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

ETSI

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Foreword

This 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 ETSs 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 organisations 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 CCIR Teletext system B.

The starting point for the development process was the Video Programming System (VPS) in the Federal Republic of 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 ITU-R Teletext system B 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 ITU-R system B 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 European Telecommunication Standard (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 reference

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; EBU/ETSI Joint Technical Committee (JTC); Specification of the D2-MAC/Packet system".

3 Definitions 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.
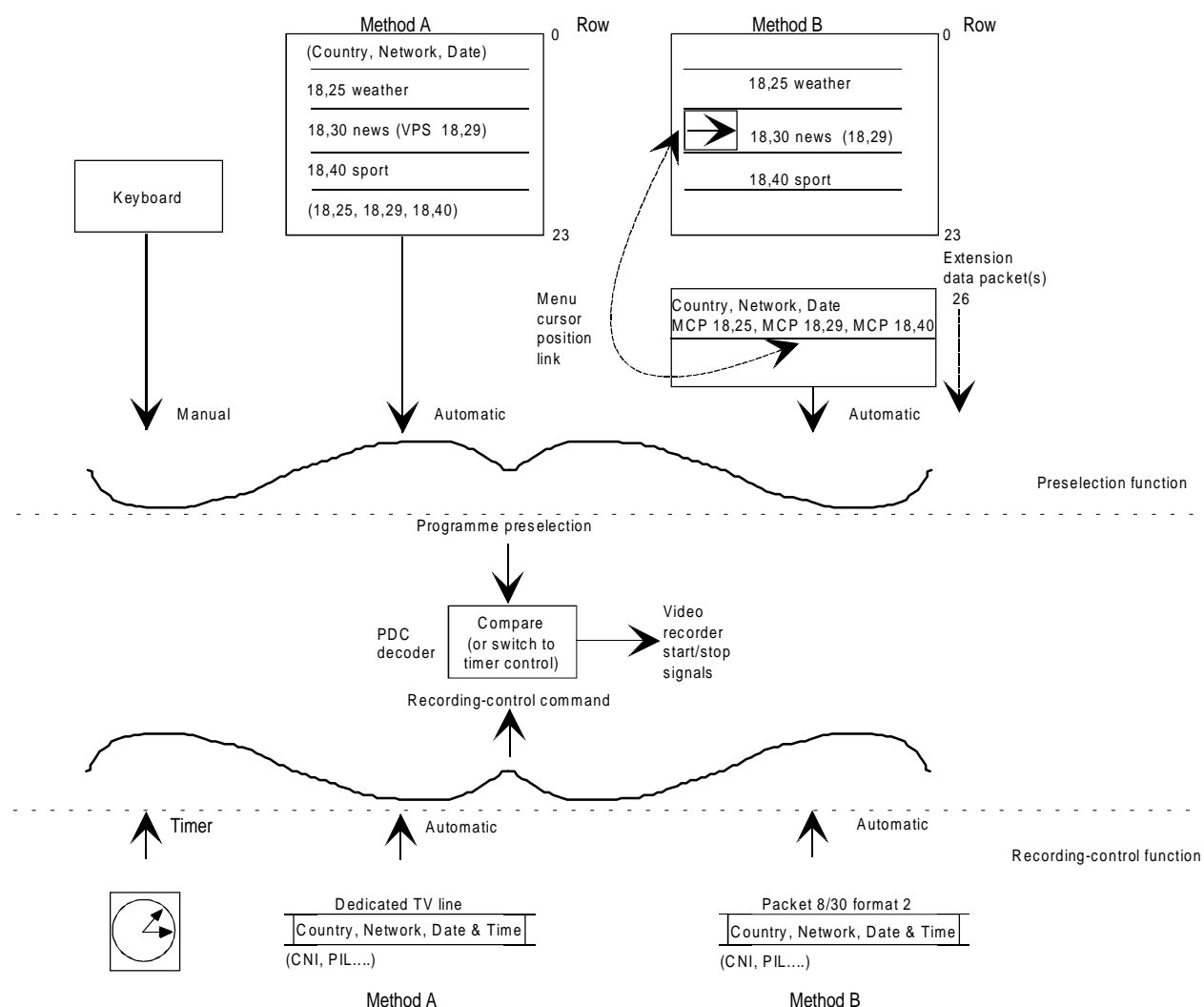
Figure 1

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,	A number system with base 16. In written form, equivalents of the decimal
or hex	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 specialised 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 ITU-R Teletext system B 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 ITU-R system B 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 minimised;

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 minimised;

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.

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 CCIR system B 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 seconds.

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).

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

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 seconds 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 4), the second group b_9 to b_{16} identifies the network or alternatively in some countries the programme provider within the defined country. The allocation of these codes is left to national authorities.

> NOTE 1:   As a national option in countries using the dedicated television line method of transport, only the last four bits of the group define the country. Bits b_1 to b_4 of this field are used for enhancements to Video Programme System (VPS).

b)   Announced Date (AD - m x 9 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 - n x 9 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;
> b_{15} to b_{20} :   minute, binary.

The PIL parameter has, however, several reserved values for receiver control in certain conditions. Five of these so-called "service codes" have been defined so far:

b_1 to b_{20}:   "00000 1111 11111 111111": **Timer-control Code (TC)**, indicating that the programme identification information is to be ignored. In this case, recording is done by timer mode;

b_1 to b_{20}:   "00000 1111 11110 111111": **Recording Inhibit/Terminate code (RI/T)**, indicating that the transmission has no label and is for example, not intended to be recorded;

b_1 to b_{20}:   "00000 1111 11101 111111": **Interruption code (INT)**, indicating a break in the programme, which will continue after a short interval;

b_1 to b_{20}:   "00000 1111 11100 111111": **Continuation code**, indicating possibly an erroneous transmission state. No action required;

b_1 to b_{20}:   "11111 1111 11111 111111": **No specific PIL value**, for use where the programme is selected by PTY (or series code) value only.

The possible use of further service codes is under study.

f)   Programme Title (PTL - n x 9 bits)

This data field is composed of n bytes, which could be either displayable Teletext characters, or as encoded information.

g)   Local Time Offset (LTO - 9 bits)

The bit allocation of this field is as follows:

b_1 :   set to "1";
b_2 :   hour offset (2-1 weight);
b_3 :   hour offset (2^0 weight);
b_4 :   hour offset (2^1 weight);
b_5 :   hour offset (2^2 weight);
b_6 :   hour offset (2^3 weight);
b_7 :   sign ("0": positive, "1": negative);
b_8 :   set to "1".

h)   Announced Time (AT-1 - n x 9 bits)

This field is composed of n bytes which could be either displayable Teletext characters, or encoded information. 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 5).

NOTE 5:   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 - 19 bits)

The duration being expressed in hours, minutes and seconds, the bit allocation is as follows (with b_i = msb for i = 1, 6 and 12):

b_1 to b_5 :   hours, binary;
b_6 to b_{11} :   minutes, binary;
b_{12} to b_{17} :   seconds, binary.

Unrealistic time codes are reserved for special purposes.

j)   Programme Control Status (PCS - 4 bits)

Bits b_1 and b_2 define the type of analogue sound dual-carrier transmission.

b_1 to b_2 =   11:   dual sound;

=   10:   stereo;

=   01:   mono;

=   00:   "do not know" (sound/data).

Bits b_3 and b_4 are reserved for future use.

k)   Programme Type (PTY - 9 bits)

This field can be used to indicate the programme sub-genre or to link a series of programmes all of which share a common value for PTY.

Codes 00 to 7F are defined in accordance with the code table for programme types (sub-genres) given in table 2.

Codes 80 to FE are available for the broadcaster as series codes to identify programmes which are desired to be identified as linked.

The code 00 indicates that no specific programme or series type is intended or when there is no information on the programme type available.

The code 3F is allocated to identify alarm or emergency messages.

The code FF is used in dedicated line transmission to signal that the PTY field is not in use. In Transport by Teletext (packet 8/30 Format 2) operation code FF is reserved.

Code 00 shall be used with all service codes except the "No Specific PIL Value" one.

l)   Conditional Access Flag (CAF - 1 bit)

This field is a single bit flag. It indicates that the programme is subject to controlled access when set to "1".

m)   Unified Date and Time (UDT - 49 bits)

This field is divided into the following nibbles carrying the Modified Julian Date (MJD) and the Co-ordinated Universal Time (UTC) respectively. The bit allocation is as follows (with b_i = msb for i = 5, 9, 13, 17, 21, 25, 29, 33, 37, 41 and 45):

b_1 to b_4	set to logical "1"		b_{25} to b_{28}	UTC hours tens;
b_5 to b_8	MJD digit weight 10^4		b_{29} to b_{32}	UTC hours units;
b_9 to b_{12}	MJD digit weight 10^3		b_{33} to b_{36}	UTC minutes tens;
b_{13} to b_{16}	MJD digit weight 10^2		b_{37} to b_{40}	UTC minutes units;
b_{17} to b_{20}	MJD digit weight 10^1		b_{41} to b_{44}	UTC seconds tens;
b_{21} to b_{24}	MJD digit weight 10^0		b_{45} to b_{48}	UTC seconds units.

This corresponds to the coding adopted in CCIR Teletext system B (packet 8/30, format 1).

n)   Label Update Flag (LUF - 1 bit)

This field is a single bit flag indicating, when set to "1", that the label does not relate to the current television programme, but is intended to update the label memories in video recorders.

o)   Label Channel Identifier (LCI - 2 bits)

Bits b1 and b2 indicate to which of the four parallel data channels the associated label applies. The bit allocation is such that b1 is the msb, b2 is the lsb. The weighting is for ease of description only and does not imply any rank order between the four possible values.

p)   Mode Identifier (MI - 1 bit)

This is a single bit field. When set to "1" in a particular programme label or Service Code, it indicates that the end of transmission of the programme label coincides exactly with the end of transmission of the programme or that the Service Code takes immediate effect. When set to "0", 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.

q)   Prepare-to-Record Flag (PRF - 1 bit)

This is a single bit flag. When set to "1" it indicates to a "waiting" PDC recorder that the programme to which the label applies is about to start but has not yet commenced, and when it is reset to "0", that the programme has commenced. It is assumed that a "waiting" recorder remains in the "waiting" state whilst the PRF is set and until the PRF is reset to "0".

Once having been reset to "0", the flag shall remain at this value while the programme is running. The value of this flag is only defined when used in association with a valid programme label and/or programme type/series code.

Table 2: Codes for programme type (PTY) Principle of classification

Codes (Hexadecimal)	Categories
00	No programme type or series intended (or information not available)
10 - 7F	Content
3F	Alarm/emergency identification
80-FE	Codes specific to each service

Content_nibble_level_1	Content_nibble_level_2	Description
0x0	0x0 to 0xF	undefined content
		Drama & Films:
0x1	0x0	movie (general)
0x1	0x1	detective/thriller
0x1	0x2	adventure/western/war
0x1	0x3	science fiction/fantasy/horror
0x1	0x4	comedy
0x1	0x5	soap/melodrama/folkloric
0x1	0x6	romance
0x1	0x7	serious/classical/religious/historical drama
0x1	0x8	adult movie
0x1	0x9 to 0xE	reserved for future use
0x1	0xF	user defined
		News/Current affairs/Social:
0x2	0x0	news/current affairs (general)
0x2	0x1	news/weather report
0x2	0x2	news magazine
0x2	0x3	documentary
0x2	0x4	discussion/interview/debate
0x2	0x5	social/political issues/economics (general)
0x2	0x6	magazines/reports/documentary
0x2	0x7	economics/social advisory
0x2	0x8	remarkable people
0x2	0x9 to 0xE	reserved for future use
0x2	0xF	user defined
		Show/Game show/Leisure hobbies:
0x3	0x0	show/game show (general)
0x3	0x1	game show/quiz/contest
0x3	0x2	variety show
0x3	0x3	talk show
0x3	0x4	leisure hobbies (general)
0x3	0x5	tourism/travel
0x3	0x6	handicraft
0x3	0x7	motoring
0x3	0x8	fitness & health
0x3	0x9	cooking
0x3	0xA	advertisement/shopping
0x3	0xB to 0xE	reserved for future use
0x3	0xF	alarm/emergency identification

(continued)

Table 2 (continued): Codes for programme type (PTY) Principle of classification

Codes (Hexadecimal)	Categories
00	No programme type or series intended (or information not available)
10 - 7F	Content
3F	Alarm/emergency identification
80-FE	Codes specific to each service

Content_nibble_level_1	Content_nibble_level_2	Description
		Sports:
0x4	0x0	sports (general)
0x4	0x1	special events (Olympic Games, World Cup etc.)
0x4	0x2	sports magazines
0x4	0x3	football/soccer
0x4	0x4	tennis/squash
0x4	0x5	team sports (excluding football)
0x4	0x6	athletics
0x4	0x7	motor sport
0x4	0x8	water sport
0x4	0x9	winter sports
0x4	0xA	equestrian
0x4	0xB	martial sports
0x4	0xC	local sports
0x4	0xD to 0xE	reserved for future use
0x4	0xF	user defined
Content_nibble_level_1	**Content_nibble_level_2**	**Description**
		Sports:
		Children/Youth/Education/Science:
0x5	0x0	children's/youth programmes (general)
0x5	0x1	pre-school children's programmes
0x5	0x2	entertainment programmes for 6 to 14
0x5	0x3	entertainment programmes for 10 to 16
0x5	0x4	informational/educational/school programmes
0x5	0x5	cartoons/puppets
0x5	0x6	education/science/factual topics (general)
0x5	0x7	nature/animals/environment
0x5	0x8	technology/natural sciences
0x5	0x9	medicine/physiology/psychology
0x5	0xA	foreign countries/expeditions
0x5	0xB	social/spiritual sciences
0x5	0xC	further education
0x5	0xD	languages
0x5	0xE	reserved for future use
0x5	0xF	user defined
		Music/Ballet/Dance:
0x6	0x0	music/ballet/dance (general)
0x6	0x1	rock/pop
0x6	0x2	serious music/classical music
0x6	0x3	folk/traditional music
0x6	0x4	jazz
0x6	0x5	musical/opera
0x6	0x6	ballet
0x6	0x7 to 0xE	reserved for future use
0x6	0xF	user defined

(continued)

Table 2 (concluded): Codes for programme type (PTY) Principle of classification

Codes (Hexadecimal)	Categories
00	No programme type or series intended (or information not available)
10 - 7F	Content
3F	Alarm/emergency identification
80-FE	Codes specific to each service

Content_nibble_level_1	Content_nibble_level_2	Description
		Arts/Culture (without music):
0x7	0x0	arts/culture (without music, general)
0x7	0x1	performing arts
0x7	0x2	fine arts
0x7	0x3	religion
0x7	0x4	popular culture/traditional arts
0x7	0x5	literature
0x7	0x6	film/cinema
0x7	0x7	experimental film/video
0x7	0x8	broadcasting/press
0x7	0x9	new media
0x7	0xA	arts/culture magazines
0x7	0xB	fashion
0x7	0xC to 0xE	reserved for future use
0x7	0xF	user defined

7   Preselection function for recording equipment

7.1   Introduction

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, bar-codes and visual or oral announcements, and may be keyed in manually.

If no special PDC service is offered, the AT-1 (see subclause 7.3.1.2 a1) and AD parameters (and assumed knowledge of the tuner position) provide sufficient information if the programme is broadcast as scheduled. Using a PDC service which includes only the recording control functions, the parameters AT-2, AD (and the tuner position) allow a particular expected programme to be selected regardless of its actual transmission time.

Pre-selection programming of the video recorder may either be done manually, by keying in the relevant information, or electronically by use of methods such as an on-screen cursor in a Teletext programme preview page.

7.2   Manual entry of PDC programme selection data

The information to be keyed in is Announced Date (AD), Original Announced Time (AT-2) and the desired tuner channel. An alternative to selection of the tuner channel is to key in the CNI code, assuming that the user is provided with this value from programme guide publication, etc.

It is not envisaged that a Series Code will be explicitly selected in the manual keyboard entry method. Rather, if the user knows that his selected programme is one of a series, he may indicate to the VCR that he wishes to record all members of the series. On receiving the selected programme, the VCR establishes whether the programme label includes a Series Code. If so, and when the user has requested it, the VCR uses the series code to record all further programmes in the series.

In principle, for PDC, there is no need to enter an explicit programme duration.

7.3 Preselection via Teletext

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. There are two methods of transporting the data relevant for the preselection of programmes via Teletext.

"A" Together with a programme menu: 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.

"B" 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.

There are several levels of sophistication of data that can be provided for the preselection of programmes (see table 1).

The basic level provides the minimum necessary set of parameters CNI (see note), AD, AT-2 and MCP.

NOTE: In particular implementations the decoding of the CNI parameter may be avoided by assuming knowledge of the appropriate tuner position.

Higher levels provide, for example, time-related information such as LTOs, and more details about the programme such as PTL.

7.3.1 Specification of transport method "A"

7.3.1.1 General

The data which are of importance for programming a video recorder are specially marked on the Teletext programme-preview pages. By this means each programme item, together with its associated identification data, can be uniquely identified by a microcomputer running appropriate software, and may thus be programmed into the video recorder.

The preselection data are presented in a human-readable form so that receiving equipment may also be manually programmed with the aid of these data.

The particular definition of the individual data is effected by character strings of different lengths and by control characters (formats) inserted before and at the end of the string. The representation of the various formats in this ETS is shown by means of shortened symbols depicted in table 3.

When all the times and dates within a particular programme preview page are based on local time, the relevant LTO is found within the page. In the case where more than one LTO applies they are found in sequence within that page. In the case that no LTO is transmitted, UTC is presumed to apply (see note).

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

Table 3: Shortform symbols used in subclause 7.3.1.3 to indicate specific Teletext characters or sequences of characters

Meaning	Shortform symbol	Teletext system B code (hex)
Control Characters		
Any alphanumeric colour control character except "Alpha Magenta"	**+**	'01'02'03'04'06 or '07
"Alpha Magenta" colour control character	**:**	'05
"Concealed display"	**%**	'1B
2 equal alphanumeric colour control characters from the set represented by +	**++**	
End of a Teletext row	**<**	
Any appropriate method of ending the format (++ or %% or <)	**'**	
Numerical values		
Decimal figures 0 to 9	**z**	'30 to '39
Hexadecimal figures '0 to 'F	**h**	'30 to '39 and '41 to '46
Punctuation		
Separation between hours and minutes	**.**	'2E
Separation between starting and finishing times in double-time format	**-**	'2D

7.3.1.2 Presentation elements of programme-preview pages

In order to allow automatic preselection of a broadcast item, by means of programme-preview pages, certain parameters have to be inserted. The following list applies when the receiving control functions are transmitted in packet 8/30 format 2 or in the dedicated TV line:

a1)   Announced Time - 1 (AT-1);
a2)   Programme Title (PTL);
b1)   Announced Time - 2 (AT-2) for PIL encoding;
b2)   Announced Date (AD);
b3)   Country and Network Identification (CNI);
c1)   Local Time Offset (LTO);
c2)   Programme Type (PTY);
d)   Protection Word (PW).

These parameters are identified on the Teletext programme-preview page by special formats. The inclusion of parameter c1 (LTO) is done in accordance with subclause 7.3.1.1. The inclusion of parameter c2 (PTY) is optional.

a1)   Announced Time - 1 (AT-1)

A transmission time is explicitly assigned to each announced programme item. Starting and finishing times may be represented written in single format or in double format (see subclause 7.3.1.3, a1)).

a2)   Programme Title (PTL)

A title is explicitly assigned to every announced programme item. Only one title format is valid per Teletext row. Where more than one title format occurs in a given row, the first one encountered applies. The title may spread over several Teletext rows, provided each part is constructed in a title format. If possible, the first part of the title should give sufficient information to facilitate the identification of the programme item.

b1)   Announced Time - 2 (AT-2) for PIL encoding

When the PIL number reflects the foreseen time of its broadcast (see subclause 6.2, c)), the AT-2 figure represents this time in Teletext displayable characters. An AT-2 value is explicitly assigned to each announced programme item. The position of the AT-2 data for the item concerned on the programme-preview page can be freely chosen from editorial considerations. AT-2 data are normally contained in concealed form in the programme-preview page and appear in the colour magenta after activation of the reveal key. In the case of a programme change (AT-1 starting time differs from AT-2 time), AT-2 should be revealed or corresponding information in clear text should be added. This is necessary to facilitate manual preselection.

b2)   Announced Date (AD)

The AD assigned to each announced programme item is normally contained in concealed form in the programme-preview page and appears in the colour magenta after activating the reveal key. The information provided by AD is needed to complete the PIL encoding process.

b3)   Country and Network Identification (CNI)

The CNI value is allocated to every announced item and represents the 16-bit CNI code word (see note) in five Teletext-displayable characters. It is always contained in concealed form in the programme-preview page and appears in the colour magenta after activating the reveal key.

> NOTE: 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.

c1)   Local Time Offset (LTO)

This optional information reflects a relevant LTO parameter in three Teletext displayable characters. It is always contained in concealed form in the programme-preview page and appears in the colour magenta after activating the reveal key.

c2)   Programme Type (PTY)

This optional information reflects the PTY parameter in three Teletext displayable characters. It is always contained in concealed form in the programme-preview page and appears in the colour magenta after activating the reveal key.

d)   Protection word (PW)

Every Teletext programme-preview page intended for video-recorder preselection contains a protection word, which is calculated by adding modulo 256, the numerical figures occurring in all the AT-1, AT-2, AD and CNI, LTO and PTY data of a given programme-preview page. The sum found in this way is written in hexadecimal form. The protection word is always contained in concealed form in the page and appears in the colour magenta after activating the reveal key.

7.3.1.3   Definition of the formats

An explanation of the short form symbols used in the following format descriptions is given in table 3. A summary of the data formats is given in table 5.

a1)   Announced Time - 1 (AT-1) format

Two possible formats, either the single-time format or the double-time format, are used to represent the AT-1 time.

When using the single-time format, the finishing time of a programme is identical to the time which next follows the programme title (and is usually the starting time of the following programme), see figure 2.

Format: + z z . z z ,   or   % z z . z z ,

minutes   minutes

hours   hours
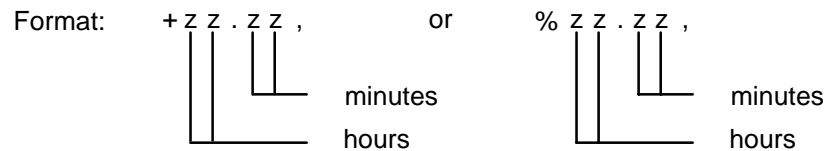
Figure 2: Single-time format

With a concealed representation of the single time (format: % ...), the alphanumeric display mode shall be set before the start of the format. Every writing colour is permissible, with the exception of magenta. All plausible clock times are allowed (00.00 to 23.59).

EXAMPLE: "Alpha White" 20.00 "Alpha Magenta".

With double-time format, the starting time and finishing time of a programme contribution are represented together, see figure 3.

Format: + z z . z z - z z . z z ,

minutes ⎤
           ⎥ finishing time
hours   ⎦

minutes ⎤
           ⎥ starting time
hours   ⎦
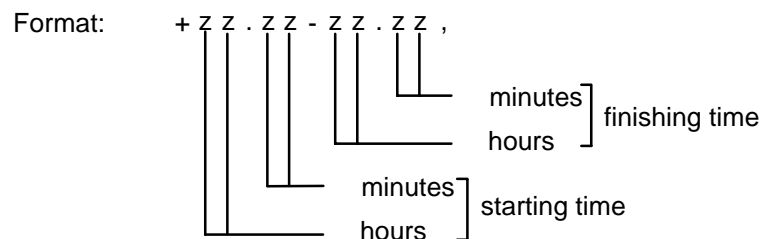
Figure 3: Double-time format

All plausible clock times are allowed (00.00 to 23.59).

EXAMPLE: "Alpha White" 20.00-20.15 "Alpha White".

a2)   Programme Title (PTL) format

The title or the individual parts of the title begin and end with two equal alphanumeric colour-control characters (++) or two characters for:

"concealed display" (%%).

Figure 4 gives an example.

Example: ++++Tagesschau+++   %%+Tagesschau++

title   title

title format   title format
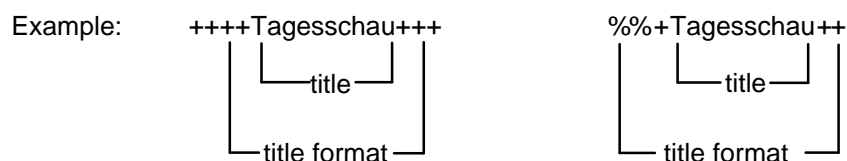
Figure 4: Example of PTL format

The control characters used at the start and at the end of a title, or of parts of a title, need not be identical.

The end of the individual parts, or of the entire title, can be indicated also by two alphanumeric magenta colour-control characters (::) or by the end of the Teletext row.

Format:

+	+	title	+	+		%	%	title	+	+
+	+	title	:	:		%	%	title	:	:
+	+	title	%	%		%	%	title	%	%
+	+	title	<			%	%	title	<	

With a title format, neither control characters for graphics nor the alphanumeric control character magenta may be used. No other formats (e.g. AT-1, AT-2 formats) may be contained in a title format. Outside of the title format, any background colour other than magenta may be used.

In the case of a concealed representation of the title, or of parts of a title (format: %%....), the alphanumeric representation mode shall be set before the start of the format. Any writing colour other than magenta is permissible. The title shall have a length of at least one character.

EXAMPLE: "Alpha.Green" "Alpha.Green" "Tagesschau" "end of Teletext row".

b1)   Announced Time - 2 (AT-2) format

In order to distinguish between the AT-2 and a starting or finishing time of an item written in single format, the "point" between the hours and minutes is removed in the case of the AT-2 format.

Format:

         : z z z z ,   : % z z z z ,

All plausible "clock times" (0000 to 2359) are permissible.

EXAMPLE: "Alpha.Magenta" "Concealed Display" 2000 "Alpha.Green".

Table 4: 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.

The AT-2 time 2500 indicates items not worth recording (e.g. test pattern). Programming of an item designated with an AT-2 time of 2500 is not possible. The same format as for plausible AT-2 times is used for the special AT-2 time of 2500.

b2)   Announced Date (AD) format

In order to distinguish the AD from normal date indications, the points between day and month, and between month and year are eliminated in the AD format. The year is represented as two figures only, e.g. 89 represents 1989 and 01 represents 2001.

Format: :zzzzzz,   :%zzzzzz,

```
          year          year
          month         month
          day           day
```
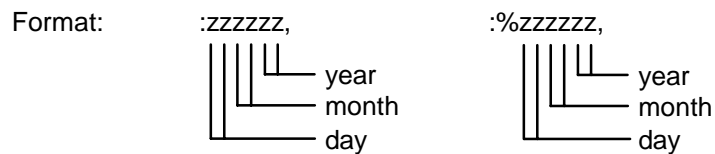
Figure 5: AD format

All plausible date indications are permitted.

EXAMPLE: "Alpha.Magenta" 150285 "Concealed Indication".

b3)   Country and Network Identification (CNI) format

The CNI format is divided into a nationality code and a network or alternatively, in some countries, a programme-provider code.

Format: :%hhzzz,

```
          network or programme provider code
          nationality code
```
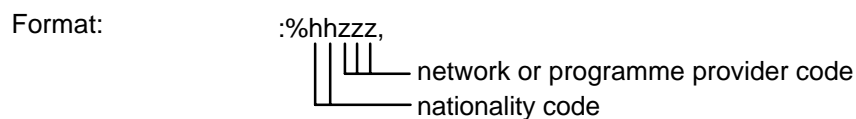
Figure 6: CNI format

The nationality code represents the row/column address of a country in hexadecimal notation, see table 4. Permissible values are 00 to FF.

EXAMPLE: The ARD programme "Erstes Deutsches Fernsehen" is represented by the CNI 1D101, coded as "Alpha.Magenta " " Concealed Display" 1D101 "Alpha.White".

c1)   Local Time Offset (LTO) format

The offset is indicated in 1/4 hour increments and is coded in three decimal figures.

Format:

% 0 z z ,   + sign
% 9 z z ,   - sign

c2)   Programme Type (PTY) format

With reference to the code table of programme types (table 2), the format is given by two hexadecimal figures preceded by an "F".

Format:

: % F h h ,

Any value for hh between 01 and FF is permitted.

d)   Protection Word (PW)

Every programme-preview page has a protection word.

Format:

: % h h ,

All hexadecimal figures from 00 to FF are allowed.

EXAMPLE: Calculation and representation of the protection word**:**
:%1D101%150285%004%F81%hh+
+20.00:%2000++Tagesschau++
up to +20.15+ approx.

CNI format	: 1 + D + 1 + 0 + 1	$= 10_{16}$
AD format	: 1 + 5 + 0 + 2 + 8 + 5	$= 15_{16}$
LTO format	: 0 + 0 + 4	$= 4_{16}$
PTY format	: F + 8 + 1	$= 18_{16}$
AT-1 (starting time)	: 2 + 0 + 0 + 0	$= 2_{16}$
AT-2 format	: 2 + 0 + 0 + 0	$= 2_{16}$
AT-1 (finishing time)	: 2 + 0 + 1 + 5	$= 8_{16}$
Hence %hh+ becomes %4D+		$4D_{16}$

Table 5: Summary of all data formats used

Data	Format(s) (z = decimal number) (h = hexadecimal number) (++ two equal control characters)	
Starting or finishing time (single time of AT-1)	+zz.zz,	%zz.zz,
Starting and finishing times (double time of AT-1)	+zz.zz-zz.zz,	
Announced Time - AT-2	:zzzz,	:%zzzz,
Spec. AT-2 "open code" (e.g. for transmission pauses)	:2500,	:%2500,
Announced Date - AD	:zzzzzz,	:%zzzzzz,
Country and Network Identification - CNI	:%hhzzz,	
Protection word	:%hh,	
Programme Title	++title++ ++title++ ++title%% ++title<	%%title++ %%title:: %%title%% %%title<
Local Time Offset - LTO	:%0zz,	:%9zz,
Programme Type - PTY	:%Fhh,	

e)   Combined formats

In order to save writing space, the formats described above may be represented combined into blocks. In this case, the control characters indicating the end of a format are in each case replaced by the control characters indicating the start of the next format.

EXAMPLE:

    +zz.zz:zzzz+   corresponds to +zz.zz+   :zzzz+

    %zzzzzz:zzzz+   corresponds to :%zzzzzz+   :zzzz+

However, if a non-title format follows a title format, then, in order to mark the end of the format, two equal alphanumeric colour-control characters or two "Concealed Display" characters shall be present.

EXAMPLE:
    +zz.zz++title::zzzz+   corresponds to +zz.zz+   ++title++   :zzzz+

If the CNI and AD formats plus the protection word format are to be sent in concealed form, it is possible to combine them and hence to avoid the repetition of the colour-control character magenta (:).

EXAMPLE:
    :%hhzzz%zzzzzz%hh+   corresponds to :hhzzz+   :%zzzzzz+ :%hh+

    :zzzz%zzzzzz%hh+   corresponds to :zzzz+   :%zzzzzz+ :%hh+

7.3.1.4   Position assignment rules between elements

a)   Between starting time and finishing time

When the starting time is in single-time format, the finishing time of an item is given by the starting time of the next following item on the page, or, if no further item follows on the page, by a further time format without a following title. In double-time format, the finishing time of a contribution is explicitly contained in the format.

If a transmission time represented in single-time format is followed by a title, it is the starting time. A title never follows a finishing time.

b)   Between starting time and title

When the starting time is in single-time format, the fixed sequence consists of the starting time followed by the associated title. In double-time format, a fixed sequence of starting time, finishing time and associated title occurs.

The title (possibly in several parts after a double-time format) is delimited by a further time format (single-time or double-time format), or by the end of the Teletext page.

c)   Between AD and AT-2

The sequence is fixed, consisting of the announced date (AD), followed by the associated AT-2 time.

d)   Between CNI and AT-2

The sequence is fixed; first the country and network identification (CNI) and then the AT-2 time.

e)   Between CNI and AD

The sequence between CNI and AD is optional. Both parameters shall, however, be indicated before the associated AT-2 figure.

f)   Between AT-1 and AT-2

The sequence of the individual AT-2 data (or of the AT-2 - AD - CNI data) on the programme-preview page is according to the sequence of the announcements of the individual contributions (represented by the starting times) on the programme-preview page.

g)   Between AT-2 and LTO

The sequence is fixed; first the LTO, then the AT-2 time.

h)   Between AD and LTO

The sequence between AD and LTO is optional.

i)   Between CNI and LTO

The sequence between CNI and LTO is optional.

j)   Between AT-2 and PTY

The sequence is fixed; first the PTY code, then the AT-2 time.

k)   Between AD and PTY

The sequence between AD and PTY is optional.

l)   Between CNI and PTY

The sequence is fixed; first the Country and Network Identification, then the PTY code.

m)   Between Date and other items

An AD figure given on a programme-preview page remains valid for the items following on the same page, (amongst others, represented by values for CNI and AT-2), until it is replaced by a new AD.

n)   Between CNI and other items

A CNI figure given on a programme-preview page remains valid for the items following on the same page, (amongst others, represented by values for AD and AT-2), until it is replaced by a new CNI.

o)   Between LTO and other items

An LTO figure given on a programme-preview page remains valid for the items following on the same page, until it is replaced by a new LTO.

7.3.1.5   Interpretation of a normal Teletext display page transporting data relevant for the preselection of programmes

The rules for the interpretation of a Teletext page transporting data for preselection are illustrated by the following example where two different page designs are shown. The data recovered in the decoder from either of these Teletext pages is given in table 6.

```
:%1D101%150285%9C%004%F81+                :%1D101%150285%9C%004%F81%2000+
                                          :%2015%2200%160285%F8A%0030%0130+
+20.00:%2000++Tagesschau                  +20.00++Tagesschau
+20.15:%2015++Na so was...                +20.15++Na so was ...
+22.00:%2200++König der Berge             +22.00++König der Berge
:%160285%F8A+
+00.30:%0030++Nacht über Bayern           +00.30++Nacht über Bayern
          Fernsehserie Folge 3                      Fernsehserie Folge 3
+01.30:%0130++Spätnachrichten             +01.30++Spätnachrichten
+01.45+Sendeschluss                       +01.45+Sendeschluss
```

Table 6

STARTING TIME	FINISHING TIME	TITLE PTL	AT-2	AD	CNI	PTY	LTO
20.00	20.15	Tagesschau	2000	150285	1D101	81	004
20.15	22.00	Na so was	2015	"	"	-	"
22.00	00.30	König der Berge	2200	"	"	-	"
00.30	01.30	Nacht über Bayern	0030	160285	"	8A	"
01.30	01.45	Spätnachrichten	0130	"	"	-	"
01.45							

The interpretation takes place by the following decoder operations:

-    establishing a table with 8 columns and approximately twenty rows for a maximum of twenty titles;

-    row-by-row read out of the Teletext data from the decoder store;

-    testing the data for formats having 2, 3, 4, 5, 6 or 11 places and title formats;

- testing the data of the formats:

  - AT-1, AT-2, AD and LTO: All decimal numerals from 0 to 9 are permissible, except that in combination some numerical values are not plausible (e.g. 28 hours);

  - Protection Word and PTY format**:** All hexadecimal numbers from 0 to F are permissible;
  - CNI format: for b_1 and b_2 all hexadecimal figures, 0 to F, are permissible; for b_3 to b_{16} all decimal numerals from 0 to 9 are permissible;

  - PTL format: All characters except the control characters for graphics and the control character "Alpha Magenta" are permissible.

- generating the protection word from the detected formats of the AT-1, AT-2, AD, LTO, CNI and PTY format;

- comparison of the generated with the detected protection word;

- entering the contents from the formats found into the columns concerned, according to the following rules:

  1) single AT-1 formats are entered in the order of their appearance, directly one below the other in the starting-time column;

  2) the finishing time of an item announced in single-time AT-1 format results only from the starting time of the following item, or, when no further item follows, from a further AT-1 format without following title;

  3) double-time AT-1 formats are entered in the order of their appearance, directly one below the other in the starting-time and finishing-time columns;

  4) any PTL formats occurring are entered in the row of the table that contains the last time entry. A title may consist of several title formats in different Teletext rows. The end of a title is formed by a further AT-1 format or by the end of the programme-summary page;

  5) CNI, AD, LTO and PTY data are entered in the next row in the table on which no AT-2 has as yet been written;

  6) AT-2 formats are entered in the order of their appearance, directly one below the other in the AT-2 column;

  7) if no CNI, AD or LTO has been directly allocated to an AT-2 (that is to say, no new CNI or no new AD or no new LTO between two AT-2's), the corresponding previously-agreed data for the CNI, AD and LTO are copied in the table;

  8) verification of the table for completeness:

     - in the table, at least in the first row, a CNI and an AD need to be entered. Moreover, the number of AT-2 parameters equals the number of PTL parameters which equals the number of single AT-1 formats plus the number of double AT-1 formats (less one if the finishing time of the last programme contribution is represented in single AT-1 format);

  9) if, during the preceding verification, an error is found, the programming shall halt and await a new transmission of the page in question.

7.3.2 Specification of transport method "B"

7.3.2.1 General

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 (see CCIR Teletext system B specification). 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 a menu cursor position (MCP) which points to a 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.

When all the times and dates within a particular extension packet are based on local time, the relevant LTO is found within the extension packet. In the case where more than one LTO applies they are found in sequence within that extension packet. In the case that no LTO is transmitted, UTC is presumed.

> NOTE: 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 within a common time zone.

7.3.2.2 Presentation elements of programme-preview pages

In order to allow automatic preselection of a broadcast item by means of programme-preview pages, certain parameters shall be inserted. The following list applies when the recording control functions are transmitted in packet 8/30 format 2:

> a1) Announced Time - 1 (AT-1);

> a2) Programme Title (PTL).

These items (a1 and a2) are transmitted in visible form as Teletext characters on the page. The format is at the discretion of the editor, subject to the correct positioning of the cursor (MCP, see below):

> b1) Announced Time - 2 (AT-2) for PIL encoding;

> b2) Announced Date (AD);

> b3) Country and Network Identification (CNI).

These items (b1, b2 and b3) are transmitted in coded form as machine-readable data using extension packets X/26. Each recordable programme is associated with a Menu Cursor Position (MCP) and the corresponding position on the screen should precede the programme title. The coding is described in subclause 7.3.2.3.

If the programme schedule has been altered, the original announced time AT-2 shall also be included in visible form on the page to facilitate manual programming.

The above items (a1 to b3) are defined for all recordable programmes on a preview page. The following items may also be defined for certain programmes, if required:

> c1) Local Time Offset (LTO);

> c2) Programme Type (PTY);

> c3) Controlled Access Flag (CAF).

These items are transmitted in coded form as machine-readable data using extension packets X/26, as described in subclause 7.3.2.3.

7.3.2.3 Coding of preselection data in extension packets X/26

a) General

Extension packets X/26 are used to convey additional information relating to a Teletext page, for example extended language facilities or higher levels of display. Up to 16 packets X/26 may be transmitted associated with a given page. Preselection data in packets X/26 follows any data for display enhancement, and is transmitted as a continuous sequence without interleaving of other functions. On completion of the sequence, a terminator and CRC check are transmitted.

Each packet X/26 contains a clock run-in, framing code, magazine and packet address, followed by a designation code and 13 groups of 3 bytes. The designation code (byte 6) is Hamming protected, and the 4 data bits are used as sequence labels from 0000 to 1111 to define up to 16 packets X/26. Each group of 3 bytes is Hamming protected, and contains 19 bits of data with 6 bits of protection.

The 18 data bits are allocated as follows:

> 6 bits: data word A;
> 5 bits: mode description;
> 9 bits: data word B.

The data words have different meanings according to the function invoked by the mode description.

b) Data group meanings and sequence

The following types of data group are defined:

- Source Definition data group;
- Date Definition data group;
- Local Time Offset data group;
- Starting Time Hours data group;
- Minutes data group;
- Finishing Time/Duration Hours data group;
- Programme Type data group.

Each recordable programme is identified by a pair of data groups; the Starting Time Hours data group and the Minutes data group. This pair also includes the cursor position (MCP) using the standard addressing technique. In this way the Announced Time (AT-2) for each programme is defined.

These pairs are transmitted in sequence with the positions of the cursor, moving from left to right and top to bottom down the screen. Where there is a discontinuity in the schedule of recordable programmes, the Finishing Time Hours data group and a Minutes data group should be transmitted to allow the expected recording time of a programme to be calculated.

Optionally, a programme may be designated a series, in which case the appropriate code replaces 00 in a Programme Type data group. This allows an alternative recording selection method using the PTY field in packet 8/30 format 2.

At the start of the sequence, the country and network (CNI) and announced date (AD) are defined using the Source Definition and Date Definition data groups respectively. Optionally, the Local Time Offset (LTO) data group may be transmitted. These three data groups activate their functions in the sequence and remain until redefined. For example, if all programmes on a page are from the same country and network and have the same date, the Source Definition and Date Definition data groups are only transmitted once at the beginning of the sequence.

c)   Source Definition data group

This function is invoked when the mode description bits are set to "01000".

Data word A   4 least-significant bits: **Country of Origin**
                     2 most-significant bits: set to "1";
Data word B   6 least-significant bits: **Programme Source**
                     Most-significant bit: when "0", indicates the first set of 64 programme
                     sources, when "1", indicates the second set of 64 programme sources.

d)   Date Definition data group

This function is invoked when the mode description bits are set to "01001".

Data word A   4 least-significant bits: **Month**
                     2 most-significant bits: set to "1";
Data word B   4 least-significant bits: **Day Units**
                     2 next-significant bits: **Day Tens**
                     Most-significant bit: set to "0".

e)   Local Time Offset data group

This function is invoked when the mode description bits are set to "01100".

Data word A   Cursor row position; decimal values 41 to 63 indicate rows 1 to 23
                     and decimal value 40 indicates row 24;
Data word B   6 least-significant bits: **Local Time Offset** in binary coded quarter-hour
                     units.
                     Most-significant bit: sign of offset, 1 is negative (i.e. West of Greenwich)

f)   Starting Time Hours data group

This function is invoked when the mode description bits are set to "01010".

Data word A   Cursor row position; decimal values 41 to 63 indicate rows 1 to 23
                     and decimal value 40 indicates row 24;
Data word B   4 least-significant bits: **Hours Units**
                     2 next-significant bits: **Hours Tens**
                     Most-significant bit: **Controlled Access Flag** (CAF) set to "0" if the
                     programme is for free access, set to "1" if the programme is for controlled
                     access.

g)   Minutes data group

This function is invoked when the mode description bits are set to "00110".

Data word A   Cursor column position; decimal values 0 to 39;
Data word B   4 least-significant bits: **Minutes Units**
                     3 most-significant bits: **Minutes Tens.**

h)   Finishing Time Hours or Programme Duration Hours data group

This function is invoked when the mode description bits are set to "01011".

Data word A   Cursor row position; decimal values 41 to 63 indicate rows 1 to 23 and
                     decimal value 40 indicates row 24; 00
Data word B   4 least-significant bits: **Hours Units**
                     2 next-significant bits: **Hours Tens**
                     Most-significant bit: is set to "0" for Finishing Time and is set to "1" when
                     the coding is for Programme Duration.

i)   Programme Type (or Series code) data group

This function is invoked when the mode description bits are set to "01101".

Data word A   Set to "110000" defines that the programme is one of a series;
Data word B   9 bits: give the code for the series, equivalent to the 7 least-significant bits
                     of PTY in packet 8/30 format 2 when the most-significant bit of PTY is set
                     to "1".

j)   Terminator

This function indicates the end of active data groups and is invoked when the mode description bits
are set to "11111".

Data word A   Set to "111111";
Data word B   Not used (no response).

k)   CRC Protection word

This function is invoked in the final three-byte data group of an extension packet X/26 with
designation code set to "1111".

Data word A   6 bits   16-bit CRC
Mode description   5 bits   protection word
Data word B   5 least-significant bits
                     2 most-significant bits: set to "0".

The CRC covers data in extension packets X/26 and also, if transmitted, extension packets X/28.

8   Recording-control function

8.1   Specification of the recording-control commands

As stated in subclause 3.1, the programme delivery service component called the recording-control
function allows suitably-equipped recorders to be remote-controlled from the source of transmission. A
prerequisite is that the broadcaster sends a programme label in coded form together with the programme.
Such a programme 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 subclause 6.1.

It may occasionally be necessary to transmit more than one programme label at the same time. This is
accomplished by a process known as label "interleaving". In such a case the stream of labels in a
particular label data channel is distinguished from those with which it is interleaved by the LCI value each
label carries.

Depending on the transport mechanism in which they appear, the recording-control commands are
structured in two ways, as set out in subclause 8.2.

8.2   The transport of the recording-control commands

For PAL or SECAM television services, the recording-control commands may be carried in Teletext or a
dedicated television line (see note 1) and for television services conveyed by a member of the
MAC/packet family of systems, Teletext is the normal method (see note 2).

NOTE 1:   In countries where neither of these ways is available, but the DIDON system is used,
            DIDON III may transport the recording-control command (see annex C).

NOTE 2:   On the basis of a temporary national option, line 16 of the field-blanking interval of
            MAC signal may carry a bi-phase signal in accordance with subclause 8.2.2. This
            signal is identified in line 625 by TDMCID code '1F and is processed as a luminance
            signal.

8.2.1 Transport via Teletext (ITU-R system B)

This transport method is able to carry the parameters CNI, PIL, PCS, LCI and PTY. A 20-character version of PTL is also provided;

The transport of the recording-control commands is carried out by means of the broadcast service data packets 8/30 format 2.

As illustrated in figure 7, 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 four message bits of Byte 13 are used as follows:

Table 7

byte 13 bit	0	LCI b_1	Label channel identifier
	1	LCI b_2	
	2	LUF	Label Update Flag
	3	PRF	Prepare to Record Flag

The message bits of bytes 14 to 25 are used as follows; the arrangement is similar to the label coding method used in the dedicated television line transport method:

Table 8

byte 14 bit	0	PCS b_1	Status of analogue sound	Byte 20 bit	0	PIL b_{15}	
	1	PCS b_2			1	PIL b_{16}	
	2	MI	Mode identifier		2	PIL b_{17}	Minute
	3	-	Reserved but yet undefined		3	PIL b_{18}	
byte 15 bit	0	CNI b_1		Byte 21 bit	0	PIL b_{19}	
	1	CNI b_2	Country		1	PIL b_{20}	
	2	CNI b_3			2	CNI b_5	
	3	CNI b_4			3	CNI b_6	Country
byte 16 bit	0	CNI b_9	Network (or programme	Byte 22 bit	0	CNI b_7	
	1	CNI b_{10}	provider)		1	CNI b_8	
	2	PIL b_1			2	CNI b_{11}	
	3	PIL b_2			3	CNI b_{12}	
byte 17 bit	0	PIL b_3	Day	Byte 23 bit	0	CNI b_{13}	Network (or
	1	PIL b_4			1	CNI b_{14}	programme
	2	PIL b_5			2	CNI b_{15}	provider)
	3	PIL b_6			3	CNI b_{16}	
byte 18 bit	0	PIL b_7	Month	Byte 24 bit	0	PTY b_1	
	1	PIL b_8			1	PTY b_2	
	2	PIL b_9			2	PTY b_3	
	3	PIL b_{10}			3	PTY b_4	Programme type
byte 19 bit	0	PIL b_{11}	Hour	Byte 25 bit	0	PTY b_5	
	1	PIL b_{12}			1	PTY b_6	
	2	PIL b_{13}			2	PTY b_7	
	3	PIL b_{14}			3	PTY b_8	

The remainder of the packet (bytes 26-45) contains a 20-character version of PTL for display as a status message.

In the case of the use of the MAC/Packet family of systems [1], the Teletext signal, structured as given earlier, may be located:

a)   in the packet multiplex according to the principles given in clause 2 of part 4B of [1], or
b)   in part 4A of [1];
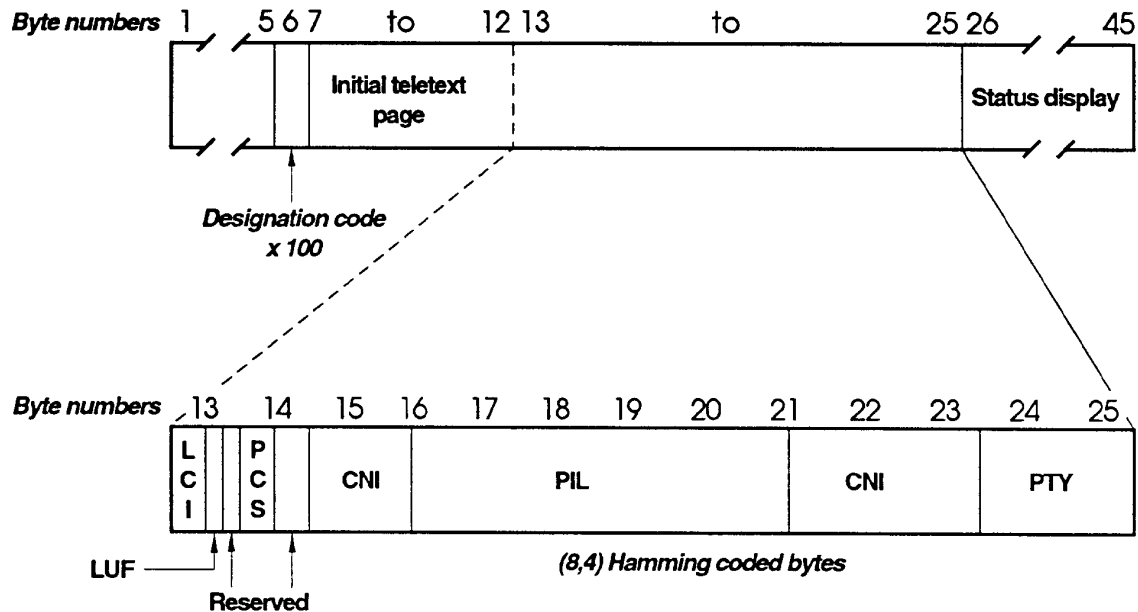
Figure 7: Structure of the Teletext data packet 8/30 format 2

8.2.2 Transport via a dedicated television line

8.2.2.1 General

The transport of the recording-control commands for suitably equipped receiving equipment makes use of a dedicated line in the field-blanking interval of a video signal (in Germany, Austria and Switzerland, line 16 is dedicated for this purpose).

This transport method is able to carry the parameters CNI, PIL, PCS and PTY.

8.2.2.2 Transmission format for the dedicated line

a)   Modulation (see figure 8)

A bi-phase modulation is used with a data rate of 2,5 Mbit/s. Each data bit is described by two complementary signalling elements, hence a logical "1" consists in sequence of the signalling elements 1 and 0, and a logical "0" consists in sequence of the signalling elements 0 and 1.

Bit length: 400 ns;
Element length: 200 ns;
Precision of time base: $\pm 1 \cdot 10^{-4}$;
Signal shape: approximately $\cos^2$ half-amplitude pulse period 200 ns + 10 ns.

Video baseband signal level of element 1: $0,5 \text{ V} \pm 5 \%$
Video baseband signal level of element 0:   0 V
Positioning: Start of run-in: $12,5 \pm 1,5$ µs after line synchronising pulse leading edge (H_0).
Capacity of the whole data line: 15 bytes of 9 bits each, comprising 1 run-in byte, 1 start-code byte and 13 useful bytes.
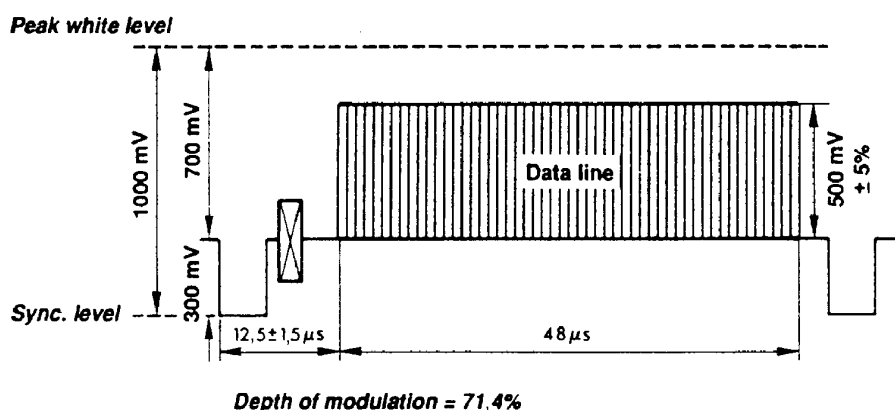
Figure 8: Insertion of the data line into the video signal

b)   Allocation of bytes (see figure 9)

-    **Byte 1:** run-in;
    -    a uniform sequence of eight bits set to logical "1". It provides for clock synchronization in data receivers.
-    **Byte 2:** start code;
    -    defines the position of the useful bytes or their individual bits. It is the only byte which violates the bi-phase non-equivalence rule. The element sequence of the start code is: 10 / 00 / 10 / 10 / 10 / 01 / 10 / 01.
-    **Bytes 3 and 4:** not relevant for this application;
-    **Byte 5:** PCS and the first part of CNI;

Transmission bits 20 and 1 of this byte carry the PCS bits b_1 and b_2, which define the type of analogue sound dual carrier transmission. Transmission bits 2 and 3 are reserved but as yet undefined.

Transmission bits 4 to 7 are reserved for enhancement of VPS. (This differs from the Teletext-transported version where explicit country codes are provided for).

-    **Bytes 6 to 10:** not relevant for this application;
-    **Bytes 11 to 15:** a 40-bit field conveying the PIL, PTY and the 2nd part of the CNI information. As shown in figure 9, the relationship between the parameter bits as defined in subclause 6.2., and the transmitted bits are as follows:

Parameter bits:			Transmission bits:
PIL: b_1 to b_5	:	day	: byte 11 bits 2 to 6
b_6 to b_9	:	month	: byte 11 bit 7 and byte 12 bits 0 to 2
b_{10} to b_{14}	:	hour	: byte 12 bits 3 to 7
b_{15} to b_{20}	:	minute	: byte 13 bits 0 to 5
CNI: b_1 to b_4	:	enhancement of VPS	: byte 5 bits 4 to 7
b_5 to b_8	:	country	: byte 13 bits 6 to 7 and byte 14 bits 0 to 1
b_9 to b_{10}	:	network	: byte 11 bits 0 to 1
b_{11} to b_{16}	:		: byte 14 bits 2 to 7
PTY: b_1 to b_8	:		: byte 15 bits 0 to 7

c)   Specific   service codes within the PIL parameter

    -        four specific service codes have been defined as illustrated in figure 9.

d)   Specific   service code within the CNI parameter

One specific service code has been defined as illustrated in figure 9.

Other values of CNI parameter bits b_1 to b_4 are used for signalling enhancements to the VPS system.

e)   Specific service code within the PTY parameters

The value FF hex is used as a default value to signal that this field is not in use.

8.3   Availability and repetition rate of the recording-control commands

The methods of transport of the recording-control commands may be used separately or together. In the case of the packet 8/30 version (Method B) the repetition rate of labels in any label data channel is once per second. Transmission of any Format 2 packet should be separated in time by 200 ms from any other packet 8/30, hence, there is sufficient capacity for a total of up to four packet 8/30s of format 2 per second, in addition to one broadcast service data packet (8/30 format 1). In the case of the dedicated television line version (Method A) the repetition rate is 25 Hz.
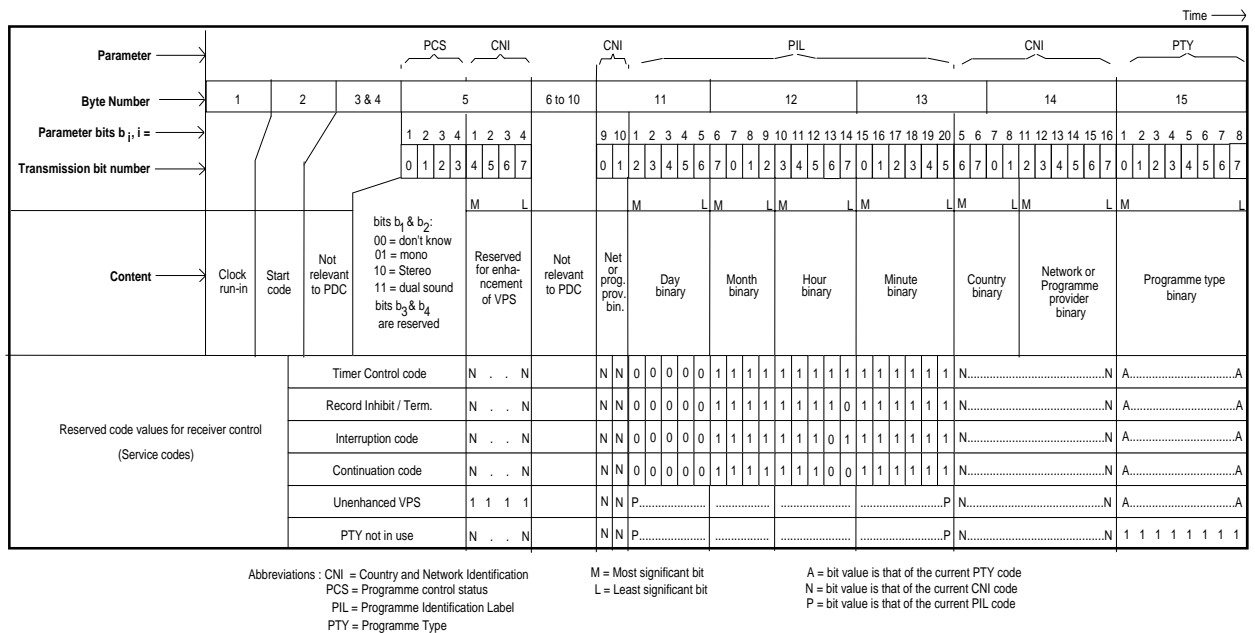
Figure 9: Data format of the programme delivery data in the dedicated TV line

9 Code of practice for broadcasters

9.1 Introduction

This code of practice gives information intended to guide broadcasters and industry in the operation of PDC services. It also describes the intended response of a typical PDC-equipped Video Cassette Recorder to the various broadcast signals it may encounter, including, in the event of service failure, fallback to simple timer-control. These guidelines should ensure that the PDC service will operate and evolve with the minimum risk of ambiguity for those having chosen to utilise the service.

From the broadcaster's point of view, a PDC service involves three main activities:

a)   the first, at the time of programme schedule planning, requires construction of programme guides and allocation of appropriate labels;

b)   the second, taking place between the initial publication of schedules and actual transmission, is concerned with updating programme guides with new times for rescheduled programmes, and modifying, as necessary, the corresponding transmission schedules for the labels which will accompany the programmes at broadcast time;

c)   the third, at transmission time, is to maintain an accurate relationship between the broadcast programme and the label signal.

Subclauses 9.2, 9.3 and 9.4, respectively explain how to undertake these three activities and give guidance on how to restart the service, should equipment fail, in such a way as to minimise adverse effects on home recordings.

Broadcasters should be aware that the VCR may be recording, and may be unaware of the codes for future events on that or other television channels.

9.2 PDC in programme schedule planning

9.2.1 Programme guide

The broadcaster provides programme schedules and assigns programme labels to each programme or programme segment, and, if appropriate, to gaps or fillers between programmes. If the programme schedule is constructed with computer assistance, the programme labels may be assigned automatically at the same time. The broadcaster publishes the schedules in paper form or, where appropriate, by giving access to his database, and hence makes all relevant data (Country and Network Identification, Announced Date, Announced Time and Original Announced Time) available to broadcasting stations, Teletext editors and the print media.

9.2.2 Programme labelling

9.2.2.1 Normal programmes

Every programme or programme segment intended to be separately identified receives a label. This contains a PIL and CNI. The PIL identifies the programme or programme segment uniquely; and the CNI identifies either the network or the programme provider. The PIL is normally obtained from the originally-announced local time and date of transmission.

> NOTE: The possible use of "random number" programme labels is described in annex F.

Where the contents of a programme conform to one of the categories defined under the Programme Type coding, a broadcaster may additionally set the appropriate code in the PTY field of the transmitted label.

Where a number of programmes forms a "series", the series may be assigned a series code number, and each programme of the series may carry this number in place of the Programme Type. This allows a video recorder to collect all parts of a series, in transmission order, irrespective of date and time of transmission. (The series code is used in conjunction with the CNI value, and so all possible values are available for use on each television channel).

In addition to the PIL, CNI and PTY, a full label also includes the Label Channel Identifier (LCI). The four values of LCI permit the transmission of up to four labels simultaneously (sequentially separated by 200 ms; see Annex E.2). Label Channels shall only be transmitted when carrying active programme data. In cases where either no specific PIL or no specific PTY value is intended, this fact is signalled by the appropriate code values.

9.2.2.2   Non-programme items

Items such as promotional "trails", commercials and "fillers" may be assigned individual labels or may be included within an adjacent programme transmission by extending or advancing the transmission time of that programme's own label. In some cases such an item may be considered as part of both the preceding and the following programmes, in which case the appropriate signalling will be provided at transmission time by transmitting both programme labels during the overlap period. Each programme label is then carried by an independent parallel data channel. In other cases, certain service codes designed for direct control of the video recorder may be transmitted coincidentally with such material. In particular the "recording inhibition/termination" and "interruption" service codes may be used at such times. A fuller explanation of the interpretation presumed to be made at the PDC decoder on reception of service codes or sequences of service codes is given in tabular form in annex D.

In the particular case of promotional trails, single key-press pre-selection is envisaged for the future (see subclause 9.6).

9.2.2.3   Planned segmentation of a programme

Multi-segment programmes such as sports magazines, which are required to be considered as a single entity for recording, should be given a single label covering all the segments. Intervals between such programme segments may consist of programme pauses, ordinary programmes, or similarly segmented programmes. For each label up to 5 programmes or programme segments may be in the "interruption" state simultaneously.

Where a period of more than 1 hour between programme segments is expected or planned, each segment should be announced with its own label.

During an interruption the video recorder will remain tuned to the channel for a period of 1 hour (see note). During this period any preselected programmes which are broadcast on a different channel will be lost. Preselected programmes on the same channel will be recorded correctly.

> NOTE: Where data line 16 of the Video Programming System (VPS) is the sole method of transmission of the recording control function on a particular TV channel, then the video recorder will remain fixed tuned for a period of 3 hours when an Interruption service code (INT) is broadcast.

9.2.2.4   Anticipated changes to schedule dependent upon future events

When any one of a choice of two or more alternative programmes may be transmitted at a certain time, depending on the outcome of events in the meantime, then they may all be announced, but they should be assigned different labels.

9.2.2.5   Indicating end-of-transmission

Where the end of one programme does not coincide with the start of another, for instance during intermissions or at close-down of services, the scheduled time of end of the programme should also be announced in programme guides.

9.2.2.6   Network topology changes

Where network reconfiguration takes place from time to time, the label assignment shall remain unique and the network or programme source should be coded unambiguously.

9.2.2.7 Daylight-saving time-changes

It is possible that two programmes being broadcast during the autumn night when local clock time is moved back by one hour may appear in announcements with the same start time (see example in annex E). The labels assigned shall differ, and where they indicate announced times a difference of one minute is recommended. The label which is derived from the earlier time should apply to the programme to be broadcast first. Calculation of programme duration by the recorder will be inaccurate by one hour unless account is taken of the change to local time offset (LTO) indicated in the programme guide page.

Similarly, in the spring when an hour of local clock time is lost, the duration computed by the decoder with knowledge of local time offset will be correct if account is taken of the LTO.

9.2.2.8 Time zone

It is recommended that the LTO is given at least once in each programme guide page. Where a broadcaster provides programme guide pages for programmes originated in other time zones, the first LTO stated should be that applying in the broadcaster's time zone, at the intended time of the broadcast of the programme.

If no use is made of broadcast local time offsets by the recorder programmes will, in general, be correctly recorded. However, mistakes could occur in the detection of overlap conflicts between programmes preselected from differing time zones, for instance, and the time window of validity assumed by the broadcaster (see subclause 9.3) may differ from that applied at the recorder. In addition, the fall-back to local timer-control would no longer be appropriate, should label transmissions fail.

9.2.2.9 Special uses of PDC labels

The PIL can be assigned any random or arbitrary value (excluding those values allocated as service codes). Such label values do not have the advantage of normal labels, which allow recorders to fail-safe to timer-control should the label transmission fail. Also, different time windows of validity apply for PILs which do not represent real times or dates (see annex F). The use of such random or arbitrary PILs by the broadcaster shall not interfere with the normal operation of domestic equipment under the control of valid PILs.

9.3 Rescheduled programmes - validity time windows of PIL and PTY labels

Programmes may be rescheduled several times before actual transmission. No change need be made to the programme label value and no special action is required by the broadcaster provided the time of transmission remains within the appropriate "validity time window" as shown in figure 10.
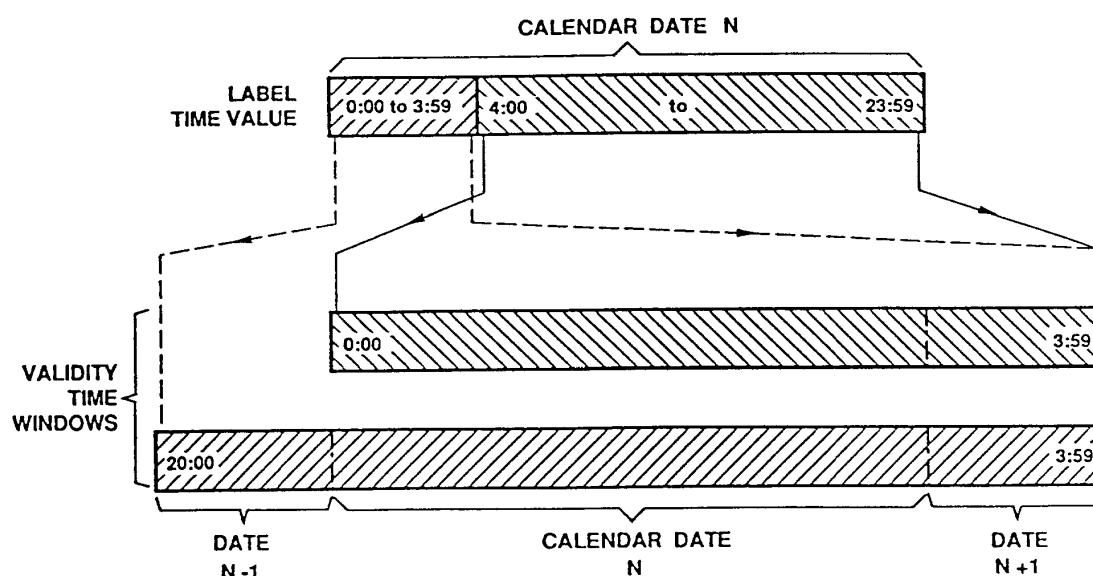
Figure 10: Time windows of validity of programme labels

The PIL is, in general, valid from 00:00 hours on the date in question until 03:59 on the following day (28 hours). For example, a label derived from 19:30 on July 15 is valid from 00:00 on July 15 until 03:59 on July 16.

Where the PIL value represents an originally announced local time between 00:00 and 03:59 hours, the time window of validity is opened at the earlier time of 20:00 hours on the preceding day, and remains open until 03:59 hours on the day following the PIL date (total 32 hours). For example, a label derived from 02:30 on September 3 is valid from 20:00 on September 2 until 03:59 on September 4.

A second time window duration of approximately one month is used in connection with the Programme Type (PTY) (or series-number) code as follows:

- for the PDC decoder, only those programmes with the appropriate PTY value that are transmitted within a period of 4 weeks plus the remainder of the PIL time validity window from the last received use of the value are to be recorded. For example, for a broadcast on a Tuesday the PTY value remains valid up to and including the fourth Tuesday following, and extending until 03:59 on the Wednesday morning;

- for the broadcaster, a PTY value representing a series-code shall not be reused for a different series until one calendar month plus one day from the date of its last use (e.g. on or after 04:00 on the 6 April when the last earlier use was made on 5 March). This ensures that no decoder will be confused into linking together the final episode of one series with the first episode of a different series which has been assigned the same PTY series-number code.

9.3.1 Modification to programme guides and informing the user

The viewer will normally be informed of changes to published schedules by broadcast announcements and by changes to the Teletext programme guide pages. No change is made to the PIL once it has been made publicly available provided the transmission time remains within the validity time window.

When a programme is shifted from its originally-announced time, or when the PIL is not derived from this time, the value of the label should be given in addition to the rescheduled transmission time in Teletext or other programme guide pages to allow for manual programme preselection. In this case, in the print media the originally-announced time should be indicated in a clear way for example in parenthesis with the letters PDC (or, as appropriate, VPS), e.g. (PDC 20.25).

9.3.2 Programme labelling

9.3.2.1 Programme cancellation

When a programme is cancelled, all references to the programme should be deleted from Teletext programme guide pages. The label value shall not be re-used for any other programme, but may be used as necessary to satisfy the operational requirement to signal its value to the home recorder (see subclauses 9.4.2.2 and 9.4.2.3).

9.3.2.2 Programme insertion

The new programme is inserted in programme guides and given a suitable label value such as a value one minute before the scheduled time, where a different programme, now rescheduled or cancelled, was originally planned at that time. For last minute insertions, changes to Teletext programme guides would normally be reinforced with verbal or visual announcement of the label value.

9.3.2.3 Replacement programme

The replacement programme is announced with a label differing from that of the originally announced programme. Where the label is explicitly a time value, and the scheduled time for the replacement programme is the same as that of the original programme, the label assigned should have a value one minute earlier. If a further or subsequent substitution is made, labels are assigned always differing by at least one minute from any other originally announced programme, again assigning values in advance of scheduled time.

9.4 PDC in programme presentation and operation

Recording control function labels are transmitted to accompany each programme, programme segment or inter-programme gap. Four (see note) independent parallel channels of labelling are available. Labels may be present in more than one channel for such purposes as linking inter-programme material (e.g. "trails" or commercials) with the preceding and following programmes. Service codes are specified to allow direct signalling to the recorder in unforeseen circumstances, or in certain planned situations such as when a network is reconfigured. In the latter case, it may be necessary to transmit "continuation" code throughout the switching operation to ensure all recorders on the old and new networks maintain correct functioning.

>   NOTE: The VPS system has a single label channel.

9.4.1 Transmission schedule

Label values are transmitted during the total continuous transmission schedule. When programme transmissions cease and start up again after a significant interval, it is recommended that labels should accompany any unannounced active signals such as test card, or black-and-syncs with audio line up tones. The most appropriate service code for such times is "recording inhibition/termination". This guarantees that a recorder will not revert to timer-control where an originally announced programme has been moved from its expected time slot but has not been replaced by another programme.

Similarly, where a broadcaster wishes to provide PILs only when he has moved programmes away from their originally announced times, he should broadcast at other times a "timer-control" service code thus signalling to the recorder to revert to timer mode.

The moment of commencement of transmission of a programme label should precede the start of programme by 30 seconds to allow for scanning of channels, detection of labels and recorder start-up (see note). The precise moment of commencement of the programme may be signalled by the resetting to "0" of the PRF, if used. With regard to the end of a programme, the condition of the Mode Identification bit indicates whether the corresponding label transmission ceases a maximum of 30 seconds before the end of the programme or at the moment of ending. In the former case the recorder continues recording for 30 seconds after the cessation of the appropriate label, whereas in the latter case the recording ceases immediately.

>   NOTE: In VPS, it is recommended that label transmission commences during an
>   announcement preceding the start of programme. An arbitrary period of advancement,
>   with a minimum of 5 seconds is used in practice. The label transmission ends when
>   the programme ends.

A period of advancement of much less than 30 seconds risks that some video recorders may not have begun recording at the start of the programme. Similarly, a period of advancement of much more than 30 seconds is likely to cause the inclusion of unwanted material in the first part of the recording unless the PRF is utilised (see timing diagram). It may be convenient to consider the inter-programme gap, commercial break or presentation promotion as a suitable time-buffer during which to make label transmission changes.

Whilst, in normal circumstances, recording is controlled by reception of the wanted programme's label, certain service codes may directly control the termination or interruption of recording.

It is essential that in the event of a programme or label transmission failure, a correct restarting sequence is followed. Annex D gives further information about the interpretation of service codes by the PDC video recorder.
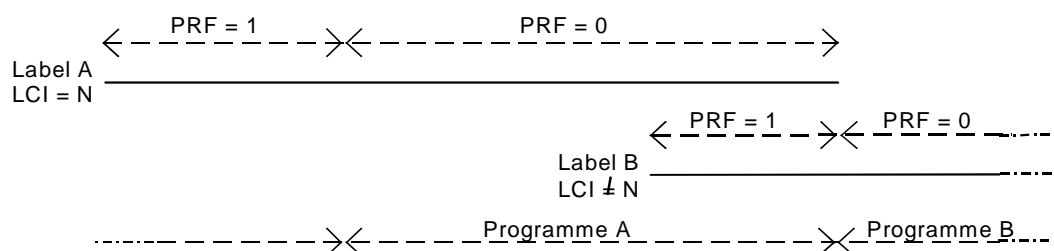
Figure 11: PRF to signal precise start times

Other features of PDC-equipped video recorders should be kept in mind:

- the VCR will not use assumed start times to tune only to the channel of the first expected programme, but will, if possible, scan channels and auxiliary inputs until the first required label is detected. For this reason the tuner will be constructed for rapid scanning of the preselected channels. It has been assumed that channel scanning, label acquisition, tape threading and commencement of recording will be possible within 30 seconds. As a consequence, recording priority will be given to the programme from the preselected list whose label is first received, irrespective of its original announced time, and for its complete duration;

- decoders may be acting upon reception of a correct CNI and PIL, or a CNI / PTY combination. The use of PIL or PTY will be known to the user (and decoder) only from the method of programme choice at the time of preselection;

- when labels are not received correctly during a recording, the recording will be continued for the computed duration following the actual start time;

- when both Line 16 (VPS) and Teletext-delivered labels are available simultaneously, decoders should default to the Teletext-delivered service;

- recorders held in record-pause mode by the PRF being set to "1" beyond the end of their pause mode time-out period, should default to record mode rather than stop. If the PRF is likely to be held set for more than about one minute, the broadcaster may choose to signal interruption and so reduce the risk that some recorders commence recording before the programme starts. For the same reason it is not recommended to use the PRF as a substitute for interruption;

- video recorders may differ in their reaction to the discontinuation of labels in a previously active Label Channel (LC) when a programme or programme-segment ends. The broadcaster may prefer, therefore, to close down the Label Channel by transmitting 5 seconds of Record Inhibit/Terminate (RI/T) service code;

- Manual entry for pre-selection of programmes does not in principle require a programme duration. However, if no stop-time or duration is entered, the recorder may operate for an arbitrary time when timer-control service code is transmitted.

9.4.2 Programme labelling

Labels are transmitted according to the prepared real-time list. Each programme label should be transmitted at least once per second for a minimum of 30 seconds. Up to four parallel Label Channels (LC) may be used simultaneously for the label transmission.

9.4.2.1 Planned interruption

The commencement of the gap between programme segments is signalled by at least 5 seconds of the "interruption" service code. In general, service operators should aim to make an interruption as short as possible. If an interruption extends to more than 1 hour, the video recorder may commence channel scanning, searching for other programmes which have been preselected. Where two programme segments are separated by a more significant interval it is recommended either that different labels are assigned to the programme segments or that a "Series Code" is used.

9.4.2.2 Anticipated changes to schedule

Where more than one programme is announced for a given time, the programme actually transmitted being dependent on the outcome of events in the meantime, it is recommended that the programme labels of deleted programmes are each transmitted for 30 seconds to act as cancellation labels.

9.4.2.3   Other unforeseen events

Some events such as news flashes, technical breakdowns, etc. may happen with little or no notice, and therefore broadcasters cannot guarantee a 30 seconds in-and-out advance notice of a PIL.

Programme cancellation:

-        if an announced programme is definitively cancelled, it is strongly recommended that the label of the cancelled programme should be transmitted, and for a minimum of 30 seconds, as near as possible to the original announced time.

Programme interruption:

-        if a programme is interrupted for an extended period of time for programme or technical reasons, but is to be continued subsequently, interruption code shall be transmitted for a minimum of 5 seconds and until another appropriate valid label replaces it. The interruption code should replace the programme label as soon as possible after the occurrence of the interruption. When the programme is resumed, transmission of the original label recommences. It is assumed that VCR machines will recommence recording immediately if the duration of the interruption has been less than 3 minutes and the PRF remains reset to "0". This requires that the recorder should enter record-pause mode on reception of an interruption label and should recommence recording immediately when the programme label resumes. It should be borne in mind that VCRs may begin channel-scanning if an interruption lasts longer than 1 hour.

Programme interruption without later resumption:

-        if it should not be possible to continue an interrupted programme marked by interruption code, the label of the interrupted programme shall be sent again to indicate the discontinuation, as soon as possible e.g. during an apology announcement on the subject (and, of course, before the next label is transmitted). The duration of this label should be a minimum of 5 seconds if within the first hour of interruption or a minimum of 30 seconds after that time.

Fail-safe features:

-        in the event of loss of correct labelling signals, transmission should be sustained with "continuation" service code until the end of a particular programme. The replacement of this code by "timer-control" service code will enable start of timed recording of following programmes. If in the meantime resumption of correct labelling is possible, this should commence.

9.5   System installation and evolution

In recognition of the diverse computer-aided and manual facilities in use by broadcasters for programme scheduling, presentation control and creation and updating of Teletext programme guides, there may be a need for a period of pre-PDC service development. During this time the full programme preselection function may be tested without transmitting meaningful PILs. Similarly, continuous "timer-control" service code labels may be transmitted to test the facilities and the continuity of network transmission, independent of any Teletext programme preselection function.

If it is not possible for a broadcaster to launch a comprehensive PDC service with both programme preselection and recording control functions implemented then a number of options for step-by-step evolution is available:

a)   a basic service could commence with a full programme preselection function and, as a minimum, alternation of the "timer-control" and "continuation" service codes to enable timer-controlled recording at delayed start time and to prevent the "timer-control" terminating the recording before the programme ends;

b) introduction of correct programme label values for re-scheduled programmes only (in combination with "timer-control" service code for normal use, "interruption" code when necessary and "recording inhibition/termination" code to inhibit timer recording until the start of a delayed programme);

c) use of programme labels for certain categories of programme or for certain periods;

d) full use of programme labels within a single Label Channel;

e) full use of programme labels in multiple Label Channels.

Whilst the stages a), b) and c) may appear to offer the broadcaster a method of introducing the service with lower initial commitment and cost, the necessary manual involvement, and the consequences of this (error proneness etc.) should, in practice, encourage rapid evolution to a full service. Any evolution of the PDC system should be made in co-ordination with equipment manufacturers in order to ensure proper operation of the system.

9.6 General observations

During the development of the code of practice, certain general observations were made. These are covered in subclauses 9.6.1 to 9.6.5, below.

9.6.1 Product information

It is important that manufacturers and service providers recognize the need for an easily understood description of the system, and simple instructions on how the customer should use it. There should be a full description in the user's guide of any limitations, e.g. implications of the rules used to resolve conflicts in timing. Such information should be available at the point of sale. It would be helpful if video recorder variants were to carry clearly recognisable logos describing which of the service options were featured. The Format 2 way of delivering the labels and the PDC way of providing preselection data may also require new abbreviations to distinguish them more clearly from less comprehensive systems.

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

9.6.2 Programme titles

It is recommended that the list of programmes selected via Teletext and stored in the decoder should include the programme titles.

9.6.3 User priorities

It is recommended that the user should be given the opportunity of assigning priorities to the programmes in the selection list. The consequences resulting from subsequent rescheduling of programmes should be made clear to the user.

9.6.4 Selected programme list amendment

It is recommended that the user is provided with the facility to add to, or delete items from, the list of preselected programmes held in the decoder.

9.6.5 Manual preselection operation

Especially in the case of manual entry of PDC "Preselection data", it is of great importance that the operation is as simple as possible. A single "This Channel" button could permit downloading of the CNI, and since the vast majority of programmes are selected on the day of transmission a simple button-push could load the announced date as "Today". Allowance should also be made for the option of manually preselecting the required VCR tuner channel pre-set or Peritel (baseband) input. (VCRs differ in whether they operate or not with line 16 or Teletext PDC labels, depending on the particular implementation of Peritel connections and video baseband switch).

Annex A (informative): The use of Unified Date and Time (UDT)

In most countries of the world there is a twice-yearly seasonal discontinuity in the local time caused by the application and removal of daylight-saving time. A PDC system based only on a local clock time may lead to ambiguities and mistakes when events both before and after such discontinuities are considered together. The problem may be worsened when a programme straddles the discontinuity or when a programme junction occurs during the repeated (or missing) hour. The size, frequency and timing of these changes is not always predictable.

In more sophisticated PDC equipment, where the expected timings of several events are stored in memory, and where possible timing contention is detected, similar problems may occur throughout the year when instructions relating to programme items from sources in different time-zones are processed together. It should not be assumed that the time-zone pattern will not change.

These problems can be overcome if all the relative time (and date) differences (offsets) from an agreed reference time (and date), are available at the decoder.

In a system intended for world-wide application it is convenient to avoid favouring any particular calendar convention, particularly as these may themselves be subject to change.

These issues are discussed in CCIR Report 1078 where it is proposed that, in accordance with CCIR Recommendations 457 and 460, Co-ordinated Universal Time (UTC) be used together with the Modified Julian Date (MJD) as the common reference, known as Universal Date and Time (UDT).

The UDT may be calculated in the PDC decoder by subtracting the local time offset from the local date and time. UDT may also be obtained from a transmission, for instance in part of packet 8/30 format 1 of CCIR system B Teletext, and in the line-625 data of the MAC/packet family of systems [1]. At any given instant this information is the same world-wide.

Annex B (informative): Use of packet 8/30 format 1 in CCIR system B Teletext

The system B Teletext specification includes a Broadcast Service Data Packet (BSDP) 8/30 format 1, which is broadcast at a regular rate of once per second. This has been a feature of some United Kingdom transmissions for many years, and equipment responding to the BSDP is available.

The BSDP contains data relevant to an accompanying Teletext service in the form of the complete address of an initial page. It also contains a statement of Universal Date and Time (UDT), together with a local offset which can be associated with that particular network at that time (see annex A).

A 20-character data field is provided to give a programme-related on-screen text display on channel change or at switch-on. The remaining data in the BSDP is provided for automated identification of the particular television network and programme.

In order to combine efficiency of coding, error protection and flexibility, the Network Identification (NI) and the Short Programme Label (SPL) codes are, in effect, random 16-bit numbers subjected to certain constraints.

There are sufficient 16-bit numbers to allocate a unique number to every broadcast network world-wide. The NI codes are allocated such that those likely to be received at a common point differ in at least three of their 16 bits so as to avoid false recognition under error conditions. If required, the network name (which may change in the long term) associated with particular NI numbers can be stored (and can even be updated via Teletext) in a look-up table in a decoder.

SPL codes are allocated such that those used in time-proximity on any particular network differ in many of their 16 bits, to avoid false recognition under error conditions. The BSDP allows for two SPLs to be broadcast, and the optimum use of this resource is the subject of study. Two SPLs could be used to signal a specific and a generic programme (e.g. a series or a particular episode of that series) so that either or both could be selected. They could also be used to signal information about the following programme in advance of a programme junction. Although the use of a static SPL throughout a programme is the more obvious method of programme identification, the use of predetermined sequences of SPLs is also being considered.

The use of NI and SPL, possibly combined with a "time window" expressed in terms of UDT, could provide a method of PDC. Means of distributing the information necessary to specify a chosen programme are under study; they do not necessarily involve the use of Teletext. Such a system could be implemented in a purpose-built unit, or as a "Teletext adapter" coupled to a microcomputer, which communicates to a VCR by imitating its infra-red remote-control signals.

Annex C (informative): The use of DIDON III for the transport of the recording control commands

C.1 General

The transport of the recording control commands is carried out by means of a programme delivery data group conveyed by DIDON III data packets with a structure shown in figure C.1.

Each data packet includes a prefix (8 bytes) and 30 useful bytes including a suffix 2 (bytes). The packets convey data groups, each group made of a group header (8 bytes) followed by the useful data.

The packet prefix (PP) comprises the following bytes:

- two bytes used for bit synchronization;
- one byte for byte synchronization;
- three address bytes;
- one continuity index;
- one packet structure byte.

The packet suffix (S) is made of two bytes of CRC (the remainder of the division of the polynomial made of 30 useful bytes by the polynomial generator: $x^{16} + x^{12} + x^5 + 1$).
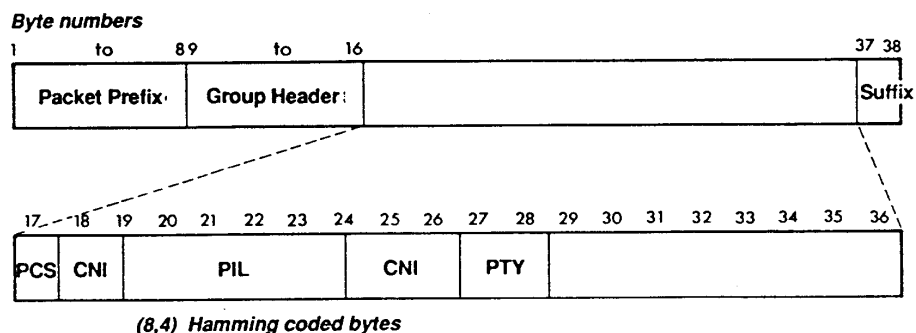
Figure C.1: Structure of the programme delivery data in DIDON III

The Group Header comprises the following bytes:

- group type;
- group continuity index;
- data group repetition indicator;
- two bytes indicating the data group size;
- two bytes indicating the size of the last data block of the group;
- data group routing.

The programme delivery data group conveys the programme delivery data block (39 bytes) carrying the CNI, PIL, PCS and PTY parameters.

C.2 Error protection

For error-protection purposes, the bytes are encoded using (8,4) Hamming code:

One byte consists of four data bits (x_2, x_4, x_6, x_8) and four protection bits (x_1, x_3, x_5, x_7). The first bit transmitted is x_1.

The parity checks P_n (with odd parity) are:

$P_1 = x_8, x_6, x_2, x_1$;
$P_2 = x_8, x_4, x_3, x_2$;
$P_3 = x_6, x_5, x_4, x_2$;
P_4 = bits x_1 to x_8 inclusive.

In the following text the data bits x_2, x_4, x_6, x_8 are respectively named d_1, d_2, d_3 and d_4.

C.3   Transmission format of programme delivery data group

a)   Prefix: See subclause 9.3.2;

b)   Country and Network Identification Label (CNI);

The CNI bits b_1 to b_4 are carried by bits d_1 to d_4 of Hamming word 2, the bits b_5, b_6 by the bits d_3, d_4 of Hamming word 8; the bits b_7, b_8 by the bits d_1, d_2 of Hamming word 9 the bits b_9, b_{10} by the bits d_1, d_2 of Hamming word 3; the bits b_{11} to b_{16} by the bit d_3 of Hamming word 9 to bit d_4 of Hamming word 10 (the bits being taken in the numerical order).

c)   Programme Identification Label (PIL);

The PIL bits b_1 to b_{20}, are carried in sequence by bit d_3 of Hamming word 3 to bit d_2 of Hamming word 8;

d)   Programme Control Status (PCS);

The PCS bits b_1 to b_4 are found in bits d_1 to d_4 of Hamming word 1;

e)   Programme type (PTY);

The eight PTY bits b_1 to b_8 are found in bits d_1 of Hamming word 11 to d_4 of Hamming word 12.

Annex D (informative): Interpretation of services codes at the PDC video recorder

At present, five service codes are defined. Their names do not necessarily explain their functions in all circumstances. The following tables further develop the explanation of the use of service codes by indicating the precise activity expected of a PDC video recorder when it receives a particular label type (numbered N) following on from an earlier type (numbered N-1). The tables also indicate expected actions on passing from the reception of a specific label to "no label" (due to transmission failure or erroneous data reception) and vice-versa. The "no label" condition here means no label in any label channel.

See table D.1 for a video recorder in record mode, and see table D.2 for a video recorder in the active standby, or "waiting" mode.

Table D.1: Action required of a recording PDC recorder on receiving various sequences of labels in a data channel

		LABEL N					No label
		Programme Label	Recording inhibition / termination Code	Timer-control Code	Continuation Code	Interruption Code	
LABEL N-1	Programme Label	continue or terminate recording	terminate recording	switch to timer-control & continue for the calculated duration	continue recording	interrupt recording	switch to timer-control & continue for calculated duration
LABEL N-1	Timer-control Code	switch to automatic control & continue or terminate recording	switch to automatic control & terminate recording	continue timer-control	continue recording	interrupt recording	continue timer-control
LABEL N-1	Continuation Code	continue or terminate recording	terminate recording	switch to timer-control & continue for the calculated duration	continue recording	interrupt recording	switch to timer-control & continue for calculated duration
No label		switch to automatic control & continue or terminate recording	switch to automatic control & terminate recording	continue timer-control	continue recording	interrupt recording	continue timer-control
NOTE: The service codes "Recording inhibition/termination" and "interruption" are not applicable to LABEL N - 1 in this table since in neither case would the video recorder be in record mode.							

Table D.2: Action required of a waiting PDC recorder on receiving various sequences of labels in a data channel

		LABEL N					No label
		Programme Label	Recording inhibition / termination Code	Timer-control Code	Continuation Code	Interruption Code	
LABEL N-1	Programme Label	continue waiting or initiate recording	continue waiting	switch to timer-control & continue waiting or initiate recording	continue waiting	continue waiting	switch to timer-control & continue initiate recording
LABEL N-1	Recording inhibition / termination Code	continue waiting or initiate recording	continue waiting	switch to timer-control & continue waiting or initiate recording	continue waiting	continue waiting	switch to timer-control & continue waiting or initiate recording
LABEL N-1	Timer-control Code	switch to automatic control & continue waiting or initiate recording	switch to automatic control & continue waiting	continue timer-control	continue waiting	continue waiting	continue timer-control
LABEL N-1	Continuation Code	continue waiting or initiate recording	continue waiting	switch to timer-control & continue waiting or initiate recording	continue waiting	continue waiting	switch to timer-control & continue waiting or initiate recording
LABEL N-1	Interruption Code	continue waiting or initiate recording	continue waiting	switch to timer-control & continue for calculated duration	continue waiting	continue waiting	switch to timer-control & continue waiting or initiate recording
No label		switch to automatic control & continue waiting or initiate recording	switch to automatic control & continue waiting	continue timer-control	continue waiting	continue waiting	continue timer-control

Annex E (informative): Some typical sequences of programme labels

E.1 Introduction

These examples are in the form of a transmission control desk log, and are not exhaustive. They assume that some operational computer assistance is available, particularly to provide accurate thirty second cues for programme start and end. They also assume that the LCI parameter is in use and that this indicates an arbitrary value, which is unchanged throughout the example, unless otherwise stated.

Also included after the transmission control log segments are examples presented in tabular form of how VCRs would react to the codes received.

In these tabular examples, the following additional abbreviations are used:

SCAN   This is the state of the VCR while waiting for record.

PTR   PREPARE TO RECORD: VCR has recognized a PDC-Code corresponded with a programmed event. The VCR is waiting for record until PRF-flag is going to 0 or PRF-flag is 1 for more than 1 minute.

REC   RECORD: The VCR is in timer record.

STBY   STANDBY: The VCR is in standby, an event could be programmed but the VCR is not scanning.

Prog.   Programme.

E.2 Data capacity requirement

The normal (and minimum) data capacity requirement for Teletext-signalled recording-control function is one Teletext TV line per second (see note), from an available capacity of typically 400 to 600 per second. The capacity requirement tends to peak in the region of programme junctions, but never exceeds 4 lines per second.

> NOTE: With VPS signalling, 25 television lines per second are dedicated for this purpose.

Each programme label is carried by one Teletext extension data packet which occupies one TV line. Where more than one label channel is in use the signalling rate is normally one line per label channel per second, and in the example tables the "worst case" occurs in table E.26 where for a few seconds four such channels are in use simultaneously.

The maximum signalling rate of four packets per second is a result of the need to maintain the 200 ms gap (needed by receivers for processing) between extension data packets of type 8/30.

The data capacity requirement for the pre-selection function is entirely under the control of the broadcaster's Teletext service manager.

E.3 Examples of programme sequences and the behaviour of VCRs

Sequence 1

This demonstrates a sequence including a programme which is one of a series, together with the use of record inhibit/terminate service code during inter-programme announcements. MI = 0 throughout this sequence.

Table E.1: Sequence 1

Local Time	Programme material	Transmitted label /PIL / CNI / PTY	Comment
1914 10	Announcements relevant to previous programme	/01JY1840/BBC1/00	Programme label of previous programme
1914 20	"	/ RI/T /	30 seconds before end of related announcements and too early to signal label for next programme.
1914 45	"	/01JY1915/BBC1/N	30 seconds cue for next programme (Series code"N").
1914 50	End of announcements	"	VCRs which had been recording using label /1840.. will stop now, 30 seconds after the RI/T service code at 1914 20
1914 53	General announcement	"	This announcement is not regarded as part of the next programme (otherwise, the label transmission would have started at 1914 23)
1915 15	Programme start	"	Programme begins
1942 35	Programme (continued)	RI/T	30 seconds before end of programme (with no related announcements to follow)
1943 05	Programme end	"	Too early to signal next label
1943 19	Promotion of new programme	"	The label promoted programme is made available on a special programme guide Teletext page, which may also contain the labels of other programmes
1943 30	Promotion (continued)	/01JY1945/BBC1/00	30 seconds cue for next programme
1944 00	Film	"	Programme start (early)

Example 1

This example shows the use of RI/T & MI = 0 to terminate a programme 30 seconds after the use of RI/T. By using the PRF flag the recording of a new programme is independently set up to record 30 seconds in advance. The time between the end of one programme and the start of the next is managed precisely by the broadcaster.

VCR 1 is programmed to record 2 events   1.   01 July 18:40
     2.   01 July 19:45

VCR 2 is programmed to record one event   1.   01 July 19:15

     Programme P1 uses PIL 18:40
     Programme P2 uses PIL 19:15
     Programme P3 uses PIL 19:45

Table E.2: Example 1

| Prog. | Time | LCI | | | 1 | 2 | 3 | VCR1 | VCR2 |
| | | 0 | | | | | | | |
		MI	PRF	PIL					
P1	19:14:10	0	0	18:40				REC	SCAN
P1	19:14:20	0	x	RI/T				REC	SCAN
PX	19:14:45	0	1	19:15				REC	PTR
PX	19:14:50	0	1	19:15				SCAN	PTR
PX	19:14:53	0	1	19:15				SCAN	PTR
P2	19:15:15	0	0	19:15				SCAN	REC
PX	19:42:35	0	x	RI/T				SCAN	REC
PX	19:43:05	0	x	RI/T				SCAN	STBY
PX	19:43:19	0	x	RI/T				SCAN	STBY
PX	19:43:30	0	1	19:45				PTR	STBY
P3	19:44:00	0	0	19:45				REC	STBY

Sequence 2

As sequence 1, but MI = 1 throughout.

Table E.3: Sequence 2

Local Time	Programme material	Transmitted label LCI / MI / PRF / PIL / CNI / PTY	Comment
1914 10	Announcements related to previous programme	0/1/0/01JY1840/BBC1/00	Label of previous programme (continued)
1914 20	Announcements (continuing)	0/1/0/01JY1840/BBC1/00	30 seconds before the end of related announcements, but too early to signal the label for the next programme MI = 1, so the..1840.. label shall be continued until the end of the relevant announcements.
1914 45	Announcements (continuing)	1/1/1/01JY1915/BBC1/N interleaved with 0/1/0/01JY1840/BBC1/00	30 seconds cue for next programme, PRF set for ..1915./N label. "Waiting" VCRs which were pre-programmed with the ..1915.. or ./N label and which respond to PRF will enter "Pause" mode when this label is detected, and will await the reset of PRF before starting to record. VCRs which cannot respond to PRF will usually begin to record as soon as the wanted label is detected, thus including up to 30 seconds of unwanted material.
1914 50	End of related announcements	1/1/1/01JY1915/BBC1/N	The ..1840.. label is no longer present, and another valid label is present, so VCRs responsive to MI and which were recording against the ..1840.. label will now stop. Other VCRs will continue recording for 30 seconds.
1914 53	General announcement	1/1/1/01JY1915/BBC1/N	This announcement is not regarded as part of the next programme (otherwise, the interleaved label transmission would have started at 1914 23). But, as explained above, it will be recorded (in part, at least) by some VCRs which were pre-programmed with the ..1840.. or ..1915.. labels.
1915 15	Programme start	1/1/0/01JY1915/BBC1/N	All VCRs pre-programmed with ..1915.. are expected to be recording by this time
1942 35	Programme (continued)	1/1/0/01JY1915/BBC1/N	At 30 seconds before the end of programme, with no related announcements to follow, but too early to send the label of the next programme.
1943 05	Programme ends	0/1/X/ RI/T /BBC1/00	Still too early to signal the next label. Recording VCRs not responsive to MI will continue to record (unwanted material) for 30 seconds. [Note: X signifies 1 or 0].
1943 19	Promotion of new programme	0/1/X/ RI/T /BBC1/00	The label of the promoted programme is made available on a special Teletext page, which may also contain the labels of other programmes
1943 30	Promotion (continued)	0/1/1/01JY1945/BBC1/00	30 seconds cue for next programme. See 1914 45 for comment
1944 00	Film	0/1/0/01JY1945/BBC1/00	Programme start (early)

Example 2

In this example, the same programme PIL are used and the VCRs are programmed with the same data as in example 1. However, in this example the broadcaster is able to join P1 to P2 without any gap. For this he shall use 2 label channels.

Table E.4: Example 2

Prog.	Time	LCI								VCR1	VCR2
		0			**1**			**2**	**3**		
		MI	PRF	PIL	MI	PRF	PIL				
P1	19:14:10	1	0	18:40						REC	SCAN
P1	19:14:20	1	0	18:40						REC	SCAN
P1	19:14:45	1	0	18:40	1	1	19:15			REC	PTR
P1	19:14:50				1	1	19:15			REC	PTR
P1	19:14:53				1	1	19:15			REC	PTR
P2	19:15:15				1	0	19:15			SCAN	REC
P2	19:42:35				1	0	19:15			SCAN	REC
PX	19:43:05	1	x	RI/T						SCAN	STBY
PX	19:43:19	1	x	RI/T						SCAN	STBY
PX	19:43:30	1	1	19:45						PTR	STBY
P3	19:44:00	1	0	19:45						REC	STBY

Sequence 3

Sequence in which a commercial break is interrupted by a last-minute newsflash: newsflash cue is given after the transmission of the label for the next programme has begun. MI = 0 throughout this sequence.

Table E.5: Sequence 3

Local Time	Programme material	Transmitted label LCI / PIL / CNI / PTY	Comment
1234 56	Commercial Break	0/02JY1200/ITV1/00	Programme label (continued) of previous programme
1235 30	Commercial Break (continued)	0/02JY1235/ITV1/00	30 seconds cue for next programme
1235 50		1/ NSPV 3F interleaved for at least 5 seconds with 0/ INT /00	30 seconds cue for Newsflash (PTY set to 3F to denote an emergency message). Note that because INT action is delayed 30 seconds, any recording using label /1200.. is not interrupted. VCRs affected by INT will retain the /1235.. label in memory because that was the label which was replaced by INT.
1236 00	End of Break and announcement	1/ NSPV 3F	
1236 20	Newsflash	"	
1237 15	Newsflash ends	0/02JY1235/ITV/00	Programme label for next programme. It is assumed that there would not be a 30 seconds cue for the end of the Newsflash, so VCRs responsive to ../PTY = 3F will continue to record for 30 seconds after the end of the Newsflash
1237 20	Continuity announcement	"	This announcement is a "fill in", rather than risk VCRs losing the start of the programme.
1237 45	Programme begins	"	

Example 3

VCR 1 is programmed to record 2 events

1. 02 July 12:00
2. NSPV/3F

VCR 2 is programmed to record one event

1. 02 July 12:35

Programme P1 uses PIL 12:00
Programme P2 uses PIL 12:35
Programme P3 uses PIL NSPV/3F

Table E.6: Example 3

| Prog. | Time | LCI | | | | | | 2 | 3 | VCR1 | VCR2 |
| | | 0 | | | 1 | | | | | | |
		MI	PRF	PIL	MI	PRF	PIL				
P1	12:34:56	0	0	12:00						REC	SCAN
P1,	12:35:30	0	1	12:35						REC	PTR
PX	12:35:50	0	x	INT	0	1	NSPV/3F			REC	SCAN
PX	12:36:00				0	1	NSPV/3F			PTR	SCAN
P3	12:36:20				0	0	NSPV/3F			REC	SCAN
P2, P3	12:37:15	0	0	12:35						REC	REC
P2, P3	12:37:20	0	0	12:35						REC	REC
P2,	12:37:45	0	0	12:35						SCAN	REC

Sequence 4

As sequence 3, but MI = 1 throughout.

Table E.7: Sequence 4

Local Time	Programme material	Transmitted label LCI / MI / PRF / PIL / CNI / PTY	Comment
1234 56	Commercial Break	0/1/0/02JY1200/ITV1/00	Programme label (continued) of previous programme
1235 30	Commercial Break (continued)	1/1/1/02JY1235/ITV1/00 interleaved with 0/1/0/02JY1200/ITV1/00	30 seconds cue for next programme
1235 50	Commercial Break (contd.)	2/1/1/ NSPV /ITV1/3F interleaved with 0/1/0/02JY1200/ITV1/00 and 1/1/X/ INT /ITV1/00	30 seconds cue for Newsflash. Note that PRF does not modify the effect of "INTerruption" code: PRF may be set to 1 or 0. (It is not permitted to send a PTY, set to 3F to denote an emergency message, with INT.). It is necessary to send INT in label channel 1 for at least 5 seconds, otherwise VCRs pre-programmed with the ..1235.. label will delete it from their memories.
1235 55	Commercial Break (cont.)	2/1/1/ NSPV /ITV1/3F interleaved with 0/1/0/02JY1200/ITV1/00	
1236 00	Announcement at end of Commercial Break	2/1/0/ NSPV /ITV1/3F	VCRs not responsive to MI will continue recording for 30 seconds
1236 20	Newsflash	2/1/0/ NSPV /ITV1/3F	
1237 15	Newsflash ends	0/1/1/02JY1235/ITV1/00	Programme label for the next programme. 30 seconds cue is not available for the end of the Newsflash, so VCRs not responsive to MI, and which were recording against PTY = 3F will continue to do so for 30 seconds into the following announcement.
1237 20	Continuity announcement	0/1/1/02JY1235/ITV1/00	(It has been decided that it would not be appropriate to continue the Commercial Break). This announcement period is extended to 25 seconds to guarantee VCRs will not miss the first few seconds at the start of the next programme
1237 45	Programme begins	0/1/0/02JY1235/ITV1/00	

Example 4

This uses the same Programme data and the VCRs are programmed with the same data as example 3.

Table E.8: Example 4

Prog.	Time	LCI											3	VCR1	VCR2
		0			**1**			**2**							
		MI	PRF	PIL	MI	PRF	PIL	MI	PRF	PIL					
P1	12:34:56	1	0	12:00										REC	SCAN
P1	12:35:30	1	0	12:00	1	1	12:35							REC	PTR
P1	12:35:50	1	0	12:00	1	x	INT	1	1	NSVP/3F				REC	SCAN
P1	12:35:55	1	0	12:00				1	1	NSVP/3F				REC	SCAN
P1, P3	12:36:00							1	0	NSVP/3F				REC	SCAN
P1, P3	12:36:20							1	0	NSVP/3F				REC	SCAN
P3	12:37:15	1	1	12:35										REC	PTR
P3	12:37:20	1	1	12:35										REC	PTR
P2	12:37:45	1	0	12:35										SCAN	REC

Sequence 5

Sequence in which a commercial break is interrupted by a last-minute newsflash: newsflash cue is given before the transmission of the label for the next programme has begun. MI = 0 throughout this sequence.

Table E.9: Sequence 5

Local Time	Programme material	Transmitted label LCI / PIL / CNI / PTY	Comment
1234 56	Commercial Break	0/02JY1200/ITV1/00	Continuation of label of previous programme
1235 30	Commercial Break-terminated	1/ NSPV /3F interleaved for at least 5 seconds with 0/ INT /00	30 seconds cue for Newsflash. Note that VCRs which had been recording the Commercial Break (considered as part of the previous programme) will retain the /1200.. label in memory until that label is again **with the same LCI**
1235 35	Continuity announcement	1/ NSPV /3F	
1236 00	Newsflash	"	
1237 15	Newsflash ends	1/02JY1235/ITV/00	Programme label for next programme. (VCRs storing the /1200.. interrupted label will continue to do so. It is assumed that there would not be a 30 seconds cue for the end of the Newsflash, so VCRs responsive to ../PTY = 3F will continue to record for 30 seconds after the end of the Newsflash)
1237 20	Continuity	"	This announcement is a "fill in", rather than risk VCRs losing the start of the programme.
1237 45	Programme	"	
1238 50	Programme - (continued)	1/02JY1235/ITV1/00 interleaved for at least 5 seconds with 0/02JY1200/ITV1/00	(The operator finds the earliest convenient moment for this operation, which is to release the VCRs mentioned above from the "INTerruption" state. This will allow them to resume scanning.)
1239 00	"	1/02JY1235/ITV1/00	

Example 5

This uses the same programme data and the VCRs are programmed with the same data as example 3.

Table E.10: Example 5

| Prog. | Time | LCI | | | | | | 2 | 3 | VCR1 | VCR2 |
| | | 0 | | | 1 | | | | | | |
		MI	PRF	PIL	MI	PRF	PIL				
P1	12:34:56	0	0	12:00						REC	SCAN
P1	12:35:30	0	x	INT	0	1	NSPV/3F			REC	SCAN
P1	12:35:50				0	1	NSPV/3F			REC	SCAN
P3	12:36:00				0	0	NSPV/3F			REC	SCAN
P3	12:37:15				0	1	12:35			REC	PTR
PX	12:37:20				0	1	12:35			REC	PTR
P2	12:37:45				0	0	12:35			SCAN	REC
P2	12:38:50	0	1	12:00	0	0	12:35			PTR	REC
P2	12:39:00				0	0	12:35			PTR	REC
P2	12:39:30				0	0	12:35			SCAN	REC

Sequence 6

As sequence 5, but MI = 1 throughout this sequence.

Table E.11: Sequence 6

Local Time	Programme material	Transmitted label LCI / MI / PRF / PIL / CNI / PTY	Comment
1234 56	Commercial Break	0/1/0/02JY1200/ITV1/00	Programme label (continued) of previous programme
1235 30	Commercial Break interrupted	0/1/1/ NSPV /ITV1/3F	30 seconds cue for Newsflash. Note that VCRs which had been recording the Commercial Break (considered part of the previous programme) will stop. Those not responsive to MI will stop after 30 seconds.
1235 35	Continuity announcement	0/1/1/ NSPV /ITV1/3F	
1236 00	Newsflash	0/1/0/ NSPV /ITV1/3F	
1237 15	Newsflash ends	0/1/1/02JY1235/ITV1/00	Programme label for the next programme. 30 seconds cue is not available for the end of the Newsflash, so VCRs not responsive to MI, and which were recording against PTY = 3F will continue to do so for 30 seconds into the following announcement.
1237 20	Continuity announcement	0/1/1/02JY1235/ITV1/00	(It has been decided that it would not be appropriate to continue the Commercial Break). This announcement period is extended to 25 seconds to guarantee VCRs will not miss the first few seconds at the start of the next programme.
1237 45	Programme begins	0/1/0/02JY1235/ITV1/00	

Example 6

This uses the same programme data and the VCRs are programmed with the same data as example 3.

Table E.12: Example 6

Prog.	Time	LCI			1	2	3	VCR1	VCR2
		0							
		MI	PRF	PIL					
P1	12:34:56	1	0	12:00				REC	SCAN
PX	12:35:30	1	1	NSPV/3F				PTR	SCAN
PX	12:35:35	1	1	NSPV/3F				PTR	SCAN
P3	12:36:00	1	0	NSPV/3F				REC	SCAN
PX	12:37:15	1	1	12:35				SCAN	PTR
PX	12:37:20	1	1	12:35				SCAN	PTR
P2	12:37:45	1	0	12:35				SCAN	REC

Sequence 7

This sequence illustrates the use of INTerrupt, and MI to pause VCRs during a movie with film breakage.

Table E.13: Sequence 7

Local Time	Programme material	Transmitted label LCI / MI / PRF / PIL / CNI / PTY	Comment
1400 00	Film	0/0/0/02JY1400/CHL4/00	(It is assumed that it is impracticable to arrange automatic action based on a film breakage detector).
1404 04	Film breakage	0/0/0/02JY1400/CHL4/00	
1404 18	Apology and intermission	0/1/X INT /CHL4/00	If the film could be restarted within 30 seconds, (perhaps even 45 s), it would not be worthwhile to use INT. Those VCRs which were recording the film will now enter "Pause" mode immediately if they are responsive to MI, or after 30 seconds if they are not responsive to MI.
1406 50	Apology and intermission (cont.)	0/0/1/02JY1400/CHL4/00	10 seconds cue to allow for VCRs which will not stay in "Record-Pause" mode for this length of time (2½ minutes).
1407 00	Film resumes	0/0/0/02JY1400/CHL4/00	Note that a full 30 seconds cue is not given, as it is not necessary to allow for scanning by VCRs. Those VCRs not responsive to PRF will restart recording immediately.

Example 7

VCR 1 is programmed to record one event   1.   02 July 14:00

VCR2 is not programmed with an event

Programme P1 uses PIL 14:00

Table E.14: Example 7

Prog.	Time	LCI			1	2	3	VCR1	VCR2
		0							
		MI	PRF	PIL					
P1	14:00:00	0	0	14:00				REC	STBY
P1	14:04:04	0	0	14:00				REC	STBY
PX	14:04:18	1	x	INT				SCAN	STBY
PX	14:06:50	0	1	14:00				PTR	STBY
P1	14:07:00	0	0	14:00				REC	STBY

Sequence 8

A programme is delayed by an overrunning tennis match; the tennis match is transferred to another channel.

Table E.15: Sequence 8

Local Time	Programme material	Transmitted label LCI / MI / PRF / PIL / CNI / PTY	Comment
1822 00	Tennis (continued)	0/1/0/02JY1620/BBC2/T	It becomes clear that the tennis is going to overrun considerably. Arrangements are made for a different TV channel (BBC1) to take the rest of the match, and the PIL for that is agreed.
1830 40	Announcements	LUF = 1/ 0/1/X/02JY1829/BBC1/T interleaved for at least 5 s with LUF = 0/ 1/1/1/02JY1830/BBC2/00	At a suitable moment in play, viewers are told that the remainder of the match may be seen on BBC1. VCRs responsive to MI will stop recording, store the new PIL and begin scanning within (say) 5 seconds. In the worst case they will begin recording the tennis on BBC1 within 35 seconds (unless they encounter another pre-programmed PIL). VCRs not responsive to MI will lose 60 seconds of tennis in the worst case. The next programme on this channel (BBC2) is delayed to 1831 to allow for scanning by VCRs.
1831 10	Programme	1/1/0/02JY1830/BBC2/00	

Example 8

This example shows the use of LUF to reprogram an event from VCR 1 to another program.

VCR 1 is programmed to record one event   1.   02 July 16:20 BBC2

VCR 2 is programmed to record one event   1.   02 July 18:30 BBC2

    Programme P1 uses PIL 16:20
    Programme P2 uses PIL 18:30

Table E.16: Example 8

Prog.	Time 02 JY	LCI							2	3	VCR1	VCR2
		0				1						
		LUF	MI	PRF	PIL	MI	PRF	PIL				
P1	18:22:00	0	1	0	16:20						REC	SCAN
P1	18:30:40	1	X	X	02 JY 18:29 BBC1	1	1	18:30			REC	PTR
P1, PX	18:31:10					1	0	18:30			REC	REC
PX, P2	18:31:40					1	0	18:30			SCAN	REC

NOTE: The VCR1 event 02 JY 16:20 BBC2 is reprogrammed to 02 JY 18:29 BBC1.

        BBC2 is always displayed as network name also during reprogramming, that means during LUF = 1 the CNI-CODE is not used to display the network name.

Sequence 9

A programme, one of a series, which had been due to start at 21:00, has been re-scheduled, at one day's notice, to 22:30 on the following day.

Table E.17: Sequence 9

Local Time	Programme material	Transmitted label LCI / MI / PRF / PIL / CNI / PTY	Comment
02 July			
2100 00	Commercial Break (continued)	0/1/X/ RI/T /ITV1/00	
2100 05	Commercial Break (continued)	LUF = 0/ 0/0/0/02JY2100/ITV1/Q	30 seconds cue for announcements about postponed programme. Change to MI = 0 to allow recording of the announcement during the updating process. Note that if PRF were set at this time (as would normally be the case), the need to reset the flag would require the extended transmission of label ..2100.. into the announcement time, introducing an unnecessary complexity.
2100 35	Announcement about re-scheduled and replacement programmes	LUF = 1/ 0/0/0/03JY2229/ITV1/Q	Label of the rescheduled programme for reprogramming of VCR memories, with LUF = 1, and where the label (..02JY2100..) which has just been removed from label channel 0 is replaced. VCRs which were pre-programmed with the ..2100.. or the Series code "Q" will continue to record for 30 seconds, and so record the announcement. Coincidentally with the announcements, the VCR programming information may also be transmitted on a special Teletext page. The LUF = 1/ label shall be transmitted for at least 5 seconds.
2100 45	Announcement (continued)	LUF = 0	30 seconds cue for replacement programme.
2100 55 2101 15	Continuity announcement Replacement programme	LUF = 0/ 0/0/1/02JY2059/ITV1/00 0/0/0/02JY2059/ITV1/00	
2102 00	Replacement programme continuing	0/1/0/02JY2059/ITV1/00	Switch back to MI = 1.
03 July			
2230 20	Commercial Break (continued)	0/1/1/03JY2230/ITV1/00	30 seconds cue for announcement about cancelled programme.
2230 50	Apology about cancelled (formerly 2230) programme	0/1/1/03JY2229/ITV1/Q	30 seconds cue for re-scheduled programme. (Of the VCRs pre-programmed with ..2230.., only those designed not to respond to PRF will record this apology).
2331 20	Re-scheduled programme		

Example 9

This example shows the use of LUF to reprogram an event from VCR 1 to another date.

VCR 1 is programmed to record 2 programme events   1.   02 July 21:00
                                                       2.   03 July 20:01

VCR 2 is programmed to record 2 programme events   1.   02 July 20:59
                                                       2.   03 July 22:30

     Programme P1 uses PIL 21:00
     Programme P2 uses PIL 20:01
     Programme P3 uses PIL 20:59
     Programme P4 uses PIL 22:30
     Programme P5 uses PIL 22:29

Table E.18: Example 9

| Prog. | Time | LCI | | | | 1 | 2 | 3 | VCR1 | VCR2 |
| | | 0 | | | | | | | | |
	02 JY	**LUF**	**MI**	**PRF**	**PIL**					
PX	21:00:00	0	1	X	RI/T				SCAN	SCAN
P1	21:00:05	0	0	0	21:00				REC	SCAN
P1	21:00:35	1	X	X	03 JY 22:29				REC	SCAN
P1, PX	21:00:45	0	1	X	RI/T				SCAN	SCAN
PX	21:00:55	0	0	1	20:59				SCAN	PTR
P3	21:01:15	0	0	0	20:59				SCAN	REC
P3	21:02:00	0	1	0	20:59				SCAN	REC
P3, PX	21:45:00	0	1	0	RI/T				SCAN	STBY
	03 JY									
P2	20:00:00	0	1	0	20:01				REC	SCAN
PX	22:30:20	0	1	1	22:30				SCAN	PTR
PX	22:30:50	0	1	1	22:29				PTR	STBY
P5	22:31:20	0	1	0	22:29				REC	STBY
P5	22:55:00	0	1	0	22:29				REC	STBY

     NOTE: Event 1. for VCR1, (i.e. 02 July 21:00 ITV1), is reprogrammed to 03 JY 22:29 ITV1.

Sequence 10

Two weeks later (17 July), it is decided to again reschedule a programme from the series.

Table E.19: Sequence 10

Local Time	Programme material	Transmitted label LCI / MI / PRF / PIL / CNI / PTY	Comment
17 July			
2229 05	Commercial Break (continued)	0/0/X/ RT/I ITV1/00	30 seconds cue for announcement of the change in schedule. Because the postponed programme is to be broadcast before 0359 on 18 July, the relevant label, ..17JY2229.., shall not be used for the re-scheduling announcement.
2229 35	Announcement about re-scheduled programme	0/0/1/17JY2228/ITV1/00	30 seconds cue for the substituted programme. (The ..2229.. label has been left free for the Series code "Q" programme.)
2230 05	Substituted programme	0/0/0/17JY2228/ITV1/00	
2359 20	Commercial Break (continued)	0/1/1/18JY0000/ITV1/00	30 seconds cue for apology about cancelled programme
2359 35	Commercial Break (continuing)	1/1/1/17JY2229/ITV1/Q interleaved with 0/1/1/18JY0000/ITV1/00	30 seconds cue for re-scheduled programme.
2359 50	Apology concerning cancelled programme	1/1/1/17JY2229/ITV1/Q interleaved with 0/1/0/18JY0000/ITV1/00	VCRs which were pre-programmed with the ..0000.. label will record for 30 seconds.
18 July			
0000 05	Re-scheduled programme	1/1/0/17JY2229/ITV1/Q	VCRs recording against the ..0000.. label, but not the ..2229.. label, and which are not responsive to MI will continue recording for 15 seconds.

Example 10

This example shows the use of a PIL with the day before. Programme P2 is overlapped with P3 for 30 seconds.

VCR 1 is programmed to record 2 programme events   1.   17 July 22:28
    2.   17 July 22:29

VCR 2 is programmed to record 1 programme event   1.   18 July 00:00

    Programme P1 uses PIL 22:28
    Programme P2 uses PIL 22:29
    Programme P3 uses PIL 00:00

Table E.20: Example 10

| Prog. | Time 17 JY | LCI | | | | | | 2 | 3 | VCR1 | VCR2 |
| | | 0 | | | 1 | | | | | | |
		MI	PRF	PIL	MI	PRF	PIL				
PX	22:29:05	0	X	RI/T						SCAN	SCAN
PX	22:29:35	0	1	22:28						PTR	SCAN
P1	22:30:05	0	0	22:28						REC	SCAN
PX	23:59:20	1	1	00:00						SCAN	SCAN
PX	23:59:35	1	1	00:00	1	1	22:29			PTR	PTR
P3	23:59:50	1	0	00:00	1	1	22:29			PTR	REC
	18 JY										
P2	00:00:05				1	0	22:29			REC	REC
P2	00:00:20				1	0	22:29			REC	STBY

Sequence 11

A programme is postponed for three days, the transmission time being decided on the day of transmission, only.

Table E.21: Sequence 11

Local Time	Programme material	Transmitted label LCI/MI/PRF/PIL/CNI/PTY	Comment
02 July			
1600 06	Commercial Break (continued)	0/1/X/ RI/T /CHL4/00	30 seconds cue for announcement about postponed programme, when this programme label shall be replaced in label channel 0 by LUF = 1 together with the new label for storage in VCRs.
1600 15	Commercial Break (continuing)	LUF = 0/ 0/1/0/02JY1600/CHL4/00	As in the preceding Sequence 9, at 2100 05, PRF is not set so as to avoid complications. VCRs responsive to MI will therefore record 30 seconds of the Commercial Break.
1600 45	Announcement about cancelled and re-scheduled programmes	LUF = 1/ 0/1/0/05JY0123/CHL4/00	The updating label has a real date but an arbitrary time, and in principle, an unreal time could have been used in compliance with the Specification. Those VCRs which are equipped to do so will delete the ..1600.. label from their memories and will substitute the ..05JY0123.. label. Of these, only VCRs **not** responsive to MI will first record the announcements.
1600 57	Announcements (continuing)	0/1/1/02JY1559/CHL4/00	30 seconds cue for the substituted programme. The transmission of the new ..0123.. label with LUF = 1 shall last at least 5 seconds.
1601 27	Substituted programme	0/1/0/02JY1559/CHL4/00	
05 July			
0123 00	——	——	In the unlikely event that VCRs pre-programmed with the ..05JY0123.. label are on "timer-control" at this time, they might begin to record.
0959 50	Commercial Break (continued)	LUF = 0/ 0/1/0/05JY0123/CHL4/00	30 seconds cue for the announcement of the actual time the postponed programme is to be broadcast
1000 20	Announcement of the time of the postponed programme	LUF = 1/ 0/1/0/05JY1459/CHL4/00 interleaved with LUF = 0/ 1/1/0/05JY1000/CHL4/00	30 seconds cue for next programme (no recording is required at this time). There is no guarantee that all affected VCRs will receive this reprogramming information. From 1000 00 the label of the postponed programme could be given on a Teletext page. The label quoted on that page would be ..1459.., and not the arbitrary "holding" label ..0123... Thus there is no real need to use the label updating process at this time.
1000 50	Programme begins	1/1/0/05JY1000/CHL4/00	
1459 40	(Different) Programme (continued)	1/1/1/05JY1500/CHL4/00 interleaved with 0/0/0/05JY1430/CHL4/00	30 seconds cue for the announcement about the cancelled programme. There is a change of MI in label channel 0 - see comment below.
1459 45	Programme (continuing)	1/1/1/05JY1500/CHL4/00	

(continued)

Table E.21 (concluded): Sequence 11

Local Time	Programme material	Transmitted label LCI / MI / PRF / PIL / CNI / PTY	Comment
1459 55	Programme (continuing)	1/1/1/05JY1500/CHL4/00 interleaved with 2/1/1/05JY1459/CHL4/00 and 3/1/1/05JY0123/CHL4/00	30 seconds cue for the programme postponed from 02 July. The interleaving process forces a change of label channel for both the ..1459.. and the ..0123.. labels. In order to reduce the number of interleaved labels, MI was changed to 0 for label channel 0, so that VCRs continued to record the previous programme (label ..1430..) even though its label was removed at 1459 45.
1500 10	Announcement about cancelled and substitute programmes	1/1/0/05JY1500/CHL4/00 interleaved with 1/1/1/05JY1459/CHL4/00 and 3/1/1/05JY0123/CHL4/00	The arbitrary value label (..0123..) will still be needed for VCRs which missed any label updates during the day. (Such VCRs would not have a correct fall-back to timer-control.)
1500 25	Postponed programme begins	2/1/0/05JY1459/CHL4/00 interleaved with 3/1/1/05JY0123/CHL4/00	

Example 11

This example shows the use of reprogramming for two times.

On 05 July 01:23:00 the VCR will start record because no LCI is present. Normal "Timer-control" is working between "Start- Stop-Time". After "Timer-controlled Record" the timer will be deleted. At 09:59:50 no programmed timer is available to record !!!

VCR 1 is programmed to record 2 programme events   1.   02 July 16:00 (STOPTIME 16:35)
2.   05 July 14:30

VCR 2 is programmed to record 2 programme events   1.   02 July 15:59
2.   05 July 10:00

     Programme P1 uses PIL 16:00 + 01:23 + 14:59
     Programme P2 uses PIL 15:59
     Programme P3 uses PIL 14:30
     Programme P4 uses PIL 10:00
     Programme P5 uses PIL 15:00

Table E.22: Example 11

Prog.	Time	LCI													VCR1	VCR2
		0				1			2			3				
	02 JY	LUF	MI	PRF	PIL	MI	PRF	PIL	MI	PRF	PIL	MI	PRF	PIL		
PX	16:00:06	0	1	X	RI/T										SCAN	SCAN
P1	16:00:15	0	1	0	16:00										REC	SCAN
P1	16:00:45	1	1	0	01:23 05 JY										REC	SCAN
PX	16:00:57	0	1	1	15:59										SCAN	PTR
P2	16:01:27	0	1	0	15:59										SCAN	REC
P2, PX	16:20:10														SCAN	REC
PX	16:20:40														SCAN	SCAN
	05 JY															
PX	01:23:00														REC	SCAN
PX	01:58:00														SCAN	SCAN
PX	09:59:50	0	1	0	01:23										SCAN	SCAN
P1+P4	10:00:20	1	1	0	14:59	1	0	10:00							SCAN	REC
P4	10:00:50					1	0	10:00							SCAN	REC
P3	14:59:40	0	0	0	14:30	1	1	15:00							REC	STBY
P3	14:59:45					1	1	15:00							REC	STBY
P3	14:59:55					1	1	15:00	1	1	14:59	1	1	01:23	REC	STBY
PX, P5	15:00:10					1	0	15:00	1	1	14:59	1	1	01:23	REC	STBY
PX, P5	15:00:15					1	0	15:00	1	1	14:59	1	1	01:23	STBY	STBY
P5+P1	15:00:25								1	0	14:59	1	0	01:23	STBY	STBY

Sequence 12

A sports magazine programme includes Gymnastics, Rugby football and Motor racing events, each of which has more than one segment. The number of segments is not known in advance.

It is required that VCR users should be able to choose to record all segments of Gymnastics and/or Rugby football and/or Motor racing, or the entire sports programme. To enable this (in this example) labels have been assigned to (i) the Sports Programme (Series code "S"), (ii) Gymnastics segments, (iii) Rugby football segments and (iv) Motor racing segments. Using the INT codes in the various label channels, as illustrated in table E.21, it is therefore possible to change between segments through the entire Sports Programme until it is clear that the last segment of a particular sport is being transmitted. With careful regard to the likely effects on decoders, it will sometimes be possible to re-use the LCI codes within the composite programme, thus allowing more than four segments to be labelled.

Table E.23: Sequence 12

Local Time	Programme material	Transmitted label LCI/ MI/ PRF/ PIL/ CNI/ PTY	Comment
1359 00	Previous programme (continued)	0/1/0/01DE1330/BBC1/00	Programme label of previous programme.
1359 40	Previous programme (cont.)	1/1/1/ NSPV /BBC1/S	30 seconds cue for the Sports programme.
1400 10	Sports Programme - announcements & Introduction	1/1/1/ NSPV /BBC1/S	VCRs which were recording against label ..1330.. and which do not respond to MI continue to record for 30 seconds.
1402 05	Introduction (cont.)	1/1/1/01DE1400/BBC1/S	30 seconds cue for the first segment of Gymnastics (using label ..1400..). VCRs which are already recording against the Series code "S" are presumed to continue to do so, even though PRF = 1 (this is also the case for VCRs which do not respond to PRF).
1402 35	Gymnastics - 1	1/1/0/01DE1400/BBC1/S	1st. Gymnastics segment begins
1445 40	Gymnastics - 1 (cont.)	1/1/0/01DE1400/BBC1/S interleaved with 0/1/1/01DE1440/BBC1/S	30 seconds cue for Motor Racing.
1446 10	Motor racing - 1	1/1/X/ INT /BBC1/00 interleaved with 0/1/0/01DE1440/BBC1/S	INT is sent for 5 seconds, but it could be for longer. VCRs which do not respond to MI will interrupt recording after 30 seconds (unless pre-programmed with "S" or..1400..). The transmission of Series code "S" continues in label channel 1 only because it
			is not permitted to transmit a valid PTY with a "control" PIL. (It is assumed that VCRs pre-programmed with "S" will continue recording without interruption, because "S" is still present - now in label channel 1.
1446 15	Motor racing - 1 (cont.)	0/1/0/01DE1440/BBC1/S	The label for Gymnastics (1/..1400..) will not be deleted from VCR memories because it was replaced in label channel 1 by INT. VCRs pre-programmed to record Gymnastics, but neither Motor Racing nor the Series, will stop recording, and will remain tuned to BBC1, awaiting the re-appearance of the 1/..1400.. label.
1458 40	Motor racing - 1 (cont.)	0/1/0/01DE1440/BBC1/S interleaved with 2/1/1/01DE1510/BBC1/S	10 seconds cue for Rugby football (label ..1510..). For operational reasons a full 30 seconds cue could not be given for the end of the first part of Motor racing.
1458 50	Rugby football - 1	2/1/0/01DE1510/BBC1/S interleaved with 0/1/X/ INT /BBC1/00	INT is sent for 5 seconds in label channel 0. Commentators and announcers will have been warned in advance that some VCRs will not begin recording until 30 seconds after each cue (i.e. until 1459 10 in this case).

(continued)

Table E.23 (concluded): Sequence 12

Local Time	Programme material	Transmitted label LCI / MI / PRF / PIL / CNI / PTY	Comment
1459 55	Rugby football - 1 (cont.)	2/1/0/01DE1510/BBC1/S	
	... and so on through the entire Sports Magazine Programme, repeating the INTerrupt codes in the various label channels until it is certain that the last segment of a particular sport has been broadcast. With careful consideration given to the likely effects on VCRs, it will sometimes be possible to re-use the LCI codes within the composite programme, thus allowing more than four segments to be labelled.		
1550 00	Gymnastics - last segment (cont.), which is also the last segment of the Sports Programme.	1/1/0/01DE1400/BBC1/S	Although INT is not again to be transmitted in any label channel, some VCRs will still be storing labels for other sports. This would be expected in such magazine programmes because of the need for flexibility to return to any sport at any time.
1550 50	Last segment of the Sports Programme (cont.)	1/1/0/01DE1400/BBC1/S interleaved for at least 5 seconds with 0/X/X/01DE1400/BBC1/00 and 2/X/X/01DE1510/BBC1/00	To clear labels ..1440.. and ..1510.., they are transmitted briefly as illustrated here. For such clearance, these labels shall not immediately be followed by INT in the same label channel **and** shall be followed by another valid label in any label channel, (in this case 0/1400...),.
1604 10	Last segment of the Sports Programme (cont.)	3/1/1/01DE1600/BBC1/00 interleaved with 1/1/0/01DE1400/BBC1/S	30 seconds cue for next programme.
1604 40	Next Programme	3/0/0/01DE1600/BBC1/00	Any VCRs which had been recording from the Sports magazine, and which are not pre-programmed with the ..1600.. label will stop (after 30 seconds, if not responsive to MI), and will resume scanning.

Example 12

This example shows the use of interrupt code and PRF flag for VCR1, and for VCR2 if the label disappears longer than 30 seconds.

VCR 1 enters record pause with PTR for event 2 at 15:50:50. After 1 minute the PRF flag is not going down, that seems that the broadcasting station has forgot the PRF flag and the VCR starts record until P2 disappears or will be interrupted by INT.

VCR 2 starts record for event 1 at 14:58:50. At 15:50:00 the label disappears, so the 30 seconds rule starts and at 15:50:30 record is stopped and event 1 will be deleted.

VCR 1 is programmed to record 2 programme events	1. 01 December 13:30
	2. 01 December 14:40
VCR 2 is programmed to record 2 programme events	1. 01 December 15:10
	2. 01 December 16:00
VCR 3 is programmed to record 1 programme event	1. 01 December 14:00

Programme P1 uses PIL 13:30
Programme P2 uses PIL 14:40
Programme P3 uses PIL 14:00
Programme P4 uses PIL 15:10
Programme P5 uses PIL 16:00
Programme P6 uses PIL S (Series code)

Table E.24: Example 12

Prog.	Time 01 DEC.	LCI 0 MI	PRF	PIL	1 MI	PRF	PIL	2 MI	PRF	PIL	3 MI	PRF	PIL	VCR1	VCR2	VCR3
P1, P6	13:30:00	1	0	13:30/S										REC	SCAN	SCAN
P1, P6	13:59:00	1	0	13:30/S										REC	SCAN	SCAN
P1, P6	13:59:40				1	1	NSPV/S							REC	SCAN	SCAN
P6	14:00:10				1	0	NSPV/S							SCAN	SCAN	SCAN
P6	14:02:05				1	1	14:00/S							SCAN	SCAN	PTR
P3, P6	14:02:35				1	0	14:00/S							SCAN	SCAN	REC
P3, P6	14:45:40	1	1	14:40/S	1	0	14:00/S							PTR	SCAN	REC
P2, P6	14:46:10	1	0	14:40/S	1	X	INT							REC	SCAN	SCAN
P2, P6	14:46:15	1	0	14:40/S										REC	SCAN	SCAN
P2, P6	14:58:40	1	0	14:40/S				1	1	15:10/S				REC	PTR	SCAN
P4, P6	14:58:50	1	X	INT				1	0	15:10/S				SCAN	REC	SCAN
P4, P6	14:59:55							1	0	15:10/S				SCAN	REC	SCAN
P4, P3, P6	15:50:00				1	0	14:00/S							SCAN	REC	REC
P3, P6	15:50:30				1	0	14:00/S							SCAN	SCAN	REC
P3, P6	15:50:50	1	1	14:40/S	1	0	14:00/S	1	1	15:10/S				PTR	SCAN	REC
P3, P6	15:51:50	1	1	14:40/S	1	0	14:00/S	1	1	15:10/S				REC	SCAN	REC
P3, P6	16:04:10				1	0	14:00/S				1	1	16:00/S	REC	PTR	REC
P3, P5, P6	16:04:40										0	0	16:00/S	STBY	REC	REC
P3, P5, P6	16:05:10										0	0	16:00/S	STBY	REC	STBY

NOTE: Any Video recorder which is actively recording during the transmission of the "clearing" labels may not have acted upon them. It may be advisable therefore to send such clearing labels a number of times.

Sequence 13

This sequence is virtually the same as the previous one, except that in this instance a "Series code" is used for each separate sport, as follows: "G" = Gymnastics, "M" = Motor racing, and "R" = Rugby football. The label..1400.. is used to denote the entire Sports magazine programme.

Table E.25: Sequence 13

Local Time	Programme material	Transmitted label LCI/ MI/ PRF/PIL/CNI /PTY	Comment
1359 00	Previous programme (continued)	0/1/0/01DE1330/BBC1/00	Programme label of previous programme.
1359 40	Previous programme (cont.)	1/1/0/01DE1400/BBC1/00 interleaved with 0/1/0/01DE1330/BBC1/00	30 seconds cue for the Sports programme.
1400 10	Sports Programme - announcements & Introduction	1/1/0/01DE1400/BBC1/00	VCRs which were recording against label ..1330.. and which do not respond to MI continue to record for 30 seconds.
1402 05	Introduction (cont.)	1/1/0/01DE1400/BBC1/00 interleaved with 2/1/1/ NSPV /BBC1/G	30 seconds cue for the first segment of Gymnastics.
1402 35	Gymnastics - 1	1/1/0/01DE1400/BBC1/00 interleaved with 2/1/0/ NSPV /BBC1/G	1st. Gymnastics segment begins
1445 40	Gymnastics - 1 (cont.)	1/1/0/01DE1400/BBC1/00 interleaved with 2/1/0/ NSPV /BBC1/G AND 0/1/1/ NSPV /BBC1/M	30 seconds cue for Motor Racing.
1446 10	Motor racing - 1	2/1/X/ INT /BBC1/G interleaved with 1/1/0/01DE1400/BBC1/00 AND 0/1/0/ NSPV /BBC1/M	INT is sent for 5 seconds, but it could be for longer.
1458 40	Motor racing - 1 (cont.)	1/1/0/01DE1400/BBC1/00 interleaved with 3/1/1/ NSPV /BBC1/R AND 0/1/0/ NSPV /BBC1/M	10 seconds cue for Rugby football. For operational reasons a full 30 seconds cue could not be given for the end of the first part of Motor racing.

... and so on through the entire Sports Magazine Programme, repeating the INTerrupt codes in the various label channels until it is certain that the last segment of a particular sport has been broadcast. With careful consideration given to the likely effects on VCRs, it will sometimes be possible to re-use the LCI codes within the composite programme, thus allowing more than three segments to be labelled.

Local Time	Programme material	Transmitted label LCI/ MI/ PRF/PIL/CNI /PTY	Comment
1550 50	Gymnastics - last segment which is also the last segment of the Sports Programme.	1/1/0/01DE1400/BBC1/00 interleaved with 2/1/0/ NSPV /BBC1/G and for at least 5 seconds with 0/X/X/ NSPV /BBC1/M and 3/X/X/ NSPV /BBC1/R	Although INT is not again to be transmitted in any label channel, some VCRs will still be storing labels for other sports. As these are "Series" codes they will remain stored until unused for a month. However, as in the previous example, the labels no longer required for this particular Sports magazine programme shall be transmitted briefly to clear the INT states, thus releasing VCRs to scan for other wanted programmes.

(continued)

Table E.25 (concluded): Sequence 13

Local Time	Programme material	Transmitted label LCI / MI / PRF / PIL / CNI / PTY	Comment
1604 10	Last segment of the Sports Programme (cont.)	0/1/1/01DE1600/BBC1/00 interleaved with 1/1/0/01DE1400/BBC1/00 and 2/1/0/ NSPV /BBC1/G	30 seconds cue for next programme. To reduce the amount of interleaving the Series code "G" could have been transmitted here (but not earlier), with the ..1400.. label, as before, in label channel 1.
1604 40	Next Programme	3/1/0/01DE1600/BBC1/00	Any VCRs which had been recording from the Sports magazine programme, and which are not pre-programmed with the ..1600.. label will stop (after 30 seconds, if not responsive to MI), and will resume scanning.

Example 13

This example shows:

VCR 1 records event 2 programmed with NSPV and is interrupted by INT.

VCR 2 starts record with PTR for event 1 at 14:58:40. After 1 minute the PRF flag is not going down, that seems that the broadcasting station forgot for the PRF flag and the VCR starts record at 14:59:40 until P2 disappears.

VCR 1 is programmed to record 2 programme events	1.	01 December 13:30
	2.	NSPV/G

VCR 2 is programmed to record 1 programme event	1.	NSPV/R

VCR 3 is programmed to record 1 programme event	1.	01 December 14:00

Programme P1 uses PIL 13:30
Programme P2 uses PIL 14:00
Programme P3 uses PIL NSPV/M
Programme P4 uses PIL NSPV/G
Programme P5 uses PIL NSPV/R
Programme P6 uses PIL 16:00

NOTE: P2 includes P3, P4 & P5.

Table E.26: Example 13

Prog.	Time 01 DEC.	LCI												VCR1	VCR2	VCR3
		0			1			2			3					
		MI	PRF	PIL	MI	PRF	PIL	MI	PRF	PIL	MI	PRF	PIL			
P1	13:59:00	1	0	13:30										REC	SCAN	SCAN
P1	13:59:40	1	0	13:30	1	1	14:00							REC	SCAN	PTR
P1, P2	14:00:10				1	0	14:00							REC	SCAN	REC
P2	14:00:40				1	0	14:00							SCAN	SCAN	REC
P2	14:02:05				1	0	14:00	1	1	NSPV/G				PTR	SCAN	REC
P2, P4	14:02:35				1	0	14:00	1	0	NSPV/G				REC	SCAN	REC
P2, P4	14:45:40	1	1	NSPV/M	1	0	14:00	1	0	NSPV/G				REC	SCAN	REC
P2, P3	14:46:10	1	0	NSPV/M	1	0	14:00	1	X	INT/G				SCAN	SCAN	REC
P2, P3	14:58:40	1	0	NSPV/M	1	0	14:00				1	1	NSPV/R	SCAN	PTR	REC
P2, P3, P4, P5	14:59:40	1	1	NSPV/M	1	0	14:00	1	0	NSPV/G	1	1	NSPV/R	REC	REC	REC
R2, P3, P4, P5	15:50:50	1	1	NSPV/M	1	0	14:00	1	0	NSPV/G	1	1	NSPV/R	REC	REC	REC
P2, P4, P5	16:04:10	1	1	16:00	1	0	14:00	1	0	NSPV/G				REC	REC	REC
P6	16:04:40	1	0	16:00										REC	SCAN	STBY
P6	16:05:10	1	0	16:00										SCAN	SCAN	STBY

Sequence 14

Change of clock time for autumn daylight-saving.

Table E.27: Sequence 14

Local Time	Programme material	Transmitted label LCI / MI / PRF / PIL / CNI / PTY	Comment
28 Oct.			
0201 16	Programme	/ / /28OCT0159/ITV1/00	Published label for programme at 0200 "old time"
0258 30	Programme (continued)	/ / / RI/T /ITV1/00	30 seconds cue for announcement
0259 00	Announcements about clock time change	/ / / RI/T /ITV1/00	
0259 15	Commercial Break	/ / / RI/T /ITV1/00	
0259 45	Commercial Break (continued)	/ / /28OCT0200/ITV1/00	30 seconds cue. Published Label for programme at 02:00 "new time". (The earlier programme has a label representing an earlier time to avoid possible logic conflicts in decoder algorithms).
0200 15	Programme	/ / /28OCT0200/ITV1/00	

Example 14

This example shows:

VCR 1 is programmed to record one event   1.   28 Oct. 01:59 ITV1

VCR 2 is programmed to record one event   1.   28 Oct. 02:00 ITV1

Programme P1 uses PIL 01:59
Programme P2 uses PIL 02:00

Table E.28: Example 14

Prog.	Time 28 Oct.	LCI							VCR1	VCR2
		0				1	2	3		
		LUF	MI	PRF	PIL					
P1	02:01:16	0	0	0	01:59				REC	SCAN
P1	02:58:30	0	0	0	RI/T				REC	SCAN
PX	02:59:00	0	0	0	RI/T				STBY	SCAN
PX	02:59:15	0	0	0	RI/T				STBY	SCAN
P2	02:59:45	0	1	0	02:00				STBY	REC
P2	02:00:15	0	1	0	02:00				STBY	REC

Annex F (informative): Use of "random number" programme labels

The 20-bit coding space of the PIL field is approximately half-used for real months, days, hours and minutes data. The remainder of the coding space, which represents partially or totally non-real times and dates, remains available for applications other than the normal ones. The time windows of validity which apply to such label values are given in table F.1.

When the label assigned to a programme is not a real date and/or time, the programme finishing time hours data group is reassigned to indicate the programme duration explicitly. This application is signalled by the setting of the most significant bit of data word B (in this data group the bit does not signal controlled access).

When a programme is assigned a label with an indefinite time-window of validity, but which was selected by the user by Programme Type (or series code), the normal PTY rule (i.e. calendar month) overrides at the video recorder.

Table F.1: PIL codes, their uses and validity

Month	Day	Hour	Minute	Time window of validity
0	Unallocated			
1 to 12	1 to 28,29,30 or 31 (as valid)	0 to 23	0 to 59	Normal
1 to 12	1 to 28,29,30 or 31 (as valid)	24 to 31 (unreal hours)	Any	Normal
1 to 12	1 to 28,29,30 or 31 (as valid)	Any (unreal minutes)	60-63	Normal
1 to 12	Invalid days	Any	Any	Indefinite
13	Any	Any	Any	Indefinite
14	Any	Any	Any	Indefinite
15	Unallocated except for the following service codes (for which there is no restriction to the time window of validity):			
15	0	31	63	Timer-control code
15	0	30	63	Recording termination/inhibition code
15	0	29	63	Interruption code
15	0	28	63	Continuation code

Annex G (informative): Bibliography

- Technical Rules ARD/ZDF Nr. 8R2: "Video Programme System".

- CCIR Recommendation 653: "Teletext system B".

- CCIR Recommendation 653: "Teletext system C Layer 1- 4 (general description)".

   NOTE: A table of programme type categories (table 2 in this ETS) is called for in various other ETSs: viz. ETS 300 707 (EPG) and ETS 300 468 (SI in DVB).

- ETS 300 468: "Digital Video Broadcasting (DVB); Specification for Service Information (SI) in DVB systems".

- prETS 300 707: "Electronic Programme Guide (EPG); Protocol for a TV Guide using electronic data transmission".

History

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