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**Integrated Services Digital Network (ISDN);
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Videotelephone systems and terminal equipment operating
on one or two 64 kbit/s channels**

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Foreword

This European Telecommunication Standard (ETS) was produced by the Terminal Equipment (TE) Technical Committee of the European Telecommunications Standards Institute (ETSI).

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1 Scope

This 2nd edition of ETS 300 145 specifies the system requirements for a Videotelephone using one or two B-channels, when connected to the S point or coincident S and T reference point of the pan-European Integrated Services Digital Network (ISDN). These requirements ensure end-to-end compatibility of terminals supporting the videotelephony teleservice described in ETS 300 264 [1].

This ETS is applicable in whole to Terminal Equipment (TE) supporting the videotelephony teleservice; subclauses 5.3, 6.1, 6.2 and clause 8 are also applicable to Multipoint Control Units (MCUs) using one or two B-channels.

The specific requirements which apply to a terminal in order to support various options related to videoconference and/or data transmission are specified in other documents (e.g. Draft prETS 300 483 [2]).

Conformance to this ETS allows interworking with terminals supporting the telephony 3,1 kHz teleservice described in ETS 300 111 [3], the telephony 7 kHz teleservice described in ETS 300 263 [4] and Public Switched Telephone Network (PSTN) telephony terminals. Interworking with other audio-visual terminals can take place if their operation on one or two B-channels is according to this ETS.

NOTE 1: Terminals in accordance with ITU-T Recommendation H.320 can interwork, if one or two 64 kbit/s (unrestricted or restricted) digital channels can be established between the terminals (e.g. using a remote Channel Aggregation Unit in case of a 128 kbit/s H.320 single channel terminal).

NOTE 2: Interworking with terminals according to CCITT Recommendation G.725 [5] is optional; it may be restricted to mode 0.

NOTE 3: Audio and video signal interfaces are outside the scope of this ETS.

NOTE 4: Interfaces and protocols used for optional data transmission are outside the scope of this ETS.

The in-band signalling procedures are described in ETS 300 143 [6], and the syntax for these procedures is defined in ETS 300 144 [7]. The video coding algorithm is described in ITU-T Recommendation H.261 [8].

2 Normative references

This ETS incorporates, by dated or 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 apply.

- [1] ETS 300 264: "Integrated Services Digital Network (ISDN); Videotelephony teleservice, Service description".
- [2] Draft prETS 300 483: "Terminal Equipment (TE); Integrated Services Digital Network (ISDN); Multipoint Communications for Audiovisual Services; Main functionalities and basic requirements for Multipoint Control Units and audiovisual terminals".
- [3] ETS 300 111 (1992): "Integrated Services Digital Network (ISDN); Telephony 3,1 kHz teleservice, Service description".
- [4] ETS 300 263: "Integrated Services Digital Network (ISDN); Telephony 7 kHz teleservice, Service description".
- [5] CCITT Recommendation G.725 (1988): "System aspects for the use of the 7 kHz audio codec within 64 kbit/s".
- [6] ETS 300 143: "Integrated Services Digital Network (ISDN); Audiovisual services; In-band signalling procedures for audiovisual terminals using digital channels up to 2 048 kbit/s".

- [7] ETS 300 144: "Integrated Services Digital Network (ISDN); Audiovisual services; Frame structure for a 64 kbit/s to 1 920 kbit/s channel and associated syntax for in-band signalling".
- [8] ITU-T Recommendation H.261: "Video codec for audiovisual services at p x 64 kbit/s".
- [9] ETS 300 102-1: "Integrated Services Digital Network (ISDN); User-network interface, layer 3, Specifications for basic call control".
- [10] ETS 300 012 (1991): "Integrated Services Digital Network (ISDN); Basic user-network interface, Layer 1 specification and test principles".
- [11] ETS 300 125 (1991): "Integrated Services Digital Network (ISDN); User-network interface data link layer specification, Application of CCITT Recommendations Q. 920/I. 440 and Q.921/I. 441".
- [12] ITU-T/T.120 series of Recommendations:
- ITU-T Recommendation T.122: "Multipoint communication service for audiographics and audiovisual conferencing, service definition";
 - ITU-T Recommendation T.123: "Protocol stacks for audiographic and audiovisual teleconference applications";
 - ITU-T Recommendation T.125: "Multipoint communication service protocol specification".
- [13] CCITT Recommendation G.711 (1988): "Pulse code modulation (PCM) of voice frequencies".
- [14] CCITT Recommendation G.722 (1988): "7 kHz audio-coding within 64 kbit/s".
- [15] CCITT Recommendation G.728 (1992): "Coding of speech at 16 kbit/s using low-delay code-excited linear prediction".
- [16] I-ETS 300 302, Parts 1 to 4: "Integrated Services Digital Network (ISDN); Videotelephony teleservice".
- [17] ETS 300 267-1: "Integrated Services Digital Network (ISDN); Telephony 7 kHz and videotelephony teleservices, Digital Subscriber Signalling System No. one (DSS1), Part 1: Protocol specification".
- [18] I-ETS 300 245-5: "Integrated Services Digital Network (ISDN); Technical characteristics of telephony terminals, Part 5: Wideband (7kHz) handset telephony".
- [19] I-ETS 300 245-2: "Integrated Services Digital Network (ISDN); Technical characteristics of telephony terminals, Part 2 - PCM A-law handset telephony".
- [20] ITU-T Recommendation H.233: "Confidentiality system for audiovisual services".

3 Definitions

For the purposes of this ETS, the definitions given in clause 3 of both ETS 300 143 [6] and ETS 300 144 [7] apply along with the following:

additional channel: One of the channels between two users, which is not the I-channel (see ETS 300 144 [7]).

audio mute: Muting the loudspeaker of a terminal.

channel: A unidirectional link between two users.

connection: A bi-directional link between two users: it carries both (unidirectional) channels.

Control and Indication (C&I): End-to-end signalling between terminals, consisting of Control, which causes a state change in the receiver, and Indication which provides for information as to the state or functioning of the system (see also ETS 300 144 [7] for additional information and abbreviations).

data: Refer to any of these: Low Speed Data (LSD), High Speed Data (HSD), Multi Layer Protocol (MLP), High Speed Multi Layer Protocol (H-MLP) as defined in ETS 300 144 [7].

I-channel: The initial or only B-channel as defined in ETS 300 144 [7].

In-band signalling: Signalling via the Bit-rate Allocation Signal (BAS) of the frame structure, as defined in ETS 300 144 [7].

lip synchronisation: Operation to provide the feeling that the speaking motion of the displayed person is synchronised with his speech.

man-machine interface: Interface between human user and terminal/system, consisting of a physical section (electro-acoustic, electro-optic transducer, keys, etc.) and a logical section dealing with functional operation states.

4 Abbreviations

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

BAS	Bit-rate Allocation Signal
C&I	Control and Indication
CLIP	Calling Line Identification Presentation
COLP	Connected Line Identification Presentation
CONNECT	D-channel message (as in ETS 300 102-1 [9])
ECS	Encryption Control Signal
ECT	Explicit Call Transfer
FAS	Frame Alignment Signal
H-MLP	High Speed Multi Layer Protocol
HOLD	Supplementary service
HSD	High Speed Data
ISDN	Integrated Services Digital Network
LSD	Low Speed Data
MCU	Multipoint Control Unit
MLP	Logical data sub channel named "MLP"

NOTE: MLP previously referred to the ITU-T Recommendation T.120 [12] Multilayer Protocol, but now this is just a name for the logical subchannel which may contain T.120 or H.224 protocol, or Dummy data (see ETS 300 143 [6] and ETS 300 144 [7]).

MSB	Most Significant Bit
MSN	Multiple Subscriber Number
PSTN	Public Switched Telephone Network
SC	Service Channel
TEA	Terminal Equipment Alarm
TERM A, TERM B	Terminals
TERM C	Terminal

TP Terminal Portability

5 System description

A videotelephony terminal conforming to this ETS shall be connected to an ISDN basic access in accordance with ETS 300 012 [10], ETS 300 102-1 [9] and ETS 300 125 [11]; then it cannot use more than 2 B-channels.

5.1 Block diagram and identification of elements (informative)

A generic videotelephony system is shown in figure 1. It consists of several (at least two) videotelephony terminals, the ISDN, and possibly a Multipoint Control Unit (MCU).

A configuration of a complete videotelephony terminal consisting of several functional units is also shown in figure 1.

- Video I/O equipment includes camera(s), monitor(s), and video processing units to provide functions such as split-screen scheme.
- Audio I/O equipment includes the handset and/or microphone(s), loud-speaker(s) and/or earphone(s), and audio processing units to provide such functions as acoustic echo cancellation.
- Data I/O adaptor may be used for additional services, such as facsimile, or additional facilities (e.g. far end camera control): it is optional.
- Telematic equipment includes visual aids such as an electronic blackboard and a still picture transceiver to enhance the basic videotelephone communication as defined in ITU-T T.120 series of Recommendations [12]: these are optional.
- The system control unit carries out such functions as:
 - network access through user-to-network signalling,
 - end-to-end in-band signalling to establish a suitable mode of operation,
 - audio and video signal processing and multiplexing,
 - data transmission and/or application.
- The video codec carries out redundancy reduction coding and decoding for video signals: the algorithm is as defined in ITU-T Recommendation H.261 [8].
- The audio codec carries out redundancy reduction coding and decoding for audio signals: the algorithms are defined in CCITT Recommendations G.711 [13], G.722 [14] and G.728 [15]. The audio characteristics are defined in I-ETS 300 302, Parts 1 to 4 [16].

NOTE 1: Part 4 of this prI-ETS is still under study.

NOTE 2: Delay may be introduced into the audio path equal to the video codec delay, to maintain lip synchronisation (see subclause 6.2.4.5).

- The Mux/dmux unit multiplexes transmitted video, audio, data and control signals into a single bit stream and demultiplexes a received bit stream into constituent multimedia signals, as defined in ETS 300 144 [7].
- The network interface makes the necessary adaptation between the network and the terminal according to the user-network interface requirements, as defined in ETS 300 012 [10], ETS 300 102-1 [9] and ETS 300 125 [11].

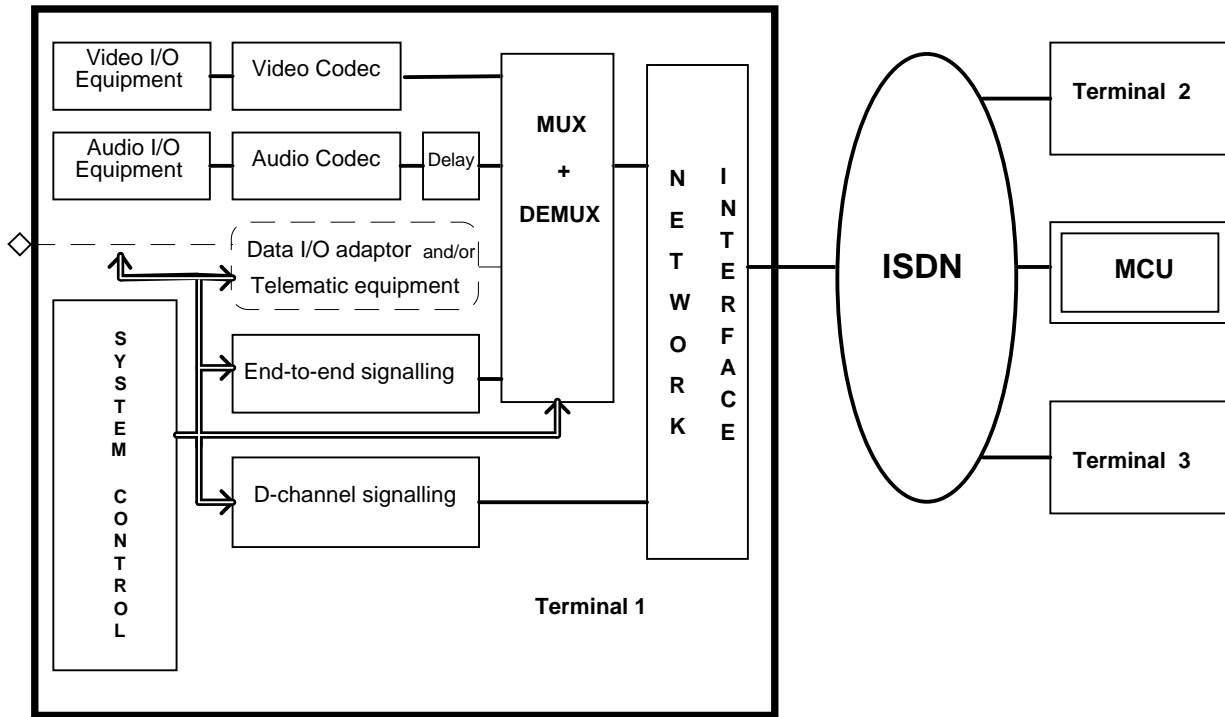


Figure 1: Visual telephone system

- End-to-end signalling is defined in ETS 300 143 [6] and ETS 300 144 [7].
- User-to-network signalling is defined in ETS 300 102-1 [9], ETS 300 125 [11] and ETS 300 267-1 [17], clause 7.

5.2 Videotelephone terminal types

Table 1 lists terminal types of videotelephone. The terminal type is categorised according to the audio communication modes and the number of B-channels with which the terminal can communicate (see subclause 5.3.4).

The terminal shall be able to operate at 1B and 2B transfer rate according to at least one of the operable audio modes. The type of remote terminal is identified through the capability exchange defined in ETS 300 143 [6].

Table 1: Videotelephone terminal type

		Transfer rate	1 B	2 B			
		TYPE	Xa	Xb1	Xb2/3	Xb4	Xb5
MODE	Transfer rate	Audio coding	G.728 G.711	G.728 G.711	G.728 G.722 G.711	G.711	G.722 G.711
a0	1B	G.711					
a1	1B	G.728					
b1	2B	G.711					
b2	2B	G.722					
b3	2B	G.728					
NOTE: "indicates operable mode".							

5.3 Signal structure and procedures

5.3.1 Frame structure

The terminal shall conform to ETS 300 144 [7].

5.3.2 Control and Indication (C&I)

C&I shall be chosen from the general audiovisual set contained in ETS 300 144 [7]. For videotelephone systems, relevant values are listed in table 2 giving their source, sink, synchronisation with picture, transmission channel and reference for code word definition.

C&I functions are defined such that, under various circumstances, the audiovisual system operates in a fault-free manner and also such that sympathetic presentation to users is possible. Some functions shall therefore be mandatory, others optional.

Table 2 with its notes clarifies the circumstances under which C&I functions are "mandatory":

M denotes mandatory for any equipment;

CM denotes conditionally mandatory if the relevant option is declared for the audiovisual system;

R means not mandatory but recommended.

NOTE: All videotelephone terminals have a video source providing a picture of participants, and some terminals may have optional additional video sources: the participant-picture source is designated #1, having the associated symbol VIA. When incoming video is ON (BAS command (010)[1] or (010)[2]) and VIA, VIA2, VIA3 have not been transmitted, source #1 is assumed.

Table 2: C&I signals for videotelephone

	C&I (function or name)	C/I	Source	Sink	Sync. with picture	Transmission channel	Code word definition	NOTES (see below)	
								RX (1)	TX (1)
Video	Picture format	I	decoder	coder	no	BAS	ETS 300 144 [7]		M
	Picture format	C	coder	decoder	yes	embedded in video	H.261 [8]	M	M
	Minimum decodable picture interval	I	decoder	coder	no	BAS	ETS 300 144 [7]		M
	VCF	C	coder or MCU	decoder	no	BAS	ETS 300 144 [7]	M	
	VCU	C	decoder or MCU	coder	no	BAS	ETS 300 144 [7]	M	CM (3)
	Freeze picture release control	C	coder	decoder	yes	embedded in video	H.261 [8]	M	
MCU	MCU related messages	C	terminal or MCU	terminal or MCU	no	MLP	ITU-T Rec. T.120 series [12]	R (9)	R (9)
	MCC / cancel-MCC	C	MCU	terminal	no	BAS	ETS 300 144 [7]	M	
	MCS / cancel MCS (or MCN)	C	MCU	terminal	no	BAS	ETS 300 144 [7]	CM (4)	
	MIZ and MIS	C	MCU	terminal	no	BAS	ETS 300 144 [7]	M	
Mainte- nance	LCA	C	terminal (1)	terminal	no	BAS	ETS 300 144 [7]		
	LCV	C	terminal (1)	terminal	no	BAS	ETS 300 144 [7]		
	LCD	C	terminal (1)	terminal	no	BAS	ETS 300 144 [7]	M	CM (2)
	LCO	C	terminal (1)	terminal	no	BAS	ETS 300 144 [7]	M	CM (2)
Confe- rence	split-screen indication	I	sending terminal	receiving terminal	yes	embedded in video	H.261 [8]		CM (5)
(continued)									

Table 2 (concluded): C&I signals for videotelephone

	C&I (function or name)	C/I	Source	Sink	Sync. with picture	Transmission channel	Code word definition	NOTES (see below)	
Terminal	Document camera indication	I	sending terminal	receiving terminal	yes	embedded in video	H.261 [8]		CM (6)
	AIA / AIM	I	sending terminal	receiving terminal	no	BAS	ETS 300 144 [7]	CM (7)	CM (7)
	VIA, VIA2, VIA3 VIS	I	sending terminal	receiving terminal	no	BAS	ETS 300 144 [7]	CM (7)	CM (7)
	VIR	I	sending terminal	receiving terminal	no	BAS	ETS 300 144 [7]	CM (8)	CM (8)
Data	Data transmission control	C	sending terminal	receiving terminal	no	BAS + MLP	ETS 300 144 [7] ITU-T / T.120 series of Rec [12].	R (10)	R (10)
	Video compatibility (Dummy)	I	sending terminal	receiving terminal	no	BAS	ETS 300 144 [7]	R (11)	R (11)
<p>NOTE 1: RX - mandatory (or conditionally mandatory) to recognise and act upon. TX - mandatory (or conditionally mandatory) to send when / if relevant conditions occur.</p> <p>NOTE 2: Maintenance terminals only.</p> <p>NOTE 3: Mandatory if the terminal cannot decode high or low video rates - see subclause 6.2.4.1.</p> <p>NOTE 4: Mandatory for a terminal which can transmit LSD, MLP, HSD or H-MLP. Terminals not obeying MCS shall not be able to exchange video in a multipoint call when other terminals are using their data capability.</p> <p>NOTE 5: Mandatory for a terminal which can transmit a split-screen picture to CCITT Recommendation H.100.</p> <p>NOTE 6: Mandatory for a terminal which has a document camera.</p> <p>NOTE 7: Mandatory for a terminal which has user controls to mute audio or cut the video without also switching off the audio/video channel within the transmitted frame.</p> <p>NOTE 8: Mandatory if the terminal itself does not turn video on until it receives this code from the remote terminal. See subclause 6.2.4.2.</p> <p>NOTE 9: Recommended to support enhanced functionalities such as Chair-control, etc.</p> <p>NOTE 10: Recommended for data transmission and/or additional applications.</p> <p>NOTE 11: Recommended for a simple terminal in order to be able to participate to a multipoint conference when other terminals are using a data sub channel (e.g. LSD or MLP).</p>									

5.3.3 In-band signalling procedures

The terminal shall conform to ETS 300 143 [6] for point-to-point communications.

5.3.4 Communication modes of videotelephones

Communication modes of a videotelephone for the ISDN basic access are defined according to their channel configuration and coding. All videotelephones shall be capable of operation in mode a_0 and one or more of the modes a_1 , b_1 , b_2 , b_3 .

The following modes of operation are defined for an ISDN basic interface (see also table 3):

- Mode a_0 : Mode 0U: 64 kbit/s audio to CCITT Recommendation G.711 [13], A or μ -law.
Mode 0F: 56 kbit/s audio to CCITT Recommendation G.711 [13], A or μ -law: 6,4 kbit/s video to ITU-T Recommendation H.261 [8] may, or may not, be activated.
- Mode a_1 : 16 kbit/s audio to CCITT Recommendation G.728 [15] and 46,4 kbit/s video to ITU-T Recommendation H.261 [8].
- Mode a_V : Video only mode (62,4 kbit/s).
- Mode b_1 : 56 kbit/s audio to CCITT Recommendation G.711 [13] A or μ -law and 68,8 kbit/s video to ITU-T Recommendation H.261 [8].
- Mode b_2 : 48 or 56 kbit/s audio to CCITT Recommendation G.722 [14] and 76,8 kbit/s or 68,8 kbit/s video to ITU-T Recommendation H.261 [8].
- Mode b_3 : 16 kbit/s audio to CCITT Recommendation G.728 [15] and 108,8 kbit/s video to ITU-T Recommendation H.261 [8].
- Mode b_V : Video only mode (124,8 kbit/s).

NOTE: Modes a_V and b_V may be used in special applications such as:

- communications between deaf,
- remote observation, etc...

Table 3: Communication modes of videotelephone

Videotelephone mode	Channel rate	ISDN channel	Audio coding	Video to H.261 [8]
a_0	64 kbit/s	B	G.711	optional, ON / OFF
a_1			G.728	
a_V			none	
b_1	128 kbit/s	2B (note)	G.711	ON
b_2			G.722	
b_3			G.728	
b_V			none	
NOTE:	In the case of two B-channels, the channels shall be synchronised according to ETS 300 144 [7].			

6 Terminal procedures and arrangements related to videotelephony call

6.1 Basic call establishment and mode initialisation

The videotelephony communication is set up according to the following steps:

- phase A: call set-up of initial channel, D-channel signalling (subclause 6.1.1);
- phase B: mode initialisation on initial channel, in-band signalling (subclause 6.1.2);
- phase CA if relevant: call set-up of additional channel (subclause 6.1.3);
- phase CB if relevant: initialisation on additional channel (subclause 6.1.4);
- phase C: videotelephone communication (subclauses 6.2 and 6.3);

- phase D/E: call clearing, in-band and D-channel signalling (subclause 6.4).

6.1.1 Phase A - Call set-up for the initial channel

The calling terminal shall request the initial channel using D-channel signalling according to ETS 300 267-1 [17], clause 7.

The called terminal shall send an ALERTING message according to ETS 300 267-1 [17], clause 7 or another message appropriate to this call state. When the called user answers, it sends the CONNECT message to the network.

Before the terminals receive the CONNECT, respectively the CONNECT ACKNOWLEDGE message, the allowed transmission from each terminal is one of the following:

- 1) unframed all-ones;
- 2) Mode-0U;
- 3) Mode-0F with full capability sets according to ETS 300 143 [6] in the BAS position;
- 4) Mode-0F with audio commands (000) [18] and optionally (001) [0].

If 1) or 2) is used there shall be a change to 3) or 4) at, or before, receipt of the CONNECT message at the calling terminal, and at, or before, receipt of the CONNECT ACKNOWLEDGE message at the called terminal.

The moment of receipt of CONNECT or CONNECT ACKNOWLEDGE message defines initialisation of timer T1 for phase B procedure which follows.

If there is no videotelephone in the called subscriber premises, the D-channel procedures specified in ETS 300 267-1 [17], clause 7 result as described below:

- a) fallback is not allowed: no communication (the call is ignored or rejected),
- b) fallback to telephony is allowed and a 7 kHz telephony terminal answers: the final call shall conform to I-ETS 300 245-5 [18] (Mode 1, 2 or 3 according to circumstances is established after a mode initialisation procedure),
- c) Fallback is allowed and a 3,1 kHz telephony terminal answers: the call shall then conform to I-ETS 300 245-2 [19] (Mode 0U),
- d) Interworking occurs and a PSTN telephone answers: the call shall proceed as in c),

NOTE 1: In case b) an indication of fall-back to the "telephony 7 kHz" teleservice is provided to the calling terminal in the CONNECT message. It is, then, allowed to initiate a mode initialisation procedure.

NOTE 2: In case c) an indication of fall-back to the "telephony" (or "3,1 kHz audio teleservice") is provided to the calling terminal in the CONNECT message. It can, then directly enter Mode 0U, omitting the initialisation procedure which would fail.

NOTE 3: In case d) an indication of interworking is given to the calling terminal in the PROGRESS indicator. It can, then directly enter Mode 0U, omitting the initialisation procedure which would fail.

Only terminals able to work in restricted modes shall accept calls from restricted networks.

NOTE 4: Set-up of such calls requires use of specific BC, HLC and LLC (cf. ETR 18).

6.1.2 Phase B - mode initialisation

Using the procedures provided in ETS 300 143 [6], framed PCM audio is transmitted in both directions. After frame and, if a 2B transfer rate capability has been declared, multiframe alignment has been gained, terminal capabilities are exchanged, using the procedures provided in ETS 300 143 [6]. During this phase, a detection of A/ μ -law shall be performed.

NOTE 1: For A/ μ law detection see subclause 6.2.4.4.

If frame alignment cannot be gained (T1 expires), an indication shall be given to the calling user, who can then decide to clear or not clear the resulting audio communication.

If, after connection, the restricted capability BAS code (100) [22] is received by the local terminal, and if which is unable to support interworking with restricted networks, the call shall be released according to phase D/E and an indication shall be given to the calling human user to avoid any new call attempt that cannot be successful.

If 2B capability is received at the calling terminal then it may initiate a request for a second B-channel. Alternatively, this action may be suspended until the user at the calling terminal has given the go-ahead. If the user at either terminal does not wish the call to proceed to two channels, even though his terminal has this capability, he shall set the terminal such that only single-channel capability is declared during the initial capability exchange.

NOTE 2: A videotelephony terminal may declare an initial capability lower than its actual one, and change later to increase picture quality.

When the terminal capabilities have been exchanged using the procedure given in ETS 300 143 [6], the most appropriate transmission mode shall be determined. This should normally be the highest mode (see table 4), but a lower compatible mode may be chosen instead. In the case that both terminals have announced the capability to work on 2 B-channels, the calling terminal may initiate the request for the additional call set-up.

Table 4: Highest default mode for communication between different types of videotelephones using 1B or 2B channel

Xa	Xb1	Xb2/3	Xb4	Xb5	Terminal type
a1	a1	a1	a0	a0	Xa
	b3	b3	b1	b1	Xb1
		b2/b3 (note 1)	b1	b2	Xb2/3
			b1	b1	Xb4
				b2	Xb5

NOTE 1: "b2/b3" indicates that either of b2 or b3 can be transmitted; b2 gives better audio, while b3 gives better video.

NOTE 2: If the terminals have not both adopted the same mode, an asymmetric communication will result.

6.1.2.1 Case of 1B call

If the communication is to remain on 1 B-channel only, a mode switch for a suitable 1B mode shall be performed; this includes changing the transmitter from A- to μ -law, if necessary. It shall be mandatory to send information about the used law (A or μ), using the appropriate command. The video transmission can start at any time after the completion of the initial capability exchange (the call has then reached phase C). This may be at 46,4 kbit/s (less 800 bit/s if Encryption Control Signal (ECS) is also on) with audio to CCITT Recommendation G.728 [15], or at 6,4 kbit/s if a 56 kbit/s to CCITT Recommendation G.711 [13] audio mode is in use (mode a₀ et a₁ in table 3). To ensure that the picture builds up quickly when the video transmission first begins, the encoder shall transmit in INTRA mode according to ITU-T Recommendation H.261 [8].

6.1.2.2 Case of 2B call

If an additional channel is going to be established immediately, mode switching to a mode including video may optionally be deferred until the second channel has been established.

During the establishment of the additional channel, the video may be switched on and, according to ETS 300 144 [7], it shall occupy all bit positions not allocated to audio or data. This video mode may be regarded as an interim state.

If the remote terminal decoder is unable to decode the video information at the start of a video transmission, it misses the INTRA pictures. In this case, it shall issue a VCU command after the transmission rate has changed (phase CB) so that it can decode the video data (see ETS 300 144 [7]).

6.1.3 Phase CA - call set-up for the additional channel

When this phase applies, the additional call set-up shall be requested by the calling terminal using D-channel signalling according to ETS 300 267-1 [17], clause 7. A frame conforming to ETS 300 144 [7] is overlaid on the additional channel as soon as it is connected.

The receipt of CONNECT or CONNECT ACKNOWLEDGE message defines the end of Phase CA.

A terminal having answered an incoming call shall not make a request for a connection back to the calling terminal.

If the additional connection cannot be established, the communication remains in phase C in a 1 B mode or is cleared by the calling user.

6.1.4 Phase CB - mode initialisation on the additional channel

Frame and multiframe alignment shall be sought and gained. The synchronisation of the two channels is achieved as specified in ETS 300 144 [7].

A mode switch towards the highest 2B modes, identified during Phase B shall then be performed using the procedure defined in ETS 300 143 [6].

If the synchronisation cannot be reached, the communication remains in Phase C in a 1B mode, the second call shall be cleared and an indication shall be given to the local calling human user (who may then decide either to retain the call in the 1B mode or clear down and make another attempt to obtain a 2B call).

NOTE: If the terminals have not both adopted the same mode, the result may be an asymmetric communication.

6.2 Videotelephony communication - Phase C

In the case where more than one channel is used, there shall be intermediate phases CA and CB as described above. Likewise, if additional channels are dropped during the call there shall be intermediate phases (see subclause 6.4). The provisions of this subclause apply to any channel, initial or additional, for which phase B has been completed and phase D/E has not yet started.

NOTE: Changes of communication here do not involve D-channel signalling. Changes of communication also involving D-channel signalling are described in subclause 6.3.

6.2.1 Mode switching

According to action by either user (for example, starting a facsimile machine) a different mode from the initially selected mode may become more appropriate. Switching to this mode is made according to the procedure of ETS 300 143 [6].

A switch to a mode which is unframed in the I-channel shall only be done if:

- the remote terminal is put on hold (e.g. prior to call transfer, see subclause 7.5.3); or
- the call is going to be cleared (see subclause 6.4).

This is to avoid an unexpected loss of frame alignment.

6.2.2 Capability change

The user may change the capability of his terminal during the call (for example, by connecting or switching-on auxiliary telematic equipment); the terminal shall then perform a capability exchange according to the procedure defined in ETS 300 143 [6].

6.2.3 Loopbacks for maintenance purposes (optional)

Some loopback functions defined in ETS 300 144 [7] allow verification of various functional aspects of the terminal, to ensure correct operation of the system and satisfactory quality of the service to the remote party.

a) Loop at terminal-network interface (towards network)

Upon receiving the LCD command as defined in ETS 300 144 [7], loopback shall be activated at the digital interface of the terminal toward the network side. In case of a multiple B-channel arrangement, loopback is activated in each connection.

b) Loop at analogue I/O interface (optional)

Upon receiving the LCV or LCA command as defined in ETS 300 144 [7], loopback should, where possible, be activated at the analogue interface of the video/audio codec towards the video/audio codec.

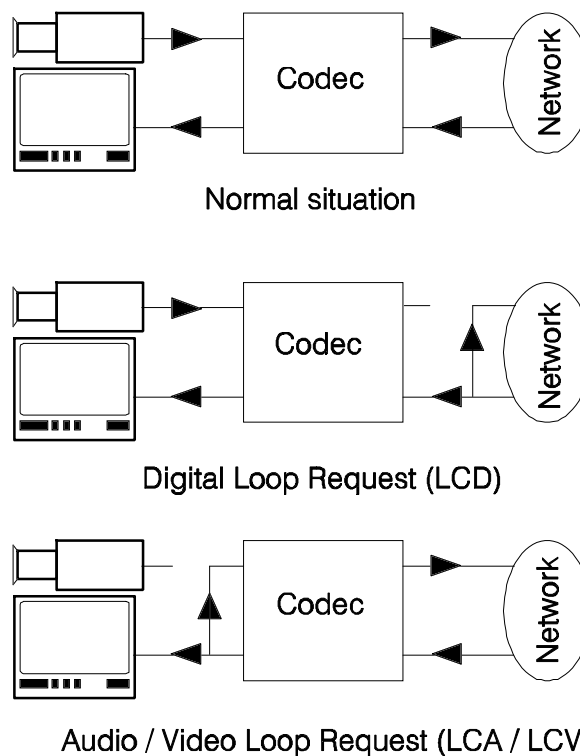


Figure 2: Loopback

6.2.4 Terminal arrangements

6.2.4.1 Video transmission

Pictures may or may not be visible to both users as soon as initialisation is complete:

- either user may switch to Video On;
- either user may send the C&I BAS code VIR and wait the remote party answer (cf. subclause 6.2.4.3);
- a terminal may send the C&I BAS code VIS to indicate video suppression.

In any case, the terminal screen shall display a picture/message/symbol to identify the "no fault" condition.

When only the initial channel is present and the audio is at 56 kbit/s, "Video On" results in a video rate of 4,8 kbit/s (4,0 kbit/s if the Encryption Control Signal (ECS) channel is also on). A terminal which is not capable of decoding such a low rate video stream shall disable its decoder. When, subsequently, the video rate is increased sufficiently that decoding becomes possible, then the decoder shall be re-enabled and a command VCU shall be transmitted (see ETS 300 144 [7]).

When two B-channels are present and the audio is switched off, "Video On" results in a video rate of 124,8 kbit/s (124,0 kbit/s if the ECS channel is also on). A terminal which is not capable of decoding such a high rate video stream shall disable its decoder. When, subsequently, the video rate is decreased sufficiently that decoding becomes possible, then the decoder shall be re-enabled and a command VCU shall be transmitted (see ETS 300 144 [7]).

6.2.4.2 Picture definition

The communication modes include the possibility to use CIF format as well as QCIF format. The picture format may differ between the two directions.

6.2.4.3 Exchange of video by mutual agreement (optional)

The symbol VIR, "Video Indicate Ready-to-activate", is defined in ETS 300 144 [7]. Its use is optional, but when used the procedure shall be as follows.

Terminal A has been set so that video is not transmitted unless, and until, the remote terminal has also indicated readiness to transmit video. Terminal A shall send the indication VIR when the initial capability exchange has been completed, but shall not transmit a video signal until it has received either VIR or the video-ON command.

6.2.4.4 Audio decoding

Whenever a terminal is receiving in mode 0U, or is receiving in mode 0F but has not received a command stating A/ μ coding law, it shall monitor the received audio signal (e.g. according to the algorithm specified in the Appendix to CCITT Recommendation G.725 [5]) to identify the coding law. The audio decoder shall be switched accordingly.

6.2.4.5 Delay compensation (optional)

Video codecs, as in ITU-T Recommendation H.261 [8], require some processing delay, while the audio codecs to CCITT Recommendations G.711 [13], G.722 [14] and G.728 [15] involve much less delay. Lip synchronisation is not mandatory, but where it is to be maintained, the video processing delay shall be compensated in the audio path. Since video coder and decoder delays may vary according to implementation, delay compensation shall be carried out individually at the coder and decoder. A reference measurement method of video coder and decoder delays is defined in ITU-T Recommendation H.261 [8].

NOTE: The effect of lip synchronisation on the overall quality of a videotelephony communication is a recommended option.

6.3 Change of connection arrangements

6.3.1 Expanding a 1B call to a 2B call

If, for example, a higher picture quality is desired, the communication mode can be changed, by the calling terminal only, from a 1B call to a 2B call. This can be done for example, if two Xb2/3 terminals are connected. The procedure to be used is as follows:

Initial situation: TERM A is the calling terminal, and it is connected to TERM B in a 1B connection.

Requirement: TERM A wants to change the connection arrangement from 1B to 2B.

- In-band signalling: TERM A signals TERM B a 2B capability within a valid capability set.
 - a) Outcome: TERM B signals a 2B (or higher) capability; continue with D-channel signalling.
 - b) Outcome: TERM B signals a 1B capability; 2B operation not possible - not proceed.

- D-channel signalling: TERM A set up an additional channel according to phase CA.
 - a) Outcome: the connection is established; proceed with in-band signalling.
 - b) Outcome: the connection is not established; continue in 1B operation. If desired by the human user, try again.
- In-band signalling: continue according to phase CB.

6.3.2 Reducing a 2B call to a 1B call

This functionality may be invoked to reduce the call costs, or to free the second channel on a basic access for other purposes (e.g. for facsimile applications during the session). The procedure to be used is as follows:

Initial situation: TERM A is connected to TERM B in a 2B connection.

Requirement: TERM A wants to change the connection arrangement from 2B to 1B.

- In-band signalling, initial channel:
 - a) TERM A switches its transmitter to a mode in which the additional channel is vacant, if necessary stopping transmission of video, data, etc.
 - b) TERM A switches to 1B transfer rate.
 - c) TERM A then forces TERM B to a mode in which the additional channel is vacant by sending 1B transfer-rate capability within a valid capability set, using the mode-forcing procedure given in ETS 300 143 [6].
- D-channel signalling: TERM A disconnects the additional channel according to ETS 300 267-1 [17], clause 7.

6.4 Call clearing - Phase D/E

The procedure described in this subclause ensures that:

- the distant terminal (either a videotelephone or a 7 kHz telephone) does not erroneously invoke an error recovery procedure due to a loss of frame alignment;
- the human user gets the right indications via tones and announcements from the network exchange;
- according messages can be displayed for the human user by the terminal.

It is assumed that the terminals receive in a framed mode according to ETS 300 144 [7] prior to the procedure described. Otherwise an in-band signalling is not necessary, e.g. in a communication with a telephone.

6.4.1 Clearing terminal

The clearing terminal shall:

- a) discontinue encryption and, by successive BAS commands, change its transmission mode to: audio mode 0F(A), video-OFF, data-OFF, ECS-OFF, transfer rate 64 kbit/s;
- b) switch audio off, using the command Au-off, U;
- c) disconnect all connections according to ETS 300 267-1 [17], clause 7.

6.4.2 Cleared terminal

When receiving from the network a disconnection message for the additional channel, it shall release this channel at once.

When a disconnection message includes information about the availability of tones and announcements provided by the network (see ETS 300 102-1 [9]), the audio decoder shall be restarted in A-law to be able to decode them

properly. Otherwise, the cleared terminal shall release the I-channel at once from the network to make it available immediately for another connection.

7 Implementation of supplementary services by videotelephony terminals

This clause lists special requirements applicable to videotelephony terminals for their optional use of various supplementary services.

7.1 Calling Line Identification Presentation (CLIP) and Connected Line Identification Presentation (COLP)

These supplementary services shall be activated for the initial and additional connection (i.e. for the bearer services and teleservices invoked by the terminal when setting up an audiovisual call).

They are specially useful in various cases:

- CLIP: allows discrimination between an expected call for an additional channel and any other incoming call;
- COLP: allows a terminal to set-up an additional channel when it knows the remote terminal has the related capability (e.g. after a call transfer).

NOTE 1: The other possibilities to dial the appropriate number are:

- to have a previous knowledge of the remote address;
- to use the relevant in band procedure described in ETS 300 143 [6];
- verbal exchange and manual dialling.

NOTE 2: When the additional connection is set up to a destination address different to the first one, the user should be aware of possible charging implications.

Restriction of these supplementary services (CLIR and COLR) should be avoided for videotelephony.

7.2 Multiple Subscriber Number (MSN)

The MSN shall be the same for the initial and additional channels (i.e. for the bearer services and teleservices invoked by the terminal when setting up an audiovisual call).

NOTE: Terminals outside Europe may use different network addresses for initial and additional connections.

7.3 Call Completion to Busy Subscriber (CCBS) and Call Completion on No Reply (CCNR)

The activation of this supplementary service shall be limited to the initial channel, since even when a successful initial connection has been established, there is no evidence that the service is available for the additional channel.

7.4 Call Deflection (CD)

If a terminal has deflected an I-channel, it shall deflect any further additional channel set-up to the same address.

7.5 Supplementary services resulting in connection interruption

This subclause applies to the period after completion of phase B, and before starting phase D/E. It describes procedures for the use of those supplementary services which involve an interruption or switching of transmission channel(s):

- Terminal Portability;
- Call Hold;
- Call Transfer.

If one of these supplementary services is invoked, the B-channel(s) is/are interrupted, causing framing to be lost in the receiving parts of the terminals. Special care shall be taken to distinguish this specific loss of framing from an (erroneous) unexpected loss of framing and to avoid the activation of a fault recovery procedure.

In case of 2B channels, the supplementary service invocation applies separately to both calls: order of invocation, and successful result of the first invocation, shall be taken into account.

Related D-channel procedures are specified in other ETSs.

7.5.1 Procedure P

This procedure is used to prepare execution of the above supplementary services.

- 1) TERM A (which invokes the supplementary service) discontinues encryption, if in use, and by successive BAS commands changes its transmission mode to: audio mode 0F, transfer rate 64 kbit/s video-OFF, data-OFF, ECS-OFF.
- 2) TERM A then forces TERM B (initially connected to TERM A) to transmit in mode 0F by using the mode-0 forcing procedure (see ETS 300 143 [6]); if possible, TERM B should be forced to mode 0F(A), otherwise to mode 0F(μ).
- 3) TERM A then switches its transmitter to mode 0U (A/ μ); TERM B is now receiving unframed, and so does not enter a fault procedure (due to "unexpected loss of frame alignment") when the B-channel is interrupted.

7.5.2 Terminal Portability (TP)

7.5.2.1 Invocation procedure

Initial situation: TERM A is connected to TERM B. Either TERM A or TERM B had established the call.

Requirement: TERM A wishes to suspend the connection(s).

- a) Procedure P is carried out.
- b) D-channel signalling for the supplementary service is carried out. If two connections are involved, the supplementary service applies for each connection separately and the additional channel is suspended first.

7.5.2.2 Resumption after invocation of Terminal Portability

Initial situation: TERM A was connected to TERM B. TERM A had suspended the connection(s). TERM A has now "forgotten" the capabilities of TERM B.

Requirement: TERM A wishes to resume the connection(s).

- a) D-channel signalling is applied, resuming both connections separately in the 2B case (I-channel first).
- b) Upon receipt of RESUME ACKNOWLEDGE message from the network for the I-channel, TERM A initiates phase B; in the case of a 2B call, phase CB is started when phase B has been completed and the RESUME ACKNOWLEDGE message has been received from the network for the additional channel.

7.5.3 Hold

7.5.3.1 Invocation procedure

Initial situation: TERM A is connected to TERM B. Either TERM A or TERM B had established the call.

Requirement: TERM A wishes to put TERM B on HOLD.

- a) Procedure P is carried out.
- b) D-channel signalling for the supplementary service is carried out, requesting the network to put TERM B on HOLD; if two connections are used, the supplementary service applies at least for the I-channel; the additional channel may be put on hold or not.

7.5.3.2 Retrieval after invocation of HOLD

Initial situation: TERM A has TERM B on hold. TERM A may have, now, "forgotten" the capabilities of TERM B.

Requirement: TERM A wishes to retrieve the call with TERM B.

- a) D-channel signalling is applied to retrieve the I-channel (in the 2B case).
- b) Upon receipt of the RETRIEVE ACKNOWLEDGE message from the network for the I-channel, TERM A initiates phase B; in the case of a 2B call, phase CB is started (if necessary) when phase B has been completed and the RETRIEVE ACKNOWLEDGE message has been received from the network for the additional channel. If the additional channel is useless it shall be cleared at this step.

7.5.4 Explicit Call Transfer (ECT)

Initial situation: TERM A is connected to TERM B. Either TERM A or TERM B has established the call.

Requirement 1: TERM A wishes to put TERM B on Hold, make a call to TERM C and then connect TERM B to TERM C.

Requirement 2: TERM A wishes to put TERM B on Hold, accept a call from TERM C and then connect TERM B to TERM C.

7.5.4.1 Procedures for the transferring terminal A

- a) Empty all additional channels. Procedure P is carried out.
 - b) In the call A-B: Activate Call Hold for the I-channel (as described in subclause 7.5.3).
 - c) Establish the call from A to C, perform capability exchange.
 - d) Check, whether B and C have a least a common set of audio capabilities. If this is not the case, a call transfer shall not be activated and appropriate indications shall be given to the user(s).
 - e) If the capability exchange indicates that less channels can be used in the call A-C than there are channels which are intended to be transferred (i.e. have been used in the call A-B), release those channels which cannot be used. (e.g.: User A, in "videotelephony communication" with user B transfers the call to user C who has only a telephony terminal).
 - f) Adapt, if possible and necessary, the used services between TERMINAL A on one side and TERMINAL B and C on the other sides. This step might not be necessary if BC and HLC are not evaluated by the switch (e.g. in private networks where BC and HLC have less significance). For this adaptation, the In-call Modification supplementary service might be used in future.
 - g) Invoke ECT for the I-channel.
 - h) If the establishment of in-band signalling according to ETS 300 143 [6] is not possible (due to the use of analogue transmission paths or any other reason), the user shall be given an appropriate indication. This may occur when the connection had been established using the speech teleservice, and the connection has been transferred to a videotelephone later on.
 - i) Release unused additional channels.
 - j) Put the (remaining) additional channel(s) on hold.
- NOTE: The advantage of putting the channels on hold so late is, that the additional B-channels cannot be used by another terminal connected to the same basic access in the meantime.
- k) If the invocation of CH for the I-channel had been successful, but the invocation of CH for further channel(s) failed, then these channels shall be disconnected.

- l) Invoke ECT for the additional channel(s) which are still on hold, i.e. are not yet DISConnected. If the supplementary service COLP is activated, the calling terminal shall use the information coming from the "connected address" field for the SETUP of the additional call.
- m) If the invocation of ECT for any additional channel fails, then this channel shall be DISConnected.

7.5.4.2 Procedures for the transferred and transferred-to terminal

- a) Initial channel. After recognising that a call has been transferred (an indication is received from the network by a NOTIFICATION message), the initialisation phase (cap exchange, etc.) shall be started.

NOTE 1: It is assumed that an adequate message is given to both the transferred and the transferred-to terminal via the D channel signalling as specified in ETS 300 369-1.

- b) Additional Channels. If a terminal is notified that ECT has been performed, it is allowed to establish additional channels, even if it did not set up the initial connection.

NOTE 2: After an ECT, both of the newly connected terminals may setup additional channels.

To avoid collision situations which might occur if both parties try to establish an additional channel automatically as soon as the call has been transferred, the terminal shall wait a random period of time before an additional channel is established automatically. This time period should be in the range 0 to 3 seconds.

8 Optional enhancements

8.1 Data ports

Data ports are physical I/O ports of the terminal for telematic and other equipments. They are activated and deactivated by BAS commands according to the in-band signalling procedures specified in ETS 300 143 [6]. Depending on the transmission capability of a connection, e.g. 1B or 2B, various bit rates are available at these ports. Data conveyed at the port(s) are transmitted transparently. Data rates are listed in ETS 300 144 [7].

NOTE 1: Interface and protocols used to set up a data communication are defined in another Standard.

NOTE 2: It is recommended to use the Multi Layer Protocol, specified in the ITU-T T.120 series of Recommendations [12], to control data transmission and allocation of data channels to various applications.

8.2 Encryption

Communication between two terminals may be encrypted if both are equipped with the same algorithm. The ECS channel shall be opened according to ETS 300 143 [6], and the encryption process carried out according to ITU-T Recommendation H.233 [20]. Encryption may be activated at any time after Phase B. When the encryption is turned on, all the user information is encrypted. Once outgoing encryption has been activated, it shall not be deactivated as a result of any change in the incoming signals (for example, an incoming capability set with ECS-capability omitted), but only upon local action by the user.

9 Fault indication

If a system fault is detected, the procedures in ETS 300 143 [6] shall be followed.

If there is a temporary loss of service or significant reduction of quality (such as loss of picture or speech path) while automatic procedures are in progress to recover from the fault, then a message or other indication shall be displayed to the user, making it clear that no action by the user is needed at this point.

If such procedures result in a loss of service to the user which can only be recovered by user action, an indication concerning this fault and the action to be taken shall be displayed.

Annex A (informative): Detailed steps and procedures

This annex summarises the various successive steps which shall be followed during a 2 B-channel videotelephony call, and identifies the various states taken by the terminals in the case where the videotelephony communication requires two B-channels successively set up.

Various situations are described below in the tables with the following titles:

- A.1 Call set-up - Normal operation
- A.2 Change of communication mode (1 B → 2 B-channels)
- A.3 Change of communication mode (2 B → 1 B Channel)
- A.4 Call clearing
- A.5 Call HOLD
- A.6 Call RETRIEVE

Procedures referenced in these tables are described below.

Procedures references and abbreviations used in annex A

Detailed Procedure	Name/Function	Reference	
		ETS	subclause
D1	Call establishment at the originating interface	300 102-1 [9]	5.1
	Call establishment at the destination interface taking into account	300 102-1 [9]	5.2
	Special case of videotelephony calls	300 267-1 [17]	7
D2	Call clearing initiated by the user (terminal A)	300 102-1 [9]	5.3.3
	Call clearing initiated by the network (terminal B)	300 102-1 [9]	5.3.4
D3	Holding a call	300 141	9.1
D4	Retrieving a call	300 141	9.4
B1	Frame reinstatement	300 143 [6]	6.3
	see also Gain, loss and recovery of frame alignment	300 144 [7]	6.3 and 6.4
B2	Capability exchange sequence	300 143 [6]	6.1
B3	Mode switching	300 143 [6]	6.2
B4	Mode forcing procedure	300 143 [6]	7.3

Legend used in tables A.1 to A.6

I	Idle (call)	CAB1	Initial call from A to B
A	Active (call)	CAB2	Additional call from A to B
H	Held (call)	↓	No change

Table A.1: Call Setup - Normal operation

P H A S E	Step	Call Status		Signalling Procedure		Terminal A		Terminal B		Procedure Reference	Condition for next step	N O T E S
		C _{AB1}	C _{AB2}	D-channel	In-band	Status	Mode	Status	Mode			
	0/A1	I	I			audio: OFF video: OFF	None	audio: OFF video: OFF	None		User A dials for a videotelephony call	
A	1/A1	↓	↓	SETUP C _{AB1} ⇒ network		↓		↓		D1	<CONNECT> C _{AB1} received by terminal A	
B	2/A1	A	↓		Frame alignment	↓	Mode 0 framed	↓	Mode 0 framed	B1 + B2	Frame Sync. gained Cap-set exchanged	
	3/A1	↓	↓		Mode choice & command	↓	↓	↓	↓	B3	Mode switching successfully completed	
	4/A1	↓	↓			audio: ON video: ON/OFF	Mode a ₀ or a ₁	audio: ON video: ON/OFF	Mode a ₀ or a ₁		None	1
CA	5/A1	↓	↓	SETUP C _{AB2} ⇒ network		↓	↓	↓	↓	D1	<CONNECT> C _{AB2} received by terminal A	
CB	6/A1	↓	A		Frame alignment	↓	↓	↓	↓	B1	Frame Sync. gained for additional channel	
	7/A1	↓	↓		Mode switch	↓	↓	↓	↓	B3	Mode switching successfully completed	
C	8/A1	↓	↓			audio: ON video: ON	Mode b ₁ , b ₂ /b ₃	audio: ON video: ON	Mode b ₁ , b ₂ /b ₃			2
NOTE 1: Video at low bit rate will generally be switched off. NOTE 2: Waiting for a new action of the human user.												

Table A.2: Change of communication mode (1 to 2 B-channels)

P H A S E	Step	Call Status		Signalling Procedure		Terminal A		Terminal B		Procedure Reference	Condition for next step	N O T E S
		C _{AB1}	C _{AB2}	D-channel	In-band	Status	Mode	Status	Mode			
C1	0/A2	A	I			audio: ON video: ON/OFF	Mode a ₀ or a ₁	audio: OFF video: ON/OFF	Mode a ₀ or a ₁		User A requests an additional channel	1
	1/A2	↓	↓		New cap-set transmitted	↓	↓	↓	↓	B2	New cap-set agreed (B supports 2 B-channels)	
CA	2/A2	A	↓	SETUP C _{AB2} ⇒ network		↓	↓	↓	↓	D1	<CONNECT> C _{AB2} received by terminal A	
CB	3/A2	↓	A		Frame alignment	↓	↓	↓	↓	B1	Frame Sync. gained for additional channel	
	4/A2	↓	A		Mode switch	↓	↓	↓	↓	B3	Mode switching successfully completed	
C2	5/A2	↓	↓			audio: ON video: ON	Mode b ₁ , b ₂ /b ₃	audio: ON video: ON	Mode b ₁ , b ₂ /b ₃			2
NOTE 1: Video at low bit rate will generally be switched off. NOTE 2: Waiting for a new action of the human user.												

Table A.3: Change of communication mode (2 to 1 B-channel)

P H A S E	Step	Call Status		Signalling Procedure		Terminal A		Terminal B		Procedure Reference	Condition for next step	N O T E S
		C _{AB1}	C _{AB2}	D-channel	In-band	Status	Mode	Status	Mode			
C1	0/A3	A	A			audio: ON video: ON	Mode b ₁ , b ₂ /b ₃	audio: ON video: ON	Mode b ₁ , b ₂ /b ₃		User A initiates clearing of the additional channel	1
	1/A3	↓	↓		New mode forced	↓	↓	↓	↓	B4	New mode adopted by both terminals	
	2/A3	↓	↓	CLEAR C _{AB2} ⇒ network		audio: ON video: ON/OFF	Mode a ₀ or a ₁	audio: OFF video: ON/OFF	Mode a ₀ or a ₁	D2	<REL COMPL> C _{AB2} sent by A	
C1	3/A3	↓	I									2

NOTE 1: Video at low bit rate will generally be switched off.
 NOTE 2: Waiting for a new action of the human user.

Table A.4: Call clearing

P H A S E	Step	Call Status		Signalling Procedure		Terminal A		Terminal B		Procedure Reference	Condition for next step	N O T E S
		C _{AB1}	C _{AB2}	D-channel	In-band	Status	Mode	Status	Mode			
C	0/A4	A	A			audio: ON video: ON	Mode b ₁ , b ₂ /b ₃	audio: ON video: ON	Mode b ₁ , b ₂ /b ₃		User A clears communication	
D	1/A4	↓	↓		Mode switch	audio: ON video: OFF	Mode 0 unframed	audio: ON video: OFF	Mode 0 unframed	B4	Mode switching successfully completed	
	2/A4	↓	↓		Command audio OFF	audio: OFF video: OFF	↓	audio: OFF video: OFF	↓	B3	None	
E	3/A4	↓	↓	CLEAR C _{AB2} ⇒ network		↓	↓	↓	↓	D2	<REL. COMPL.> C _{AB2} received by A	
	4/A4	↓	I	CLEAR C _{AB1} ⇒ network		↓	↓	↓	↓	D2	<REL. COMPL.> C _{AB2} received by A	
	5/A4	I	↓			↓	stopped	↓	stopped			*

NOTE: Waiting for a new action of the human user.

Table A.5: Call Hold

P H A S E	Step	Call Status		Signalling Procedure		Terminal A		Terminal B		Procedure Reference	Condition for next step	N O T E S
		C _{AB1}	C _{AB2}	D-channel	In-band	Status	Mode	Status	Mode			
C	0/A4	A	A			audio: ON video: ON	Mode b ₁ , b ₂ /b ₃	audio: ON video: ON	Mode b ₁ , b ₂ /b ₃		User action on HOLD key	
P	1/A4	↓	↓		Mode switching	audio: ON video: OFF	Mode 0 Framed	audio: ON video: OFF	Mode 0 Framed	B3	Mode switching successfully completed	
	2/A4	A	↓		Mode 0 forcing	audio: ON video: OFF	Mode 0 unframed	audio: ON video: OFF	Mode 0 unframed	B4	Both terminals in mode 0 unframed	
CH	3/A4	↓	H	HOLD C _{AB2} invocation		↓	Mode 0 unframed	↓	Mode 0 unframed	D3	<HOLD ACK> C _{AB2} received by A	
	4/A4	H	↓	HOLD C _{AB1} invocation		audio: OFF video: OFF	↓	↓	↓	D3	<HOLD ACK> C _{AB2} received by A	
	5/A4	↓	↓			↓	↓	↓	↓		None	*
NOTE: Waiting for a new action of the human user.												

Table A.6: Call Retrieve

P H A S E	Step	Call Status		Signalling Procedure		Terminal A		Terminal B		Procedure Reference	Condition for next step	N O T E S
		C _{AB1}	C _{AB2}	D-channel	In-band	Status	Mode	Status	Mode			
CH	0/A6	H	H			audio: OFF video: OFF	Mode 0 unframed	audio: OFF video: OFF	Mode 0 unframed		User action on RETRIEVE key	
A	1/A6	↓	↓	RETRIEVE C _{AB1} invocation		↓	↓	↓	↓	D1	<RETR. ACK> C _{AB1} received by terminal A	
	2/A6	A	↓		Frame alignment	↓	Mode 0 framed	↓	Mode 0 framed	B1 + B2	Frame Sync. gained Cap-set exchanged	
B	3/A6	↓	H		Mode choice & command	↓	↓	↓	↓	B3	Mode switching successfully completed	
	4/A6	↓	↓			audio: ON video: ON/OFF	Mode a ₀ or a ₁	audio: ON video: ON/OFF	Mode a ₀ or a ₁		None	1
CA	5/A6	↓	↓	RETRIEVE C _{AB1} invocation		↓	↓	↓	↓	D4	<RETR. ACK> C _{AB12} received by terminal A	
CB	6/A6	A	A		Frame alignment	↓	↓	↓	↓	B1	Frame Sync. gained for additional channel	
	7/A6	↓	↓		Mode switch	↓	↓	↓	↓	B3	Mode switching successfully completed	
C	8/A6	↓	↓			audio: ON video: ON	Mode b ₁ , b ₂ /b ₃	audio: ON video: ON	Mode b ₁ , b ₂ /b ₃			2
<p>NOTE 1: Video at low bit rate will generally be switched off. NOTE 2: Waiting for a new action of the human user.</p>												

Annex B (informative): Bibliography

- ETR 018 (1994): "Integrated Services Digital Network (ISDN); Application of the Bearer Capability (BC) High layer Compatibility (HLC) and Low layer Compatibility (LLC) information elements by terminals supporting ISDN services".
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History

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