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Television systems; Specification of the domestic video Programme Delivery Control system (PDC)

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Foreword

This second edition European Telecommunication Standard (ETS) has been produced by the Joint Technical Committee (JTC) of the European Broadcasting Union (EBU), Comité Européen de Normalisation ELECtrotechnique (CENELEC) and the European Telecommunications Standards Institute (ETSI).

NOTE: The EBU/ETSI JTC was established in 1990 to co-ordinate the drafting of standards in the specific field of broadcasting and related fields. Since 1995 the JTC became a tripartite body by including in the Memorandum of Understanding also CENELEC, which is responsible for the standardization of radio and television receivers. The EBU is a professional association of broadcasting organizations whose work includes the co-ordination of its members' activities in the technical, legal, programme-making and programme-exchange domains. The EBU has active members in about 60 countries in the European broadcasting area; its headquarters is in Geneva.

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Introduction

Programme Delivery Control (PDC) is a data broadcasting system which carries programme-related information for exploitation by suitably-equipped domestic video recorders. In its simplest application the programmes chosen by the viewer will be recorded by such recorders in their entirety, even if the transmission time is different from that published in the programme guide (for example owing to the over-run of a previous programme). More advanced applications may, for example, permit recording to be suspended and resumed in synchronism with breaks in programme transmission, such as may occur during a feature film in the event of film breakage.

The PDC system functions may be considered in two parts. Preselection functions deliver information about the programmes to the domestic recorder; this information may be carried via print media or via Teletext. In the latter case the user may make his selection of programmes by viewing the Teletext programme guide pages and, by the use of his remote-control, positions a cursor adjacent to the wanted programme. At the touch of a button he confirms his choice and the video recorder stores his requirement. If the video recorder does not incorporate full Teletext decoder functionality, the preselection information has to be keyed in manually, in the more conventional way. The Recording-control function depends on the establishment of a match between the viewer's preselection and a programme label transmitted by the broadcaster with each programme, thereby triggering the start and end of the recording process in synchronism with the actual transmission time of the programme.

The Programme Delivery Control (PDC) system specification is the result of several years of studies by the EBU in close collaboration with European industry. In accordance with the wishes of the European broadcasters, expressed in their replies to an EBU enquiry, the preselection and recording control functions of the PDC system have been designed mainly around the structure of ETS 300 706 [2] teletext. The starting point for the development process was the Video Programming System (VPS) in Germany.

The system has been designed to be comprehensive in the facilities it offers, and applicable to the whole of Europe. It will accommodate all future requirements foreseen by the specialists involved, including those deriving from the expansion of international television services (e.g. direct broadcasting satellite services). Downwards compatibility is assured with systems already implemented and optional methods are provided for performing particular functions where the preferred methods are not appropriate.

To assure the long-term flexibility of the PDC system, the specialists recommend that where ETS 300 706 teletext is in operation new PDC services should provide both the recording control function and the programme preselection function by means of data carried in extension data packets. For recording control this approach offers the most efficient use of the resource represented by the vertical blanking interval of the television signal; for preselection it allows the Teletext editor greater freedom in the layout of Teletext programme guide pages. A further advantage is that all PDC data are acquired by a common process at the receiver.

Although the transport of preselection data by Teletext extension packets is preferred, it is nevertheless recommend that all decoders should also be able to process preselection data sent within the displayable Teletext page.

Where no a-priori restriction applies, the preferred method for sending recording control data is in ETS 300 706 teletext extension data packets of type 8/30 format 2. Other methods nonetheless remain in the present specification; where these concern services already implemented in certain countries they are considered in the main text, whilst others are considered in the annexes.

Experience with the services already implemented has highlighted the need for clear operational rules, and a Code of Practice for Broadcasters has been included to ensure that the intended response is obtained at the receiver. It will also be necessary to arrange for the orderly introduction of any new features (see note 1) which the system is potentially able to deliver, or any further enhancements, as they are specified. The specialists therefore plan to continue their collaboration with industry as the PDC system is implemented and introduced into service.

NOTE 1:   Further enhancements are under study.

Considering that broadcasters may not only wish to modify programme schedules at short notice but also are required to generate and transmit the real-time commands to VCRs it is essential that both operations are under their close control.

NOTE 2:   The term "PDC" is used here as a technical description of the system and follows the current ITU-R terminology. Trade names for services provided within the specification of PDC include VPS, VPT (Video Programming by Teletext) and Startext.

1 Scope

This ETS specifies the Programme Delivery Control (PDC) transmission system. PDC is a data broadcasting system which carries programme-related information for exploitation by suitably-equipped domestic video recorders. Not all the features specified need be implemented in a particular service. Some of the data is essential if a minimum level of functional performance is to be achieved, whilst other data may be provided only by broadcasters wishing to provide viewers with a higher level of PDC performance. Optional data may be sent at the broadcaster's discretion.

2 Normative references

This ETS incorporates by dated and undated reference, provisions from other publications. These normative references are cited at the appropriate places in the text and the publications are listed hereafter. For dated references, subsequent amendments to or revisions of any of these publications apply to this ETS only when incorporated in it by amendment or revision. For undated references the latest edition of the publication referred to applies.

[1] ETS 300 250: "Television Systems; Specification of the D2-MAC/Packet system".

[2] ETS 300 706: "Enhanced Teletext Specification".

[3] TR 101 231: "Television systems; Register of Country and Network Identification (CNI) and of Video Programming System (VPS) codes". (This is maintained as a living document on the EBU website, http://www.ebu.ch).

3 Definitions, symbols and abbreviations

3.1 Definitions

For the purposes of this ETS, the following definitions apply:

Programme Delivery Control (PDC): Is a broadcasting service for domestic use which allows suitably-equipped recorders to record preselected programmes automatically and completely.

- PDC is made up of two distinct service components, defined as the preselection function and the recording-control function (see figure 1).

preselection function: For recording control of suitably-equipped recorders, this function 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 then enters the relevant information into the recorder, for example manually via a keyboard or bar-code reader, or interactively using a cursor on the display screen.

recording-control function: Allows remote control, from a source of transmission, of a recording made by a receiving equipment capable of preselecting the programme to be recorded. 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 shall be done under timer-control.
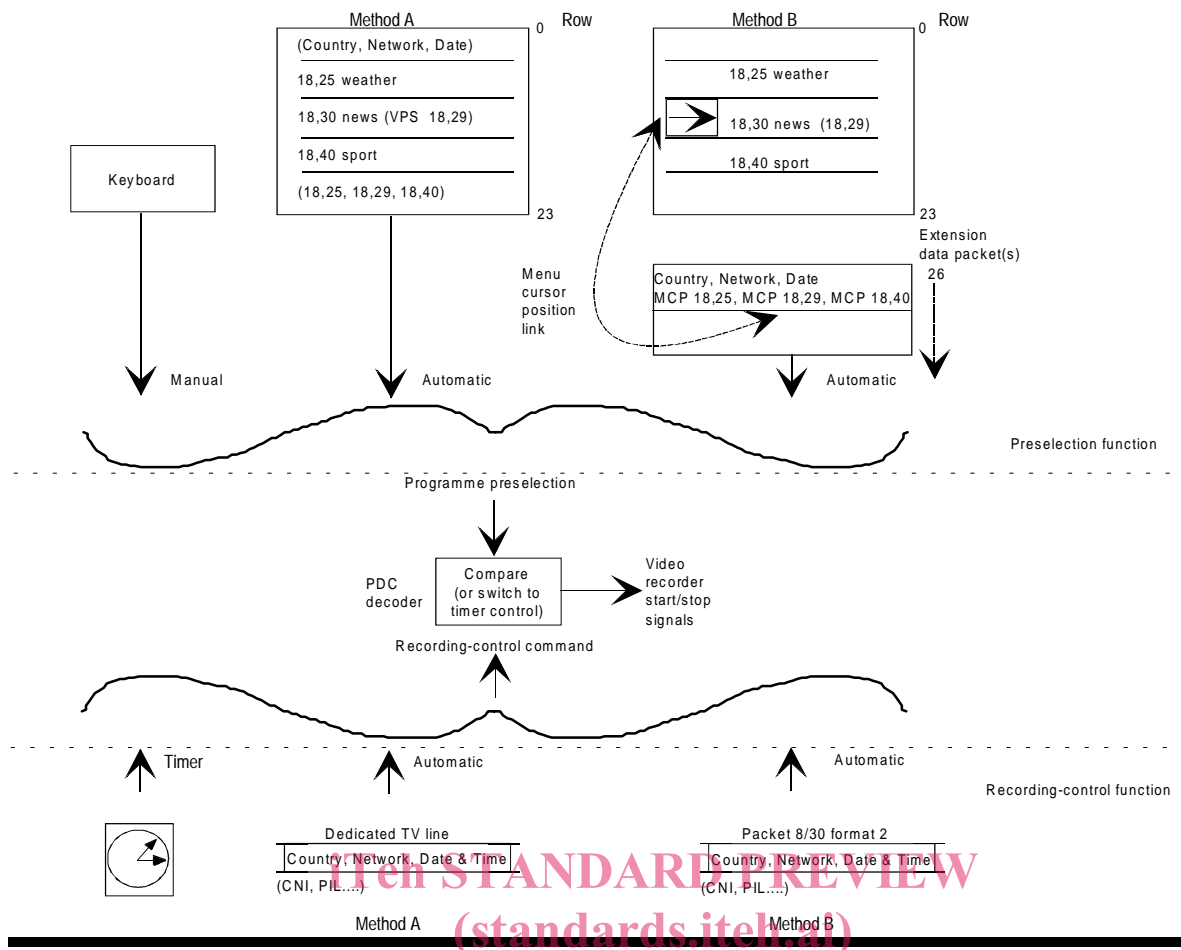
Figure 1

Preselection Method A is known as VPT, and it is described in subclause 7.3.1. Preselection Method B is known as PDC, and it is described in subclause 7.3.2.

3.2 Abbreviations

For the purposes of this ETS, the following abbreviations apply:

AD	Announced Date
AT	Announced Time
BSDP	Broadcast Service Data Packet
CAF	Conditional Access Flag
CNI	Country and Network Identification
hexadecimal, or hex	A number system with base 16. In written form, equivalents of the decimal numbers 10 to 15 are replaced by the uppercase letters A to F
'XY	Values expressed in hexadecimal notation
INT	Interruption code
LCI	Label Channel Identifier
LDT	Local Date and Time
lsb	least significant bit
LTO	Local Time Offset
LUF	Label Update Flag
MCP	Menu Cursor Position
MI	Mode Identifier
MJD	Modified Julian Date
msb	most significant bit
NI	Network Identification
NSPV	No Specific PIL Value (PIL defined below)
PCS	Programme Control Status
PD	Programme Duration

PDC	domestic video Programme/Delivery Control system
PIL	Programme Identification Label
PRF	Prepare-to-Record Flag
PTL	Programme Title
PTY	Programme Type
PW	Protection Word
RI/T	Record Inhibit/Terminate
SPL	Short Programme Label
TC	Timer-control Code
UDT	Universal Date and Time
UTC	Co-ordinated Universal Time
VCR	Video Cassette Recorder
VPS	Video Programme System
VPT	Video Programming by Teletext

Other abbreviations and specialized terminology is noted where it occurs in the ETS.

4 Application of the PDC system

PDC is a data broadcasting system which carries programme-related information for exploitation by suitably-equipped domestic video recorders. In its simplest application the programmes chosen by the viewer will be recorded by such recorders in their entirety, even if the transmission time is different from that published in the programme guide (for example owing to the over-run of a previous programme). More advanced applications may, for example, permit recording to be suspended and resumed in synchronism with breaks in programme transmission, such as may occur during a feature film in the event of film breakage.

The PDC system functions may be considered in two parts, Preselection functions and Recording-control functions, see subclause 3.1.

It is recommend that where ETS 300 706 teletext is in operation new PDC services should provide both the recording control function and the programme preselection function by means of data carried in extension data packets.

Although the transport of preselection data by Teletext extension packets is preferred, it is recommend that all decoders should also be able to process preselection data sent within the displayable Teletext page.

Where no a-priori restriction applies, the preferred method for sending recording control data is in ETS 300 706 teletext extension data packets of type 8/30 format 2. Other methods are given in this ETS; where these other methods concern services already implemented in certain countries they are considered in the main text, whilst others are considered in the annexes.

5 The PDC service

a) to enable the proper recording of programmes at times which differ from the published time of transmission (as is typical of flexible scheduling), including facilities for the recording of non pre-announced programmes;

b) the recording of programmes by programme-type shall be possible;

c) 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;

d) the presentation constraints on existing services (e.g. Teletext and television services) should be minimized;

e) the service should allow both manual and automatic preselections;

f) the service should be user-friendly;

g) the service should be reliable. In the case of failure of the recording-control function, normal timer-control should operate;

h)   the rate of transmission of recording controls shall be such that error detection/correction schemes and frequency scanning by the receiver are possible (minimum repetition rate 1 Hz);

i)   the service should operate consistently regardless of time-zone boundaries and changes to and from daylight-saving time;

        NOTE: CCIR Report 1078 proposes the use of Unified Date and Time for this purpose (see annex A).

j)   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 varying "run-up" characteristics of recording equipment;

k)   the service should operate for programmes with and without conditional access;

l)   the data capacity needed for both the real-time (recording-control) function and the other background functions should be minimized;

m)   provision should be made for the announced date and time to be changed one or more times by the broadcaster without adverse effect on the service.

6   Programme identification

6.1   List of programme identification parameters

Each parameter listed hereafter defines a certain aspect of the programme identification function and is used subsequently in the preselection and recording-control functions as shown in table 1.

a)   Country and Network Identification (CNI)

The CNI parameter is divided into two groups, one identifying the country, and one identifying the network or alternatively in some countries the programme provider. In this context a programme provider is the broadcaster who is responsible for the actual transmission of a programme.

A Register [3] of Country and Network Identification (CNI) and of Video Programming System (VPS) codes is being maintained by the EBU. In maintaining this list it was realised that the growth of satellite and other cross-border transmissions has made it increasingly possible to receive broadcasts from geographically widely-separated countries which may have been allocated arbitrarily identical 11-bit PDC codes. The Register was therefore rationalised in a way compatible with all existing consumer products to avoid the ambiguity that duplicated codes could cause. This rationalisation has meant that the relationship between the PDC NI code and that of the Broadcast Service Data Packet (8/30 format 1), is entirely arbitrary. Furthermore, when the 256 channel codes available to a country have been used (allocation is on a first-come first-served basis), further programme providers requiring CNI codes will be arbitrarily allocated an available CNI from another country's code space.

b)   Announced Date (AD)

The AD parameter gives the scheduled date of start of 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 (see note 1).

NOTE 1:   If in particular implementations no use is made of Local Time Offset (LTO), and Co-ordinated Universal Time (UTC) is not presumed, normal operation is still possible where all services are based on a common time zone.

Table 1: Application of programme identification parameters in the programme preselection and programme recording control functions

Programme preselection	Programme recording control
CNI	CNI
AD	LCI
AT-2	PIL
MCP	
PTL	PCS
LTO	
AT-1	
PD	
PTY	PTY
CAF	UDT(see note)
	LUF
NOTE: This parameter is carried, for example, in ETS 300 706 teletext by data packet 8/30 format 1.	

c) Original Announced Time (AT-2)

The AT-2 parameter may be divided into two groups: the first indicates the announced starting time or where a programme schedule has been 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 (see note 2).

> NOTE 2: If in particular implementations no use is made of LTO, and UTC is not presumed, normal operation is still possible where all services are based on a common time zone.

d) Menu Cursor Position (MCP)

The MCP parameter is used to link parameters to text information.

e) Programme Identification Label (PIL)

The PIL parameter normally carries the local announced broadcast time (day, month, hour, minute) identifying the transmitted programme. Several special values, known as "service codes", are reserved for receiver control in certain conditions.

f) Programme Title (PTL)

The PTL parameter provides the programme title in clear text.

g) Local Time Offset (LTO)

The LTO parameter indicates the local time offset from UTC to LDT in 1/4 hour steps (LTO = LDT - UTC). More than one of this parameter may need to be sent to cover discontinuities in local time.

h) Announced Time (AT-1)

The AT-1 parameter may be divided in two groups: the first indicates the announced 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 (see note 3).

> NOTE 3: If in particular implementations no use is made of LTO, and UTC is not presumed, normal operation is still possible where all services are based on a common time zone.

i) Programme Duration (PD)

The PD parameter shows the expected duration of the programme in hours, minutes and s.

j)   Programme Control Status (PCS)

The PCS 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, etc.).

k)   Programme Type (PTY)

The PTY parameter identifies the type or series of programme being broadcast and allows for selective recording of certain types of programme independent of the PILs.

l)   Controlled Access Flag (CAF)

The CAF 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)

The UDT parameter is used for broadcasting the Co-ordinated Universal Time (UTC) and Modified Julian Date (MJD).

n)   Label Update Flag (LUF)

The LUF parameter is used to signal that the associated CNI and PIL do not relate to the current television programme, but are 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 (see note 4).

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NOTE 4:   No mechanism is provided to update programme duration information held by the VCR
            when postponement or channel swapping functions are used.

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o)   Label Channel Identifier (LCI)

The LCI parameter indicates to which of the four parallel data channels the associated label applies. This permits the simultaneous labelling of a broadcast in several ways, and allows for the impending start of a new programme to be signalled before the end of the current one.

p)   Mode Identifier (MI)

The MI parameter is used to indicate which of two possible recording control function options has been selected by the broadcaster. Essentially, this determines whether the recorder stops immediately or continues for 30 s after a label change.

q)   Prepare-to-Record Flag (PRF)

The PRF is used to signal the precise start of the programme.

6.2   Coding of the parameters

The parameters listed in subclause 6.1 can be regarded as data fields. The data-field length and structure is given hereafter, taking into account that bit b_1 of a data field is the first bit transmitted.

Unless otherwise specified, a parameter transmitted with all bits set to logical "1" should be regarded as carrying irrelevant information.

a)   Country and Network Identification (CNI - 16 bits)

This field is composed of two groups of data bits. A first group, b_1 to b_8, identifies the country (see note 1 and table 2), the second group b_9 to b_{16} identifies the network or alternatively in some countries the programme provider within the defined country. The choice of these codes is left to national authorities, and they are registered with the EBU who maintains the Register [3].

Table 2: Correspondence between the CNI country codes and the ISO country codes

	Column number coded by b_5 to b_8 (hexadecimal)															
	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**A**	**B**	**C**	**D**	**E**	**F**
1		DZ	AD	IL	IT	BE	BY	AZR[2]	AL	AT	HU	MT	DE	CNR[3]	EG
2	GR	CY	SM	CH	JO	FI	LU	BG	DK	GI	IQ	GB	LY	RO	FR
3	MA	CZ	PL	VA		SY	TN	MA	LI	IS	MC			ES	NO
4		IE	TR			YU	UA	NL		LB				SE	
5							RU	PT							

└ Row number coded by b_1 to b_4 (hexadecimal), see note 1.

NOTE 1: As a national option in countries using the dedicated television line transport method the first four bits of the CNI parameter are reserved for enhancement of VPS. No correspondence exists between the coding of these bits and the first four bits of the CNI field of the dedicated line.

NOTE 2: (AZR) This represents the Azores, for which no ISO code exists.

NOTE 3: (CNR) This represents the Canary Islands, for which no ISO code exists.

b) Announced Date (AD - m x 8 bits)

This field is composed of m bytes, which could be either displayable Teletext characters, or encoded information yet to be defined. When local time is used, the relevant LTO should be provided. In the absence of an LTO, UTC is presumed (see note 2).

NOTE 2: If in particular implementations no use is made of LTO, and UTC is not presumed, normal operation is still possible where all services are based on a common time zone.

c) Original Announced Time (AT - 2 x n x 8 bits)

This field also is composed of n bytes which could be either displayable Teletext characters, or encoded information yet to be defined. If this data is duplicated, the second data field refers to the end of the programme. When local time is used, the relevant LTO (or, occasionally, LTOs) should be provided. In the absence of such LTOs, UTC is presumed (see note 3).

NOTE 3: If in particular implementations no use is made of LTO, and UTC is not presumed, normal operation is still possible where all services are based on a common time zone.

d) Menu Cursor Position (MCP - 2 x 6 bits)

The row and column co-ordinates are each coded as a six bit number. Rows 1 to 23 are indicated by decimal values 41 to 63 with row 24 given by decimal value 40. Columns 1 to 40 are indicated by decimal values 0 to 39.

e) Programme Identification Label (PIL - 20 bits)

Bits b_1 to b_{20} are filled with a number identifying the transmitted programme. The PIL number is related to a local announced date and time of transmission (see note 4). It is structured as follows (with b_i = msb for i = 1, 6, 10 and 15):

NOTE 4: The application of "random number" labels is elaborated in annex F.

b_1 to b_5	:	day, binary;
b_6 to b_9	:	month, binary;
b_{10} to b_{14}	:	hour, binary;