

REPORT 1226

CHARACTERISTICS OF A PROGRAMME DELIVERY CONTROL (PDC)
SYSTEM FOR VIDEO RECORDING1. Introduction

(1990)

A programme delivery control (PDC) system assists the user of broadcast services (video, sound and data) by the transmission of accompanying data signals specifically related to the programme.

A first application of PDC is in conjunction with video recording [CCIR, 1986-90a; ARD/ZDF, 1987]. Use of the system can simplify the process of data entry for selected programmes and can ensure accurate timing of recording under the control of the broadcaster. In the first case this reduces the opportunity for errors in data entry and in the second case this compensates automatically for rescheduling of transmission times to account for unpredictable events which may delay (or occasionally advance) programmes.

Joint Interim Working Party 10-11/5 has proposed that Study Group 11 should aim at making a Recommendation on PDC to avoid a proliferation of standards. Study Group 11 has agreed with this view and a draft new Recommendation on programme delivery control systems for video recording is to be subjected to an accelerated approvals procedure during the CCIR Study Period (1990-1994).

This report describes the main characteristics required for such a system, and in particular the service requirements and functional capabilities for the video recording application. Detailed definitions and specifications for the functions, which are considered to be central and essential to the standardization of a universal PDC system, are given.

Bearing in mind the variation in transport mechanisms already employed for data broadcasting in different countries, it is to be expected that some variation in the details of implementation and coding of PDC functions will be inevitable [CCIR, 1986-90b]. The report is therefore structured to include such details as they apply to CCIR teletext systems A, B, C and D, [CCIR Recommendation 653] and other data transports in a separate annex.

Experience with services already implemented shows the need for clear rules on how a PDC system should be operated to achieve the reaction to be intended at the receiving end. Similarly guidelines on suggested ways of implementing receiver functions in the video recorder control software may significantly improve the system performance for the user. There is therefore a need to continue the collaboration between broadcasters and industry throughout the implementation and application phases of such a system. This will be of

particular benefit in ensuring the orderly introduction of specified features and of new features for which the system has a potential, but which, at service commencement, are not fully specified.

2. Service requirements to be taken into account in the development of a PDC system

Programme delivery control as a broadcasting service should allow suitably-equipped video recorders to record preselected programmes automatically and substantially completely. In order to provide this function a PDC system would ideally fulfil the following requirements:

- Programmes which differ from the scheduled time of transmission should be recorded properly.
- Facilities for the recording of non-scheduled programmes should be provided.
- Interruption of a transmitted programme for any reason may, at the discretion of the broadcaster, be accompanied by a corresponding interruption of the recording process.
- To facilitate the complete recording of a programme the system should allow for the continuation of a programme on a different channel.
- The presentation constraints on existing services (e.g. teletext and television services) should be minimized.
- The service should allow both manual or automatic preselections.
- The service should be user-friendly.
- The service should be reliable. In the case of failure of the automatic recording control of the PDC system, normal timer control of the recorder should operate.
- The service should operate consistently regardless of time-zone boundaries and changes to and from daylight-saving time. In consequence, the use of Unified Date and Time (UDT) is proposed.
- The rate of transmission of recording controls must be such that error detection/correction schemes and frequency scanning by the receiver are possible. This results in a minimum repetition rate of 1 Hz.
- The start of the recording process should be close to the start of the required programme, however, in signalling the latter, the broadcaster should make allowance for the "run-up" characteristics of recording equipment.
- The service should operate for programmes with and without conditional access.
- The data capacity for the recording control and other background functions should be minimized.

- Provision should be made for the announced data and time to be changed one or more times by the broadcaster without adverse effect on the service. Nevertheless, there may be operational rules which restrict the range of movement to within a specific time duration (e.g. 28 hours).

3. General description of the PDC system

3.1 Distinct service components of a PDC system

Programme delivery control for video recording is made up of two distinct service components, defined as the preselection function and the recording-control function as described below (see Figure 1).

- The preselection function

The preselection function for recording control of suitably-equipped recorders performs the loading of the controller memory of the recorder with the information about all programmes required to be recorded. The viewer chooses the required programmes from television programme guides such as newspapers, magazines or teletext pages. He then enters the relevant information into the recorder, for example manually via keyboard or barcode reader or interactively using a cursor on the display screen.

- The recording-control function

The recording-control function remotely controls suitably equipped recorders from the source of transmission. Such a function depends on the broadcaster sending a programme label in coded form together with the programme. In the case where no programme label is transmitted, the recording must be done under timer control of the recorder.

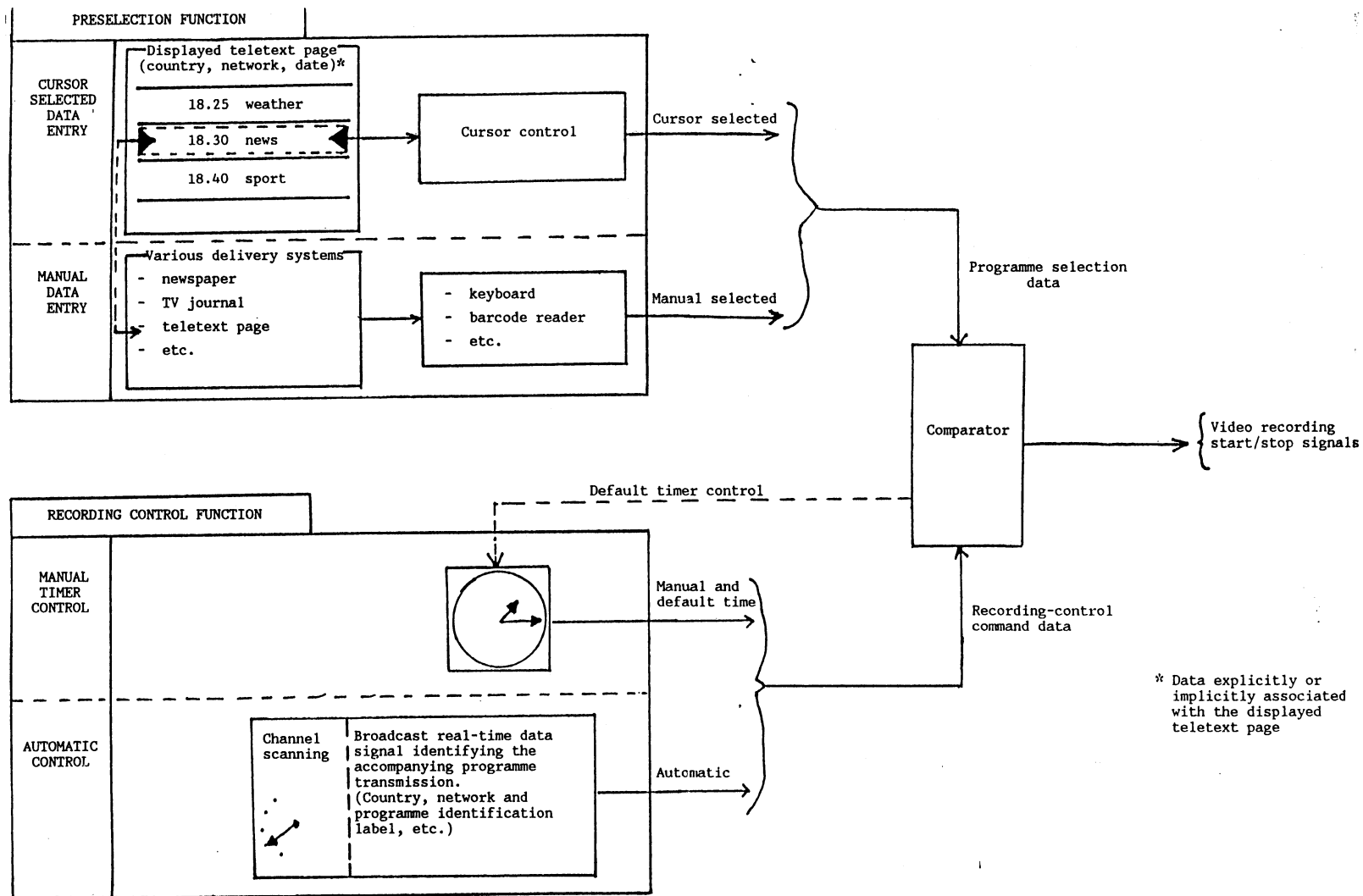


FIGURE 1

Illustration of programme delivery control (PDC) functions for video recording

3.1.1 The preselection function for recording equipment

3.1.1.1 Preselection via teletext under cursor control

The teletext system can be used to transmit a programme directory which includes the information needed to set up receiving equipment for the controlled delivery of chosen programmes.

Two possible methods of providing the data relevant for the preselection of programmes via teletext using cursor control are described below:

- Incorporated in the displayed programme menu page

In this case, the data are incorporated into the normal teletext display page. This method takes into account the requirements for manually entering preselection data into receiving equipment.

The data, which are of importance for programming a video recorder, are specially marked on the teletext programme-preview pages. In this way, every programme item and its associated identification data are unequivocally recognizable by a micro-computer programmed accordingly and may thus be programmed into the video recorder.

- Supplementary to the displayed programme menu page

In this case, the data related to a page of text, representing a programme menu, is conveyed outside the visible text area. This method allows full editorial freedom in the composition of the page at the expense of an additional transmission data capacity. All necessary data parameters, except the "Programme title" and the "Announced time", are conveyed as machine-readable data. A parameter such as "Menu cursor position" is required to link between the programme title in the visible page and the corresponding machine-readable data.

3.1.1.2 Preselection via keyboard and barcode

The information needed to set up receiving equipment for the controlled delivery of chosen programmes may be taken from various sources such as printed lists, and visual (including the teletext programme menu) or oral announcement, and may be keyed in manually. The preselection data may also be entered with the help of a barcode reader.

If no special PDC service is offered, the parameters "Announced time" and "Announced date" together with the tuner position provide sufficient information if the programme is broadcast as scheduled. Using a programme delivery control service which includes only the recording control functions, the parameters "Announced time" and "Announced date" (together with the tuner position) allow a particular expected programme to be selected regardless of its actual transmission time.

3.1.2 The recording-control function

3.1.2.1 Specification of the recording-control commands

As stated in section 3.1, the PDC function called the recording-control allows remote control from a source of transmission of a recording made by a suitably-equipped receiver. A prerequisite is that the broadcaster sends a programme identification label in coded form together with the programme. Such a programme identification label in coded form accompanying the programme is defined as a recording-control command. It consists of a defined set of parameters selected from the list of programme identification parameters of section 3.2. Depending on the transport mechanism used the recording-control commands can be structured in several different ways (see Annex).

3.1.2.2 Repetition rate of the recording-control commands

A repetition rate for the recording-control commands of between 1 and 25 Hz is recommended.

3.1.2.3 Transport of the recording-control commands

The recording control commands may be carried in any of the CCIR teletext systems (A, B, C, and D) or in a dedicated television line (see Annex).

3.2 Programme identification parameters

A PDC system has to provide appropriate parameters for identifying a television programme in order to fulfil the preselection and recording-control functions for the automatic recording of preselected programmes. Some of these programme identification parameters are essential while other parameters are only desirable or optional. A list of the currently identified parameters is given below.

3.2.1 Currently identified parameters

a) Country and network identification (CNI)

This parameter allows identification of the country and the network or, alternatively, the programme provider.

b) Announced data (AD)

This parameter gives the scheduled date of start of the transmission of the programme in terms of years, months and days. When a local time reference is used the applicable local time offset should be made explicitly available.

c) Original announced time (AT-2)

This parameter may be divided into two groups: the first indicates the announced starting time or, where the programme has altered, the original starting time; the second gives the announced finishing time. Both are expressed in hours and minutes. When a local time reference is used the applicable local time offset should be made explicitly available in both cases as it may change between the two.

d) Menu cursor position (MCP)

This parameter is used to link parameters to text information displayed on the screen.

e) Programme identification label (PIL)

This parameter identifies the programme broadcast. For example, it may take the form of an announced broadcast time (month, day, hour, minute). Several special codes, however, may be reserved for recorder control in certain conditions.

f) Programme title (PTL)

This parameter provides the programme title in clear text.

g) Local time offset (LTO)

This parameter indicates the local time offset from UTC. More than one of these parameters may need to be sent to cover discontinuities in local time.

h) Announced time (AT-1)

This parameter may be divided into two groups: the first indicates the announced starting time, the second gives the announced finishing time. Both are expressed in hours and minutes. When the local time reference is used the applicable local time offset should be made explicitly available in both cases as it may change between the two.

i) Programme duration (PD)

This parameter shows the expected duration of the programme in hours, minutes and seconds.

j) Programme control status (PCS)

This parameter is used to state real-time conditions which are relevant to the programme or its broadcasting (e.g. type of sound transmission, rating of programme, access mode, ...).

k) Programme type (PTY)

This parameter identifies the type or series of programmes being broadcast and allows for selecting recording of certain types of programme independent of the programme identification labels.

l) Conditional access flag (CAF)

This parameter is used during the preselection process to signal that the programme to which it refers is not for free access.

m) Unified date and time (UDT)

This parameter is used for broadcasting the Coordinated Universal Time (UTC) and Modified Julian Date (MJD).

3.2.2 Coding of the parameters

Appropriate coding has to be provided in order to identify the parameters listed in section 3.2.1 for transmission. Where possible the coding of the parameters should make reference to existing specifications with the CCIR documentation: for example, for the "Country and network identification" use is made of existing ITU country codes as shown in Table I.

In Europe the codes for the "Programme type" have been classified in accordance with the "ESCORT" system [EBU, 1983] using certain principles of identification (see Table II). Further study of this system should be undertaken with a view to its adoption as a unified coding scheme.

Table I

CORRESPONDENCE BETWEEN THE CNI COUNTRY CODES AND THE ITU COUNTRY CODES

Row number coded by b_1 to b_4 (hexadecimal)
Column number coded by b_5 to b_8 (hexadecimal)

	0	1	2	3	4	5	6	7	8	9	A	B	C	D	E	F
0																
1	.	DDR	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
6
7
8
9
A
B
C
D
E

Example: The country code hex. 16 (coded by b_1 - b_8 as 0001 0110) is unique to Belgium (BEL). The code hex. F6 (binary 1111 0110) also corresponds to Belgium but applies equally to Finland (FNL) Syria (SYR) and Yugoslavia (YUG).

Table II

Codes for programme type (PTY)

<u>Code</u> (Hexadecimal)	<u>Principle of classification</u>	
00	Information not available	
01-3E	Intended audience	
3F	Alarm/emergency identification	
40-7F	Content	
80-BF	Codes specific to each service (to be defined)	
CO-FF	Codes specific to each service (to be defined)	

<u>Code</u> (Hexadecimal)	<u>Programme type</u>	<u>ESCORT ref. number</u>
	<u>INTENDED AUDIENCE</u>	
08	<u>General audience</u>	2.0.0
	<u>Special Groups</u>	
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 or more)	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
	<u>CONTENT</u>	
40	<u>Public affairs</u>	
41	General domestic affairs	1.1.0
42	Legal and social affairs	1.2.0
43	Economic, industrial & financial affairs	1.3.0
44	Housing, environment & health affairs	1.4.0
45	Communication affairs	1.5.0
46	Educational and cultural affairs	1.6.0
47	International relations & defence affairs	1.7.0

<u>Code</u> (Hexadecimal)	<u>Programme type</u>	<u>ESCORT ref. number</u>
48	<u>Science & the humanities</u>	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
50	<u>Music</u>	3.1.0
51	Serious music	3.1.1
52	Light classical music	3.1.2
53	Light music	3.1.3
54	Jazz	3.1.4
55	Folk music	3.1.5
56	Rock music	
57	Other music	3.1.9
58	<u>Drama, arts</u>	3.0.0
5A	Ballet and 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	<u>Philosophies of life</u>	
61	Christian religion	4.1.0
62	Non-Christian religion	4.2.0
63	Non-religious philosophy of life	4.3.0
67	Other philosophies of life	4.9.0
68	<u>Sports</u>	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 & equestrian sports	5.5.0
6E	Athletics	5.6.0
6F	Martial arts	5.7.0
70	<u>Leisure and hobbies</u>	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	<u>Light entertainment, folklore and human interest</u>	7.0.0
7A	Light entertainment	7.1.0
7B	Folklore/festivities	7.2.0
7C	Human interest	7.3.0
7F	Other light entertainment, etc.	7.9.0

REFERENCES

Technical Rules ARD/ZDF No. 8R2 [August 1987] - Second edition video programming system.

EBU Document SPG 2353 [August 1983] - ESCORT system, Geneva.

CCIR Documents

[1986-90]: a. JIWP 10-11/5-66 (EBU); b. 11/570 (Canada).

ANNEX

DATA TRANSPORT SPECIFICATIONS FOR A PROGRAMME DELIVERY
CONTROL (PDC) SYSTEM FOR VIDEO RECORDING1. Introduction

Four teletext systems have been reported at Recommendation 653. The transport mechanism used by a particular broadcaster to carry PDC functions is likely to be the teletext system adopted in the broadcaster's country. Thus, consideration of the implementation of PDC, for instance, in Canada or Japan, is likely to lead to the specification of transport coding appropriate to CCIR teletext systems C and D respectively. In Europe a specification of a PDC system has been elaborated in close cooperation with European consumer electronics manufacturing industry [EBU, 1989]. It has been designed mainly around the structure of CCIR teletext system B and used as a starting point the video programming system (VPS) developed in the Federal Republic of Germany [ARD/ZDF, 1987].

In providing a comprehensive system applicable to all of Europe, and encompassing all future requirements foreseen, particularly in an international environment (e.g. by future DSB services), downward compatibility with systems already implemented has been retained and some optional methods for performing particular functions are provided. The main characteristics of the EBU PDC system are described in the remainder of this annex.

2. Main characteristics of the EBU PDC system2.1 Application and coding of programme identification parameters

As illustrated in the table, not all the data items specified by the EBU in the PDC system are mandatory. Some are essential to provide a minimum level of functional performance, while others may be implemented by those broadcasters who find it desirable to provide viewers with a higher level of PDC performance. Further refinement of these aspects of the service will take place as a broadcaster's "code of practice" is developed.

TABLE

Application of programme identification parameters within the
programme preselection and recording-control function
of the EBU PDC system

	Programme preselection	Programme recording control
ESSENTIAL	CNI AD AT-2 MCP	CNI PIL
DESIRABLE	PTL LTO AT-1 PD	PCS
OPTIONAL	PTY CAF	PTY UDT*

Appropriate coding has been provided in order to identify the parameters listed for transmission. Each parameter is described as a data field of given length and structure. The order in which the bits of the data field should be transmitted is also given.

In two cases the coding of the parameters makes reference to existing specifications within the EBU documentation: for the "Country and network identification" and for the "Programme type".

For the "Country and network identification" reference is made to the ITU country identification as also used by the EBU Radio Data System [EBU, 1984] see Table I of section 3.2.2. The codes for the "Programme type" have been classified in accordance with the "ESCORT" system [EBU, 1983]. Hexadecimal code 00 has been reserved for use when information on the programme type is not available and hexadecimal code 3F has been assigned to identify alarm/emergency messages, and the code FF indicates that no programme or series type is intended. In general, 75 out of 128 available codes between 00 and 7F have been assigned. 53 spare codes applicable to all services, and 128 codes applicable to individual services, remain to be assigned.

In the coding of the "Programme identification label" some code values have been reserved for recorder control in certain conditions, for example:

- System status code - indicating that the programme identification information is to be ignored. In this case, recording is done by timer control.
- Interrupt code - indicating a break in the programme which will continue after a short interval.



3. The preselection function via teletext

There are two methods of transporting the data relevant for the preselection of programmes via teletext:

- Together with the programme menu

In this case, the data are incorporated into the normal teletext display page. The data, which are of importance for programming a video recorder, are specially marked on the teletext programme-preview pages using control characters. Every programme item selected and its associated identification data may thus be programmed into the memory of the video recorder.

- In extension data packets

Related to a page of text containing data representing a programme menu, rather than within the visible text area. This method gives good error protection and allows full editorial freedom in the composition of the page at the expense of an additional transmission data capacity.

This transport method places all necessary data parameters, except the "Programme title" and the "Announced time", as machine-readable data in extension packets of the relevant teletext page. The data items of these extension packets are placed in groups, each group being associated with one of the programme titles in the visible page. A parameter in each group is the "Menu cursor position" which points to the character and row position in the visible page close to the programme title. This provides the link between the title and the corresponding machine-readable data.

4. The recording-control function

4.1 Specification and transport of the recording-control commands

Depending on the transport mechanism in which they appear, the recording-control commands can be structured in several ways.

4.1.1 Insertion in system B teletext data packet 8/30 format 2

A recording control command is made up of the parameters "Country and network identification", "Programme identification label", "Programme control status" and "Programme type". A 20-character version of "Programme title" may also be provided.

As illustrated in Fig.1, this packet includes the prefix (5 bytes), the designation code (1 byte) and the initial teletext page (6 bytes). The next 13 bytes, numbered 13 to 25, are each (8, 4) Hamming coded using the method defined for system B teletext. The remainder of the packet (bytes 26 to 43) contains a 20-character version of the "Programme title" for display as a status message.

4.1.2 Insertion in a dedicated television line

A recording control command is made up of the parameters "Country and network identification", "Programme identification label", "Programme control status" and "Programme type".

A bi-phase modulation is used with a data rate of 2.5 Mbit/s allowing a capacity of 15 bytes for the whole data line. The first two bytes are used for run-in and the start code leaving 13 useful bytes for the identification of the relevant programme parameters (Fig.2).

4.1.3 Transport via MAC/packet systems

When the recording control commands of a domestic programme delivery service are conveyed by a member of the MAC/packet family of systems, two transport methods are applicable:

- Via teletext in the packet multiplex

The general transport principles for teletext in the packet multiplex are given in section 2 of Part 4B of [EBU, 1986]; the structure of the relevant teletext data packet (8/30) is as specified in section 4.1.1.

- Via teletext in the field-blanking interval

The general transport principles for teletext in the field-blanking interval of a MAC signal are given in Part 4A of [EBU, 1986]; the structure of the relevant teletext data packet (8/30) is as specified in section 4.1.1.

4.2 Repetition rate of the recording-control commands

A repetition rate for the recording-control commands of between 1 and 25 Hz is recommended. In the case of the dedicated television line the repetition rate is 25 Hz.

REFERENCES

ARD/ZDF [1987]-Technical Rules ARD/ZDF No. 8R2 [August 1987] - Second edition video programming system.

EBU [1983]-EBU Document SPG 2353 [August 1983] - ESCORT system, Geneva.

EBU [1984]-EBU Document Tech. 3244 [March 1984] - Specification of the radio data system for VHF/FM sound broadcasting, Brussels.

EBU [1986]-EBU Document Tech. 3258 [October 1986] - Specifications of the systems of the MAC/packet family, Brussels.

EBU [1989]-EBU Document SPB 459(Rev.) [May 1989] - Specification of the domestic video programme delivery control system, Brussels.

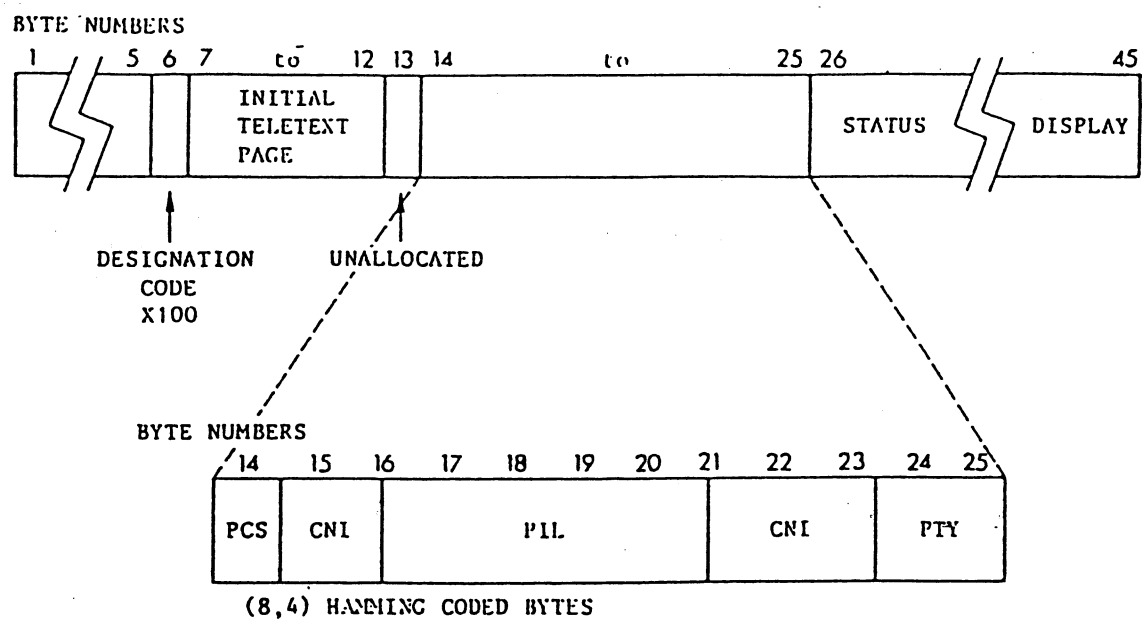


FIGURE 1 - Structure of the teletext data packet 8/30 format 2

