	5	6	7
0		0	ΐ	Π	ΰ	π
1	!	1	A	P	α	ρ
2	"	2	B	′	β	ς
3	#	3	Γ	Σ	γ	σ
4	$	4	Δ	T	δ	τ
5	%	5	E	Y	ε	υ
6	&	6	Z	Φ	ζ	φ
7	′	7	H	X	η	χ
8	(	8	Θ	Ψ	θ	ψ
9	)	9	I	Ω	ι	ω
10	*	:	K	Ϊ	κ	ϊ
11	+	;	Λ	Ÿ	λ	ϋ
12	,	«	M	ά	μ	ό
13	-	=	N	έ	ν	ύ
14	.	»	Ξ	ή	ξ	ώ
15	/	?	O	ί	ο	■

Note: The character in position 2/0 is to be interpreted as SPACE

Figure 27 **GREEK PRIMARY CHARACTER SET, G0 CODE TABLE**



b7	b6	b5	b4		0	1	2	3	4"	5	6	7
0	0	0	0	0				°		?	C	c
0	0	0	1	1			a	±	`	¹	D	d
0	0	1	0	2			b	²	´	®	F	f
0	0	1	1	3			£	³	^	©	G	g
0	1	0	0	4			e	×	~	™	J	j
0	1	0	1	5			h	m	¯	♪	L	l
0	1	1	0	6			i	n	¨	₠	Q	q
0	1	1	1	7			§	p	˙	‰	R	r
1	0	0	0	8			:	÷	"	∝	S	s
1	0	0	1	9			‘	’	¸	¹I	U	u
1	0	1	0	10			“	”	°	¹Υ	V	v
1	0	1	1	11			k	t	¸	¹Ω	W	w
1	1	0	0	12			←	¼	_	⅛	Y	y
1	1	0	1	13			↑	½	˝	⅜	Z	z
1	1	1	0	14			→	¾	˛	⅝	¹A	¹E
1	1	1	1	15			↓	x	ˇ	⅞	¹H	■

Notes:

Column 4 contains diacritical marks for association with another character addressed to the same presentation position.

The character in position 2/0 is to be interpreted as SPACE.

The character in position 5/6 represents the European Currency symbol.

Blank positions are "transparent", permitting the display of any character otherwise overwritten.

Figure 28 **GREEK SUPPLEMENTARY CHARACTER SET G2 CODE TABLE**

	0	1	2	3	4	5	6	7	8	9	A	B	C	D	E	F
1		D	ALG	AND	ISR	I	BEL	BLR	AZR	ALB	AUT	HNG	MLT	D	CNR	EGY
2		GRC	CYP	SM	SUI	JOR	FNL	LUX	BUL	DNK	GIB	IRQ	G	LBY	ROU	F
3		MRC	TCH	POL	CVA		SYR	TUN	MAR	LIE	ISL	MCO			E	NOR
4			IRL	TUR			YUG	UKR	HOL		LBN				S	
5								URS	POR							

ALB	Albania	D	Germany (Federal Republic of)	HOL	Netherlands (The Kingdom of)
ALG	Algeria (Peoples Democratic Republic of)	GIB	Gibraltar	NOR	Norway
		GRC	Greece	POL	Poland
AND	Andorra	HNG	Hungary	POR	Portugal
AUT	Austria	ISL	Iceland	ROU	Roumania
AZR	Azores	IRQ	Iraq (Republic of)	SM	San Marino (Republic of)
BEL	Belgium				
URS	Byelorussia	IRL	Ireland	E	Spain
BUL	Bulgaria	ISR	Israel	S	Sweden
CNR	Canaries	I	Italy	SUI	Switzerland (Confederation of)
URS	Commonwealth of Independent States	JOR	Jordan (Hashemite Kingdom of)	SYR	Syrian Arab Republic
		LBY	Libya (Social. Peoples Libyan Arab Jamahiriya)	TUN	Tunisia
CYP	Cyprus (Republic of)			TUR	Turkey
		LBN	Lebanon	UKR	Ukraine
TCH	Czech and Slovak Federal Republic	LIE	Liechtenstein	G	United Kingdom
		LUX	Luxembourg	CVA	Vatican City State
DNK	Denmark	MDR	Madeira		
EGY	Egypt (Arab Republic of)	MLT	Malta (Republic of)	YUG	Yugoslavia Socialist Federal Republic of)
DNK	Faroe				
FNL	Finland	MCO	Monaco		
F	France	MRC	Morocco (Kingdom of)		

Figure 29 **COUNTRY CODES**

CODE	PROGRAMME TYPE	REFERENCE NUMBER
00	Information not included	
01-3E	**INTENDED AUDIENCE**	
08	General Audience	2.0.0
	Special Groups	
10	Ethnic & Immigrant Groups	1.1.0
11	Ethnic Groups	1.1.1
12	Immigrant Groups	1.1.2
18	Age Groups	1.2.0
19	Children (0-13 years)	1.2.1
1A	Young people (14 years and over)	1.2.2
1F	Retired people	1.3.0
20	Disabled people	1.4.0
21	Blind people	1.4.1
22	Deaf people	1.4.2
28	Householders	1.5.0
30	Occupational Status Groups	1.6.0
31	Unemployed people	1.6.1
32	Students	1.6.2
33	Farmers	1.6.3
34	Fishermen & Sailors	1.6.4
38	Travellers	1.7.0
39	Motorists	1.7.1
3A	Tourists	1.7.2
3F	**ALARM/EMERGENCY IDENTIFICATION**	
40-7F	**CONTENT**	
40	Public affairs	
41	General Domestic	1.1.0
42	Legal and social	1.2.0
43	Economic, industrial & financial	1.3.0
44	Housing, environment & health	1.4.0
45	Communication	1.5.0
46	Educational & cultural	1.6.0
47	International relations & defence	1.7.0
48	Science & the humanities	2.0.0
49	Natural sciences	2.1.0
4A	Social sciences	2.2.0
4B	Humanities	2.3.0
4C	Other sciences or humanities	2.9.0

continued in part 2

Figure 30 part 1 **PROGRAMME TYPE CODES**

50	Music	3.1.0
51	Serious	3.1.1
52	Light classical	3.1.2
53	Light	3.1.3
54	Jazz	3.1.4
55	Folk	3.1.5
56	Rock	
57	Other music	3.1.9
58	Drama, arts	3.0.0
5A	Ballet & dance	3.2.0
5B	Drama	3.3.0
5C	Literature/poetry	3.4.0
5D	Media affairs	3.5.0
5E	Painting, sculpture, architecture	3.6.0
5F	Other drama, arts	3.9.0
60	Philosophies of life	4.0.0
61	Christian religion	4.1.0
62	Non-Christian religion	4.2.0
63	Non-religious philosophies of life	4.3.0
67	Other philosophies of life	4.9.0
68	Sports	5.0.0
69	Non-instrumental ball games	5.1.0
6A	Instrumental ball games	5.2.0
6B	Winter sports	5.3.0
6C	Water sports	5.4.0
6D	Racing and equestrian sports	5.5.0
6E	Athletics	5.6.0
6F	Martial arts	5.7.0
70	Leisure & hobbies	6.0.0
71	Do-it-yourself	6.1.0
72	Gardening	6.2.0
73	Tourism	6.3.0
74	Keep fit	6.4.0
77	other leisure or hobbies	6.9.0
78	Light entertainment, folklore and human interest	7.0.0
7A	Light entertainment	7.1.0
7B	Folklore/festivities	7.2.0
7C	Human interest	7.2.0
7F	Other light entertainment	7.9.0
80-FF	**SERVICE SPECIFIC SERIES CODES**	

This code table is based on the EBU classification system 'ESCORT' [13].

Figure 30 part 2 **PROGRAMME TYPE CODES**

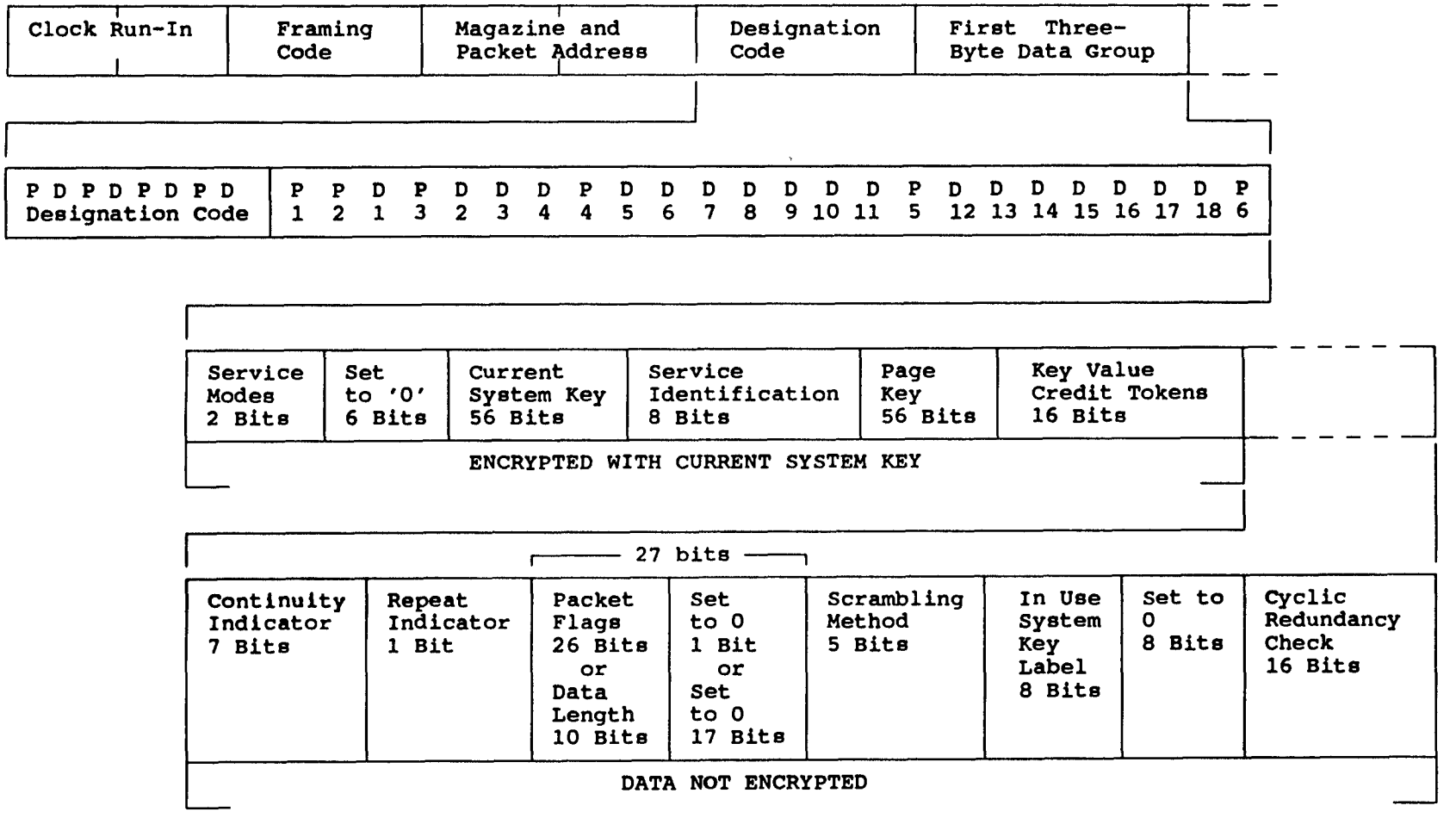


Figure 32(a) **FORMAT OF PACKET X/28 OF A SCRAMBLED PAGE**

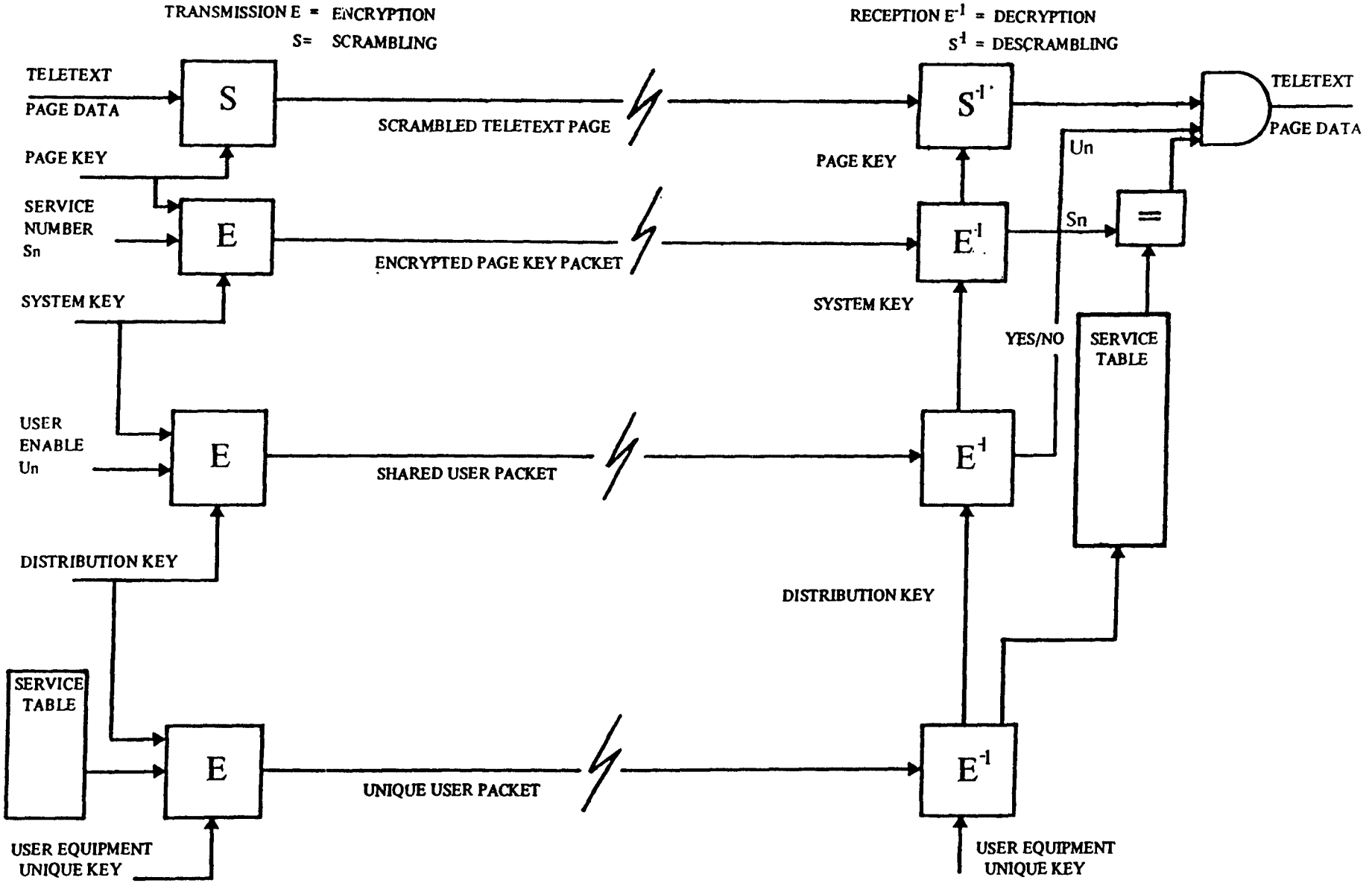


Figure 31

CONDITIONAL ACCESS TELETEXT SERVICES
ENCRYPTION AND SCRAMBLING

CODE TABLE FOR ENCRYPTION METHODS

Method Number	Bits 1 to 8 in Transmission Order	Name of Encryption Method
1	00000000	Variable Length Algorithm Using a One Way Function (see Figures 35 and 36)
2	10000000	Block Encipherment Algorithm Using Differential Code Book or Output Feedback (see note below and Figure 39)
	11111111	Method Not Specified

Figure 33 (a) REGISTER OF ENCRYPTION METHODS

CODE TABLE FOR SCRAMBLING METHODS

Method Number	Bits 1 to 5 in Transmission Order	Name of Scrambling Method
1	00000	Variable Length Algorithm Using a One Way Function Method A (see Figures 35 and 36)
2	10000	Block Encipherment Algorithm Using Output Feedback
3	01000	Variable Length Algorithm Using a One Way Function Method B
4	11000	MAC Scrambler
	11111	Method Not Specified

Figure 33 (b) REGISTER OF SCRAMBLING METHODS

Note: Differential Code Book
The first 8 bytes of conversion use the ISO Electronic Code Book [10]. For subsequent 8-byte blocks, the input data at decipherment is first 'exclusive-ORed' with the result of the previous conversion and then converted using the Electronic Code Book.

Figures 33 (a) and (b) **REGISTER OF ENCRYPTION AND SCRAMBLING METHODS**

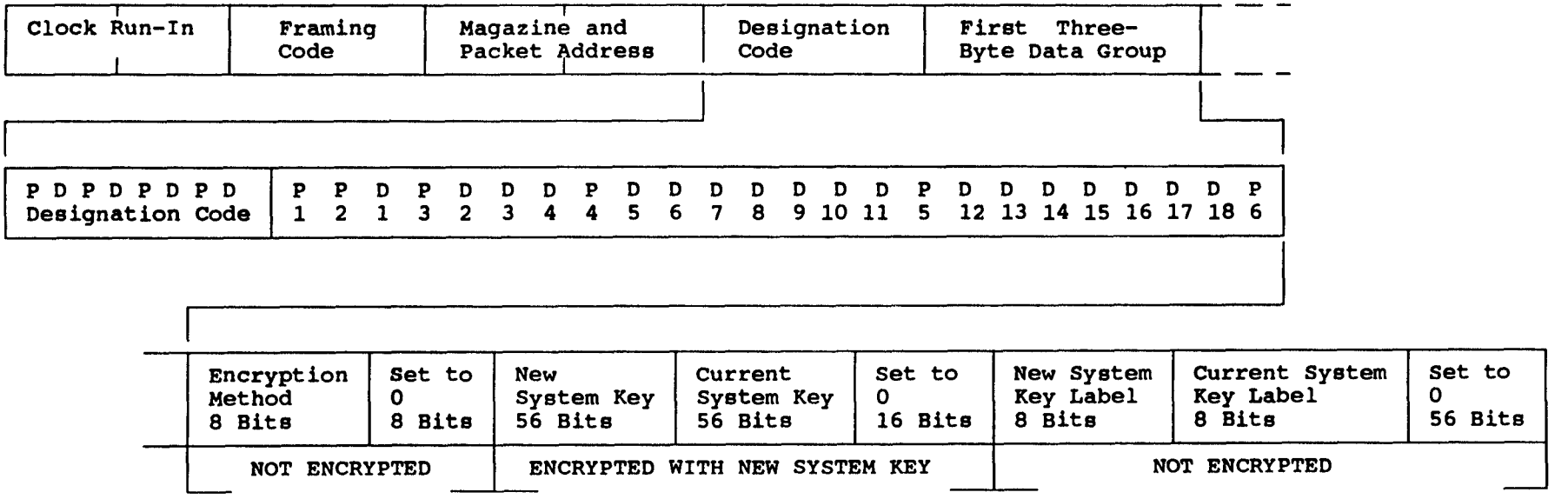


Figure 32(b) **PACKET X/28 OF A USER ADDRESSING PAGE**

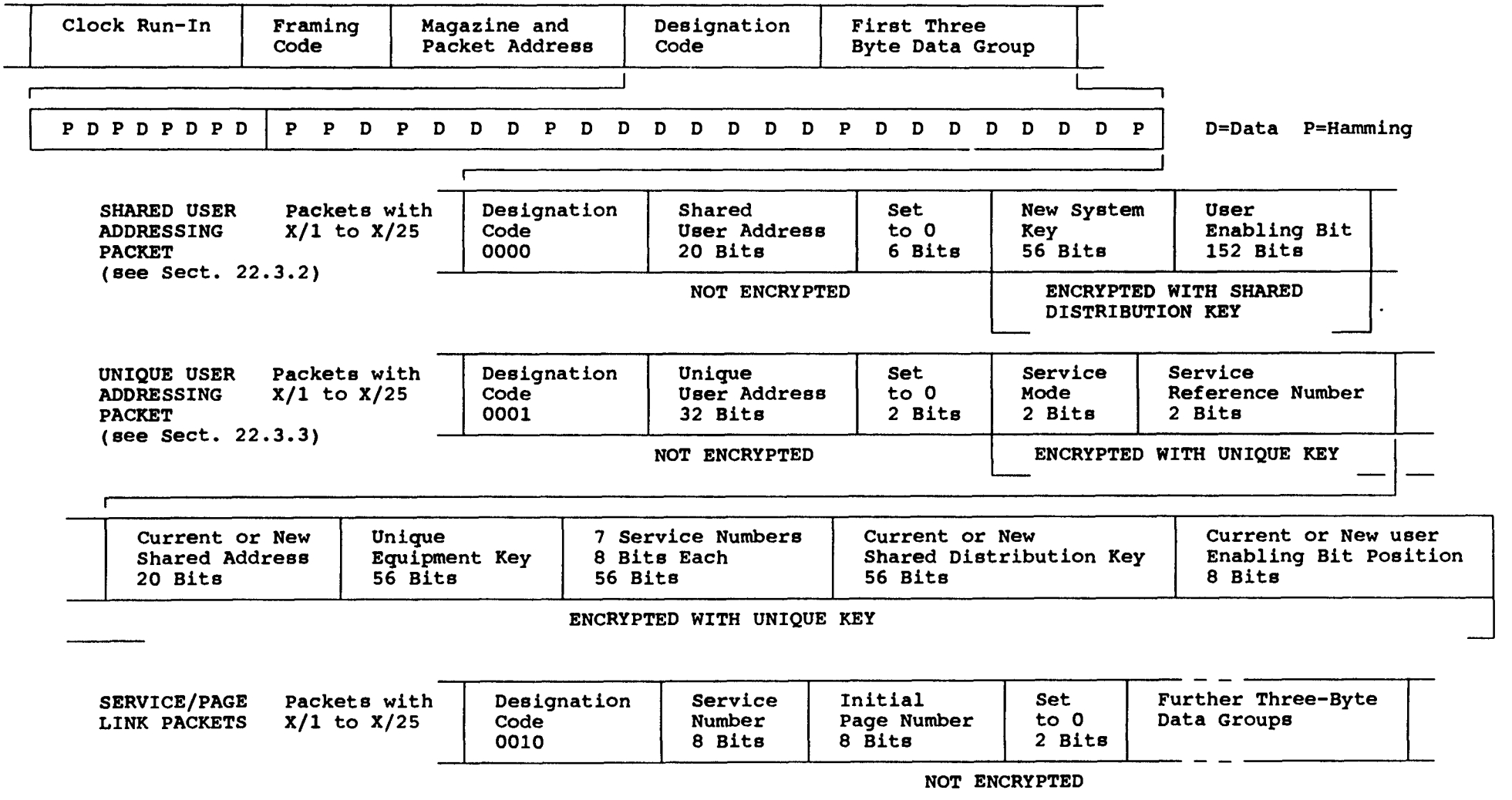


Figure 34 **USER ADDRESSING PACKETS**

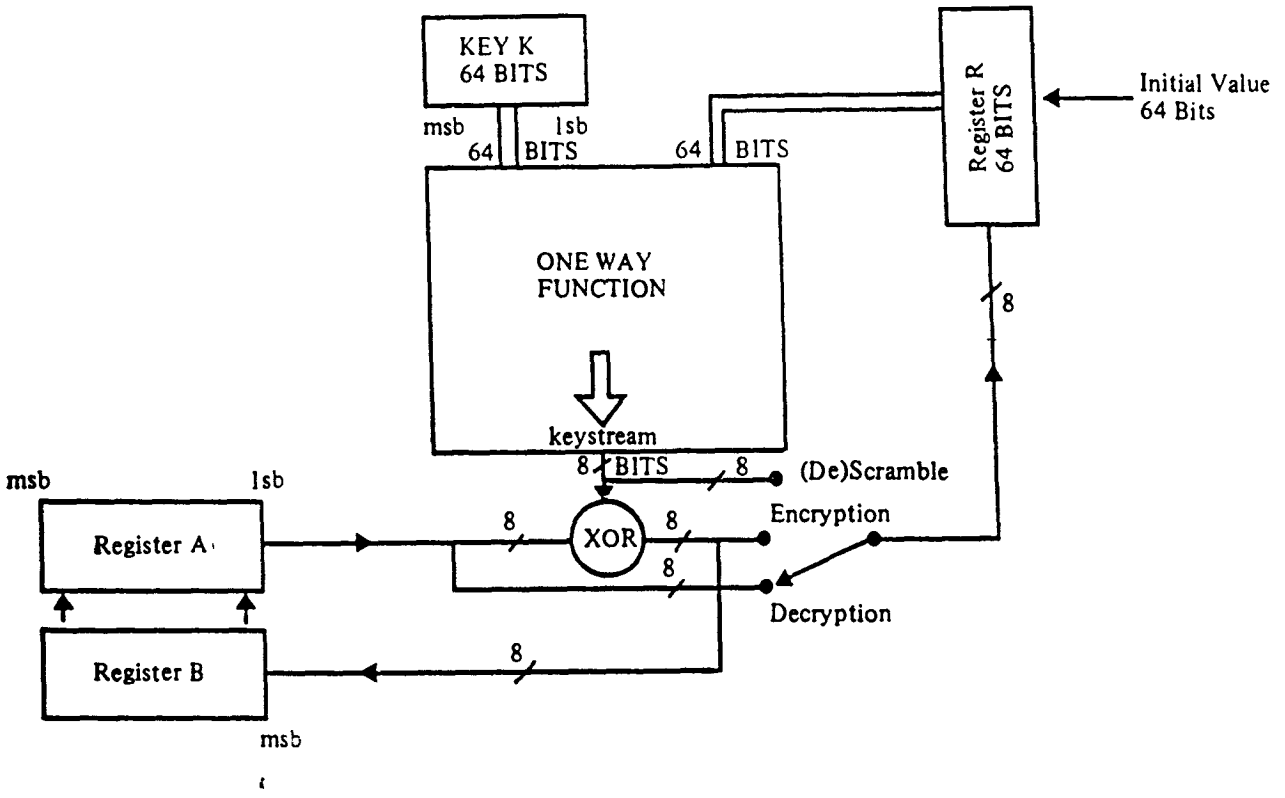


Figure 35 **VARIABLE LENGTH ENCRYPTION ALGORITHM**

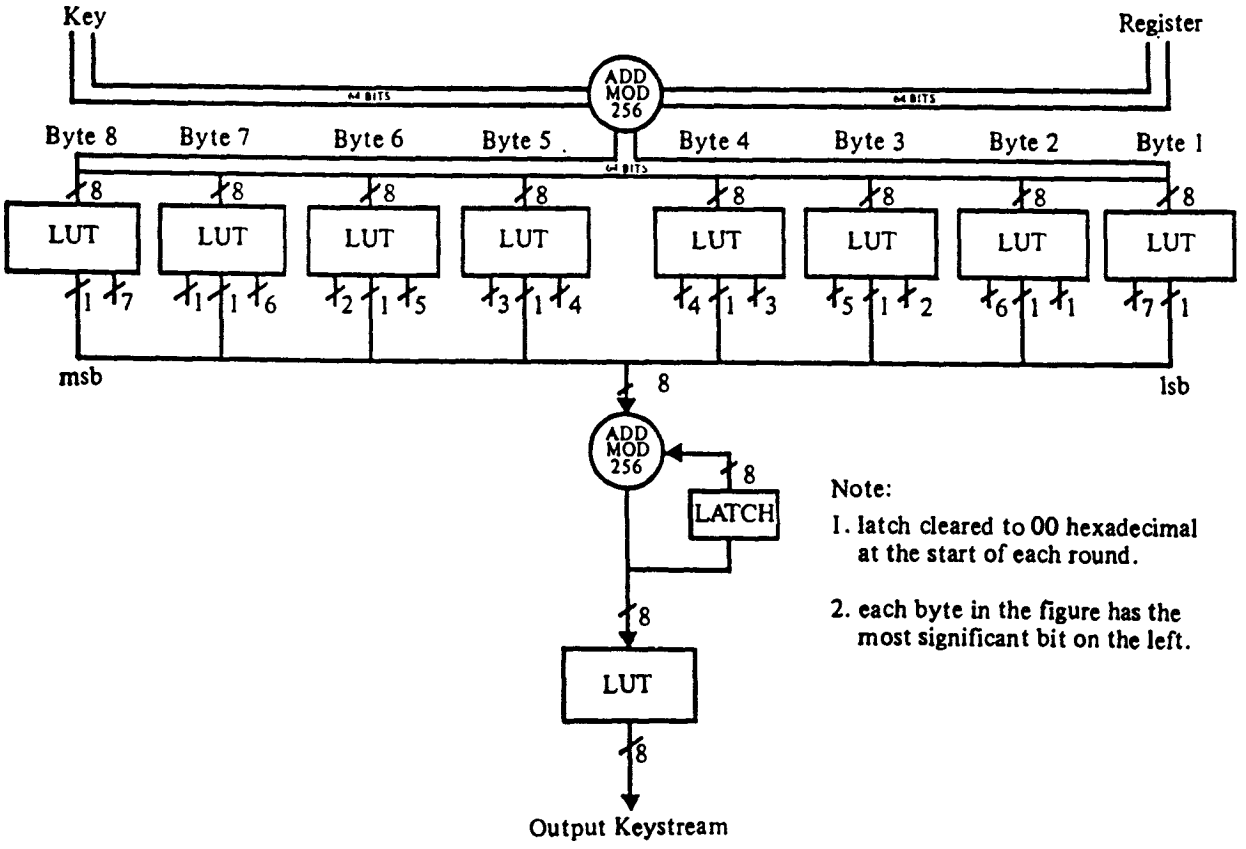


Figure 36 **EXAMPLE OF SUITABLE ONE-WAY FUNCTION**

Figures 35 & 36

DLE	Block Type 04/0X	Message Not Encrypted	Encrypted Message	User Data

Figure 37(a) **GENERAL FORM OF DATA BLOCK:** BLOCK FORMAT A (see Section 24.3)

DLE 8 bits	Block Type 04/01 8 bits	In Use System Key Label 8 bits	Service Modes 2 bits	Set to 0 6 bits	Current System Key 56 bits	Service Identification 8 bits	Block Key 56 bits
DATA NOT ENCRYPTED			ENCRYPTED WITH CURRENT SYSTEM KEY				

Key Value in Credit Units 16 bits	Scrambling Method 5 Bits	Set to 0 3 Bits
	DATA NOT ENCRYPTED	

Figure 37(b) **PRIMARY BLOCK KEY MESSAGES:** (see Section 24.3.2)

DLE 8 bits	Block Type 04/02 8 bits	Service Identification Number 8 bits	Sequence Number 8 bits	Scrambled User Data
DATA NOT ENCRYPTED				

Figure 37(c) **SECONDARY BLOCK MESSAGES AND SCRAMBLED USER DATA:** (see Section 24.3.3)

Figures 37(a), 37(b) & 37(c)

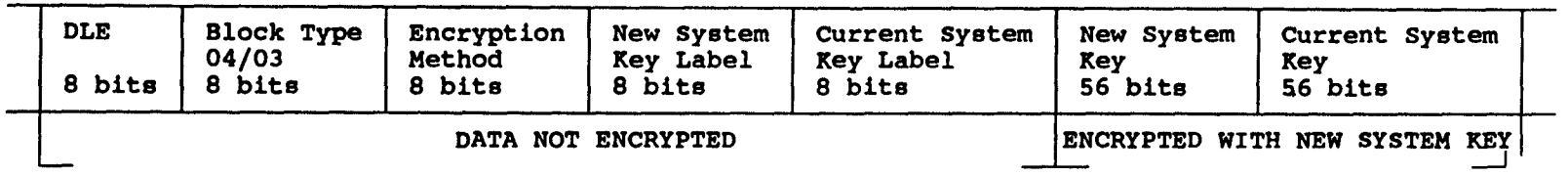


Figure 37(d) **SYSTEM KEY BLOCK MESSAGE:** (See Section 24.3.4)

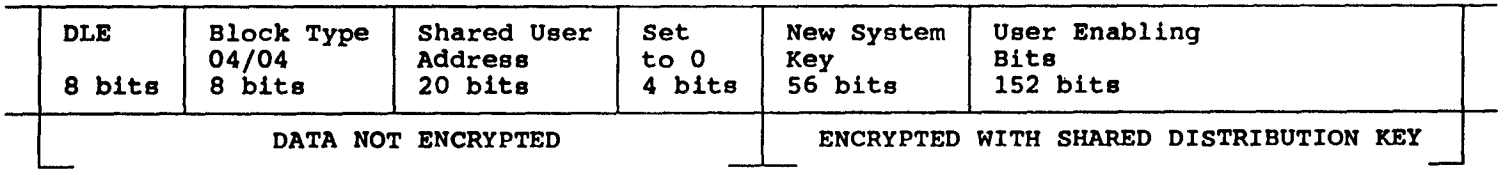


Figure 37(e) **SHARED USER MESSAGE BLOCK:** (See Section 24.3.5)

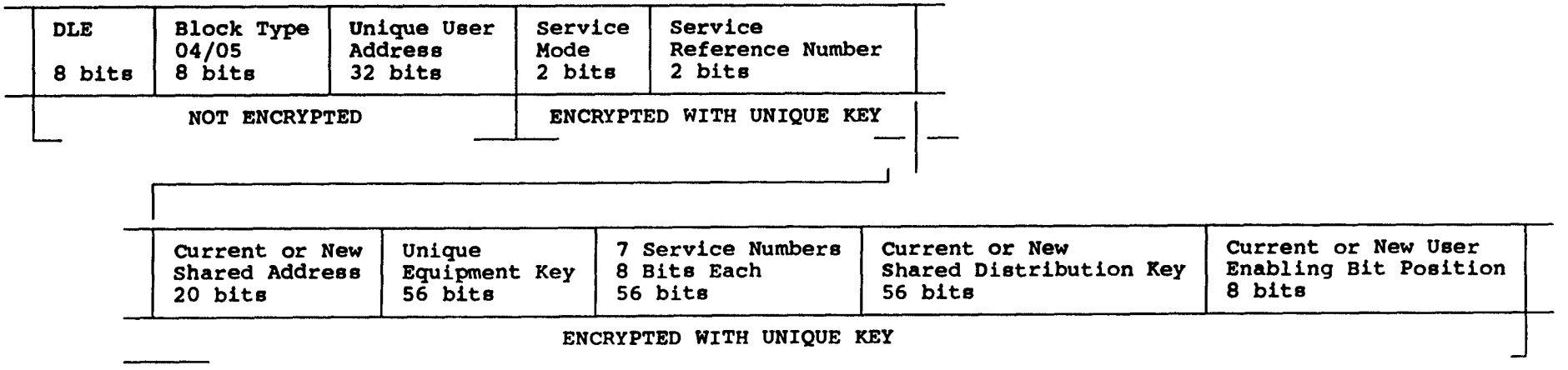


Figure 37(f) **UNIQUE USER BLOCK:** (See Section 24.3.6)

Figures 37(d), 37(e) & 37(f)

DLE 8 bits	Block Type 04/06 8 bits	Service Number 8 bits	Address Length 3 bits	Set to 0 5 bits	Service Address up to 24 bits	Group Repeated for Each Service Number
DATA NOT ENCRYPTED						

Figure 37(g) **SERVICE ADDRESS BLOCK: INDEPENDENT DATA SERVICES:** (See Section 24.3.7)

DLE 8 bits	Block Type 04/07 8 bits	Magazine Number 3 bits	Set to 0 5 bits	Service Number 8 bits	Initial Page Number 8 bits	Groups Repeated for Each Service Number
DATA NOT ENCRYPTED						

Figure 37(h) **SERVICE ADDRESS BLOCK: PAGE FORMAT SERVICES** (See Section 24.3.8)

Figures 37(g) & 37(h)

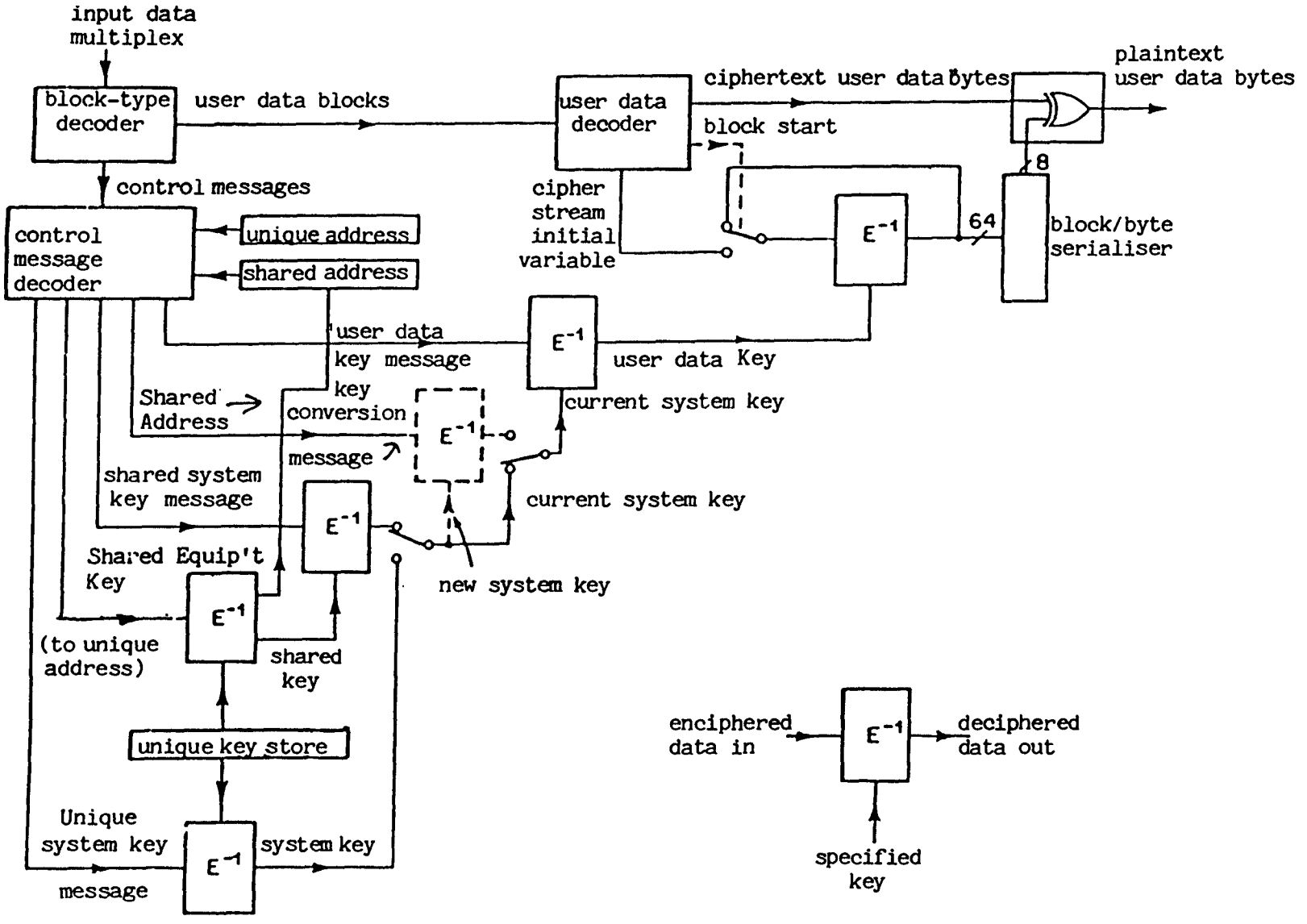


Figure 38 INDEPENDENT DATA SERVICES BLOCK FORMAT B

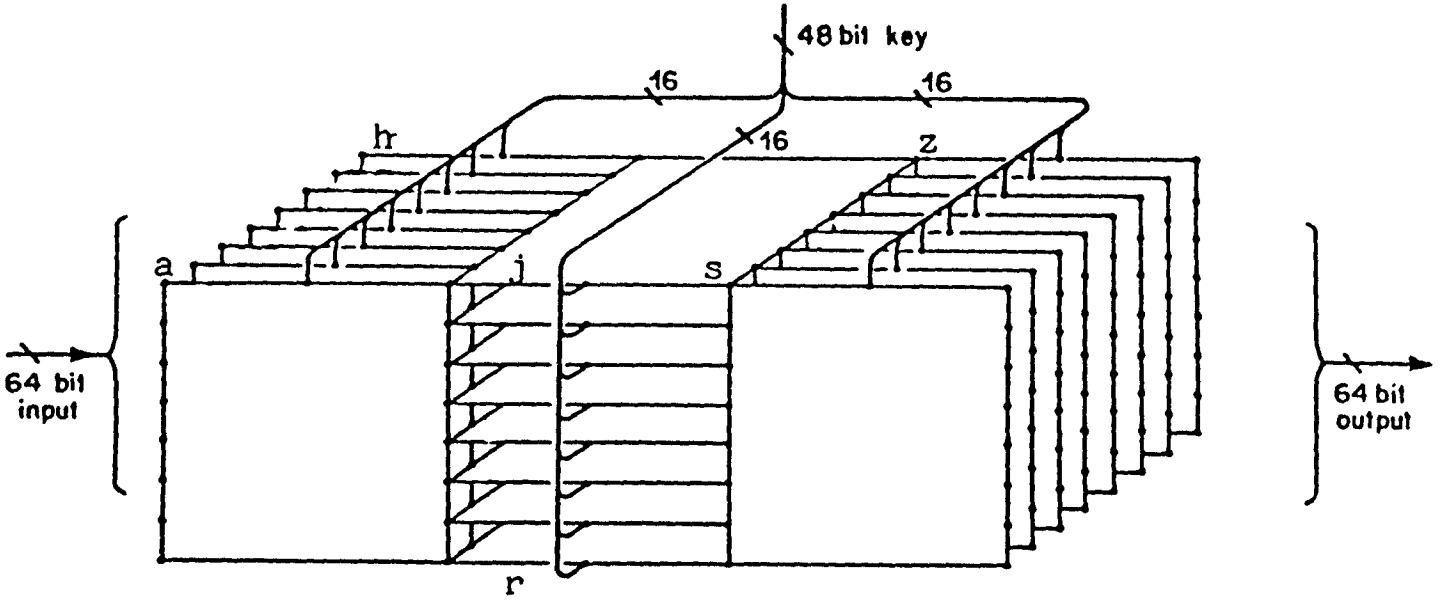


Figure 39 BLOCK ENCIPHERMENT ALGORITHM ENCRYPTION METHOD 2

DLE 1 byte	Block Type 5/C 1 byte	Unique User Address 5 bytes	Part Unique Equipment Key 7 L.S.bytes	Current System Key Label 1 byte	Sub-service Mask 16 bytes	Current System Key 8 bytes
DATA NOT ENCRYPTED			ENCRYPTED WITH UNIQUE EQUIPMENT KEY USING METHOD 2			

Figure 40(h) **UNIQUE SYSTEM KEY MESSAGE BLOCK** (See Section 24.4.9)

DLE 1 byte	Block Type 5/D 1 byte	Unique User Address 5 bytes	Part Unique Equipment Key 4 L.S.bytes	Shared User Address 3 bytes	Enabling Bit Pointer 1 byte	Sub-service Mask 16 bytes	Shared Equipment Key 8 bytes
DATA NOT ENCRYPTED			ENCRYPTED WITH UNIQUE EQUIPMENT KEY USING METHOD 2				

Figure 40(j) **SHARED EQUIPMENT KEY MESSAGE BLOCK** (See Section 24.4.10)

DLE 1 byte	Block Type 5/E 1 byte	Unique User Address 5 bytes	Previous Total Credit 4 bytes	Unique Equipment Key 8 bytes	New Total Credit 4 bytes
DATA NOT ENCRYPTED			ENCRYPTED WITH UNIQUE EQUIPMENT KEY USING METHOD 2		

Figure 40(k) **OVER-AIR CREDIT MESSAGE BLOCK** (See Section 24.4.11)

Figures 40(h), 40(j) & 40(k)

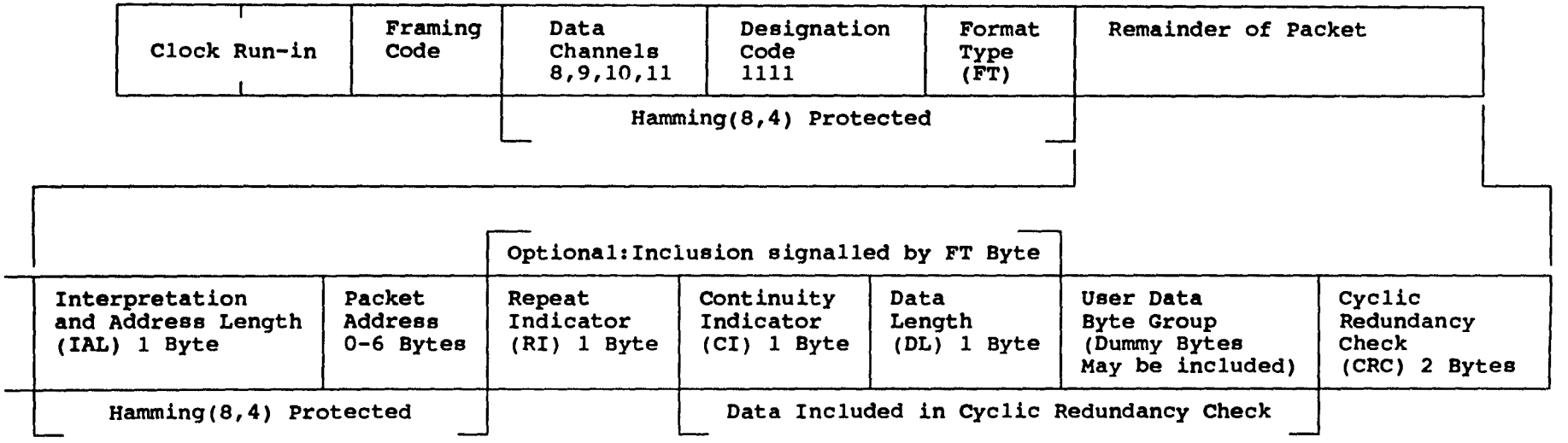


Figure 41 **FORMAT OF TYPE 'A' INDEPENDENT DATA LINE** (See Section 23)

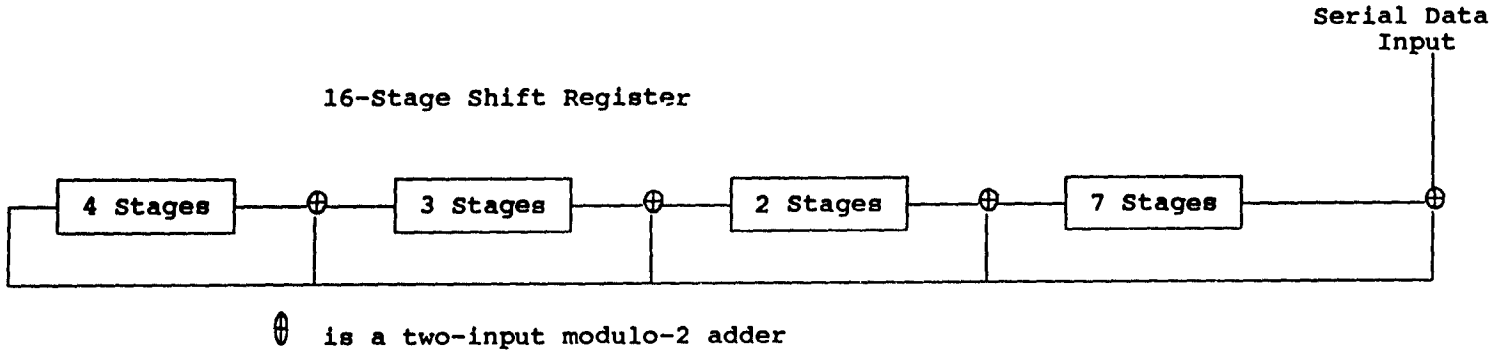


Figure 42 **CYCLIC REDUNDANCY CHECK**