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Contents

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Foreword

This Interim European Telecommunication Standard (I-ETS) has been produced by the Terminal Equipment (TE) Technical Committee of the European Telecommunications Standards Institute (ETSI).

An ETSI standard may be given I-ETS status either because it is regarded as a provisional solution ahead of a more advanced standard, or because it is immature and requires a "trial period". The life of an I-ETS is limited to three years after which it can be converted into an ETS, have it's life extended for a further two years, be replaced by a new version, or be withdrawn.

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1 Scope

This Interim European Telecommunication Standard (I-ETS) specifies the necessary signalling procedures and interfaces of a data port of ITU-T Recommendation V.24 [2] type on an audiovisual terminal using framed communication as described in ETS 300 144 [1], to which a Personal Computer (PC) or similar Data Terminal Equipment (DTE) may be attached.

The data communication facility is intended to provide an independent data channel which may be used for general data communication between two terminals. The data channel may support transmission in either or both directions.

This I-ETS describes two optional schemes:

- a fully standardized data-transmission and applications-sharing scheme capable of multipoint operation; this requires conformant software to be present on both DTEs, and the link can be controlled from the DTEs themselves. The scheme could be extended to higher bit-rates, as may be required in the future;

- a simplified scheme which does not require standardized software but which gives point-to-point communication between PCs having a common application; in this case the link must be controlled by the user from the videophones.

Terminals supporting teleservices using in-band signalling (e.g. telephony 7 kHz or videotelephony) may offer data communication facilities as described in this specification as an option, but the facility is not a part of the defined teleservice.

This interim standard is applicable to terminals which are intended for connection to the pan-European Integrated Services Digital Network (ISDN) as provided by European public telecommunication operators at the T reference point or coincident S and T reference point, and which support in-band signalling and frame communication as described in ETS 300 144 [1].

2 Normative references

This I-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 I-ETS only when incorporated in it by amendment or revision. For undated references the latest edition of the publication referred to applies.

[1] ETS 300 144 (1996): "Integrated Services Digital Network (ISDN): Audiovisual services; Frame structure for a 64 kbit/s to 1 920 kbit/s channel and associated syntax for inband signalling".

[2] ITU-T Recommendation V.24 (1994): "List of definitions for interchange circuits between Data Terminal Equipment (DTE) and Data Circuit-terminating Equipment (DCE)".

[3] ITU-T Recommendation V.28 (1994): "Electrical characteristics for unbalanced doubled-current interchange circuits".

[4] ISO 2110 (1989): "Information technology- Data communication - 25-pole DTE/DCE interface connector and contact number assignments".

[5] ITU-T Recommendation T.122 (1995): "Multipoint communication service for audiographic and audiovisual conferencing service definition".

[6] ITU-T Recommendation T.123 (1995): "Protocol stacks for audiographic and audiovisual teleconference applications".

[7] ITU-T Recommendation T.124 (1995): "Generic Conference Control".

[8] ITU-T Recommendation T.125 (1994): "Multipoint communication service protocol specification".

[9] CCITT Recommendation Q.922 (1992): "ISDN data link layer specification for frame mode bearer services".

[10] ETS 300 145 (1996): "Integrated Services Digital Network (ISDN); Audiovisual services; Videotelephone systems and terminal equipment operating on one or two 64 kbit/s channels".

[11] ITU-T Recommendation H.320 (1994): "Narrow-band visual telephone systems and terminal equipment".

[12] ETS 300 143 (1994): "Integrated Services Digital Network (ISDN); Audiovisual services Inband signalling procedures for audiovisual terminals using digital channels up to 2 048 kbit/s".

[13] ISO/IEC 3309 (1993): "Information technology - Telecommunications and information exchange between systems - High-layer Data Link Control (HDLC) procedures - Frame structure".

[14] ITU-T Recommendation V.14 (1994): "Transmission of start-stop characters over synchronous bearer channels".

3 Definitions and abbreviations

3.1 Definitions

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

H.221 framing: Framing as specified in ETS 300 144 [1].

terminal: Audiovisual terminal and attached personal computer or similar.

T.120 protocol: Protocols conforming to the specifications given in ITU-T Recommendations T.122 [5], T.123 [6], T.124 [7] and T.125 [8].

MLP: A logical data channel defined in ETS 300 144 [1].

asynchronous: Transmission where start-stop characters are used to control the data flow.

synchronous: Transmission where no start-stop characters are used to control the data flow.

3.2 Abbreviations

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

API	Application Program Interface
DCE	Data Communication Equipment
DSR	Data Set Ready
DTE	Data Terminal Equipment
DTR	Data Terminal Ready
FCS	Frame Check Sequence, see ITU-T Recommendation Q.922 [9]
HDLC	High-layer Data Link Control
ISDN	Integrated Services Digital Network
MLP	See subclause 3.1
MCU	Multipoint Control Unit
PC	Personal Computer

4 General

4.1 Overview

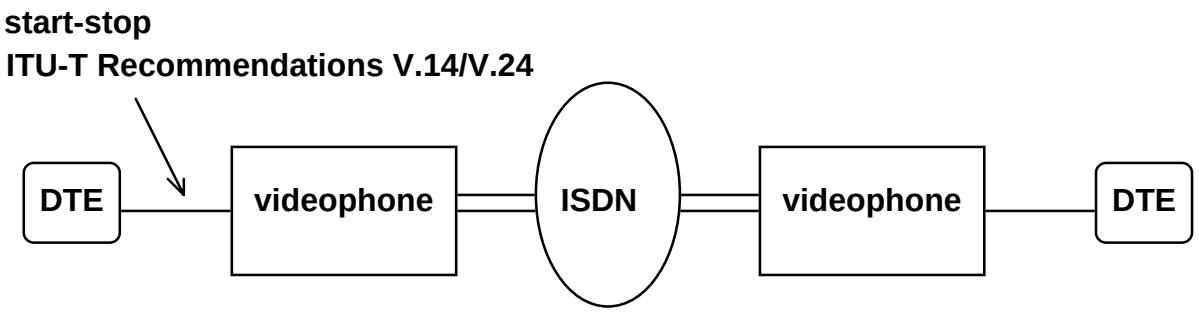


Figure 1: System configuration

Figure 1 shows the general arrangement to which the provisions of this I-ETS apply: two terminals using in-band signalling as specified in ETS 300 144 [1] are in communication via the ISDN. To each terminal a DTE (such as a PC) is attached, the DTEs are able to communicate across the telecommunication link between the videophones.

This I-ETS describes two schemes:

- a fully standardized data-transmission and applications-sharing scheme (see clause 5), capable of multipoint operation; this requires conformant software to be present on both DTEs, and the link can be controlled from the DTEs themselves. The scheme could be extended to higher bitrates, as may be required in the future (see figure 2);

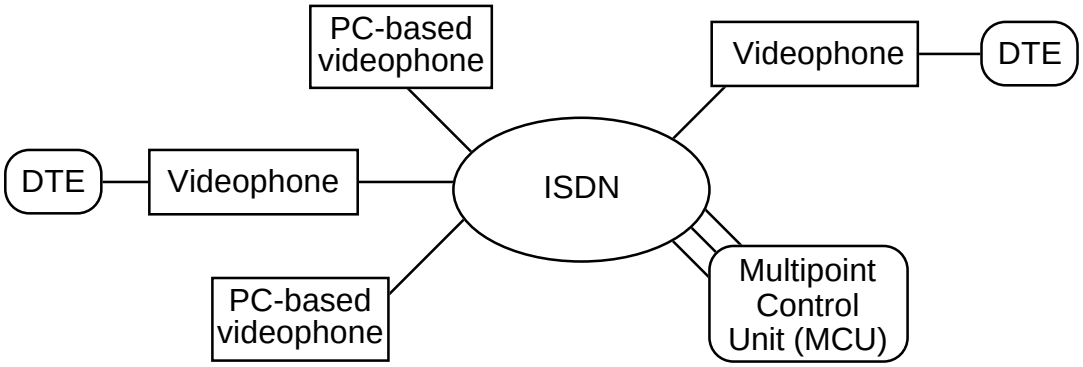


Figure 2: Multipoint communication using T.120 protocol

- a simplified scheme (see clause 6) which does not require standardized software but which gives point-to-point communication between PCs having a common application; the link must be controlled by the user from the videophones.

NOTE: If the videophone is programmed to carry out the procedures of clause 5 then a PC may be attached and **either** of these schemes activated.

4.2 Physical link between videotelephone and computer

The signalling link between the videotelephone and the computer shall meet the requirements of ITU-T Recommendation V.24 [2]. The electrical interface shall meet the requirements of ITU-T Recommendation V.28 [3]. The physical connector used on the videophone shall conform to the requirements set out in ISO 2110 [4] (see note).

NOTE: This interface is often referred to as RS-232.

5 Data communication using T.120 protocol in the MLP channel

In this clause, a PC is used as a typical example of a suitable DTE.

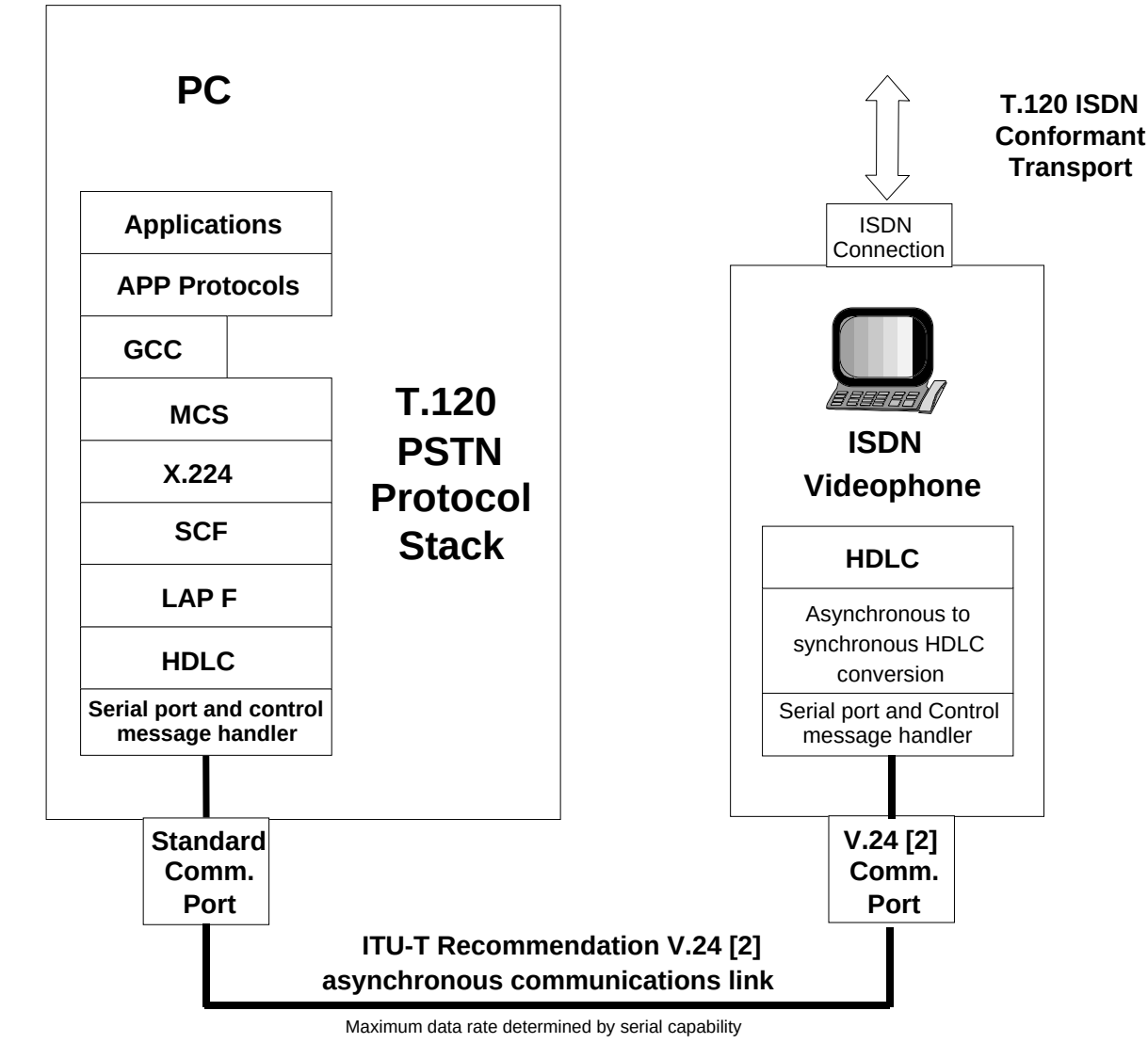
5.1 General description

The T.120 protocol is described in ITU-T Recommendations T.122 [5], T.123 [6], T.124 [7] and T.125 [8]. It provides a wide range of functionalities which can be exercised in multipoint as well as point-to-point communications. Its implementation involves a small amount of hardware and simple software within the videophone, dealing with the synchronous multiplexing of the single data stream into the ITU-T Recommendation H.221 frame structure, and software (several hundred kilobytes in all) which, in the scheme described here, resides in the PC (see note).

NOTE: Other videotelephone and videoconference terminals, notably those which are themselves PC based, are able to contain this amount of software without depending on an attached PC.

In this subclause, the description is made in terms of the intercommunication between two videophones, as in figure 1; however, the operation is equally valid when the remote end-point is of a different type (providing that it is conformant with ETS 300 145 [10] or ITU-T Recommendation H.320 [11]), such as a PC-based videophone/videoconference terminal or a Multipoint Control Unit.

The cable link between the PC and the videophone is that commonly available on PCs, namely a start-stop link. Since the transmission within the ITU-T Recommendation H.221 frame is synchronous, the videophone must contain an asynchronous-to-synchronous High-layer Data Link Control (HDLC) conversion (see figure 3).



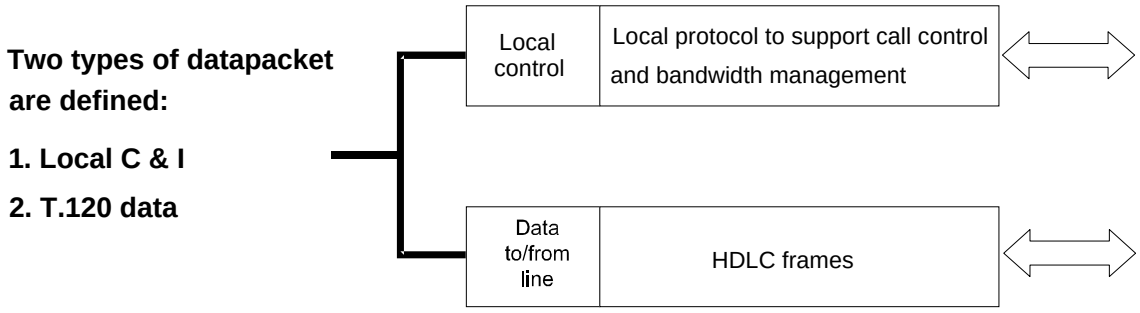


Figure 3: Data communication using the T.120 protocol stack

Two types of data packet pass across the ITU-T Recommendation V.24 [2] interface:

- applications data for transmission to the remote terminal, contained within the T.120 protocol. In particular, the PSTN option defined in ITU-T Recommendation T.123 [6] is selected for the lower layers;

- local control and indication messages supporting bandwidth control and flow management defined in subclause 5.3. The establishment of communication between the PCs takes place in several stages:

  a) communication between the videophones, according to ETS 300 145 [10];
  b) the exchange of capability information between the terminals, taking into account the communicating applications which it is intended to run in the PCs;
  c) opening of the data path between the PCs;
  d) initialisation of the T.120 protocol;
  e) start-up of the application itself.

5.2 Selection of transmission mode

The establishment of communication between the videotelephones shall follow the procedures set out in ETS 300 145 [10].

Prior to invoking an application which involves communication between the PCs, a capability exchange according to ETS 300 143 [12] and including appropriate data capability values (see below) must take place between the videotelephones. This may occur within the initialisation sequence if the PC is already active, or by means of a new capability exchange if the PC is activated later in the videotelephony session.

A terminal which is able to communicate using the T.120 protocol (see ITU-T Recommendations T.122 [5] to T.125 [8]) shall, according to the specific rates it can operate at, include in its capability set the values shown in table 1; these are defined in ETS 300 144 [1], tables 8, 10 and 12.

Table 1: Capability values required for communication using T.120 protocol

Baud rate on ITU-T Recommendation V.24 [2] interface	Mandatory capability values	Optional capability values
9 600 Baud	MLP-6.4k, T.120-cap	none
19 200 Baud	MLP-6.4k, MLP-14.4k, T.120-cap	MLP-8k, MLP-16k
38 400 Baud	MLP-6.4k, MLP-14.4k, MLP-32k, T.120-cap	MLP-8k, MLP-16k, MLP-22.4k, MLP-24k, MLP-30.4k

Optional values may be advantageous, in that they extend the range of compatibility with remote terminals which may be other than videophone + DTE. Other MLP rate values than those in table 1 shall not be sent, since the terminal is not able to cope with incoming transmissions at higher rates than these.

If the received capability set from the remote end-point includes values conforming to the same rule as in table 1 and the MCC command has not been received, either terminal may initiate data communication by mode switching according to ETS 300 143 [12] to open an MLP channel at a mutually acceptable rate.

NOTE: MCC is transmitted by a Multipoint Control Unit to cause a terminal to send exactly the same audio, data and video bit-rates as it receives.

If MCC has been received, the terminal shall not initiate data transmission but shall await an incoming MLP command. Subsequent action shall be according to the procedure defined in ETS 300 145 [10].

In general, the ITU-T Recommendation V.24 [2] interface must run at a higher rate than the MLP channel. The required MLP channel rate to support commonly available rates on the ITU-T Recommendation V.24 [2] interface are as shown in table 2. The reason for providing a lower synchronous bit-rate is to prevent the MLP data from "overrunning" the Asynchronous baud rate, for example if the MLP bit rate was 14,4 kbit/s and the Asynchronous baud rate was 9 600 baud, a possibility would always exist for the received data to be discarded, as there is no way to stop the reception of the synchronous data arriving at the MLP port.

Table 2: MLP rates needed to support given ITU-T Recommendation V.24 rates

Asynchronous rate	MLP channel rate
9 600 Baud	6,4 kbit/s
19 200 Baud	14,4 kbit/s
38 400 Baud	32 kbit/s

5.3 Communication between videophone and PC

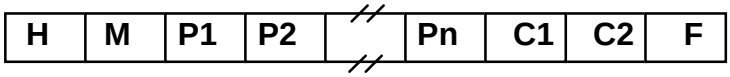
The physical interface between these two entities is an asynchronous ITU-T Recommendation V.24 [2] serial data link (LAP F). The communication setup shall be at the highest common Baud rate.

The Interface involves implementation of LAP F in the PC, conforming to ISO/IEC 3309 [13].

The primitives used to implement the interface are in two classes, **Control Primitives** and **Data Transfer Primitives**, these being multiplexed into the asynchronous link.

5.3.1 Control primitives

Control Primitives are used for local communications between the videophone and the PC. They have the form:



- H is a header byte of value DF (Hex) identifying the message as a control primitive; this byte cannot occur alone as the address field of a data primitive;
- M is one byte specifying the message type - see table 3;
- P1 to Pn are parameters, applicable to some of the messages;
- C1, C2 are a 16-bit checksum (as in ISO/IEC 3309 [13]);
- F is the HDLC flag, (as in ISO/IEC 3309 [13]).

Table 3: Control messages

Message identifier	Value of M	Message name	Message identifier	Value of M	Message name
M0	0000 0000	Acknowledgement	M6	0000 0110	
M1	0000 0001	Data capability	M7	0000 0111	Flow control
M2	0000 0010	Transmit request	M8	0000 1000	Host poll
M3	0000 0011	Transmit-startup	M9	0000 1001	Videophone poll
M4	0000 0100	Data capability set	M20	0001 0100	Data channel Clear Request
M5	0000 0101		M21	0001 0101	Data channel cleared

Table 4: Coding of MLP rates in M1, M2, M3

MLP rate	P1 (etc.) values	MLP rate	P1 (etc.) values	MLP rate	P1 (etc.) values
6,4k	0000 0001	16k	0000 0100	30,4k	0000 0111
8k	0000 0010	22,4k	0000 0101	32k	0000 1000
14,4k	0000 0011	24k	0000 0110	38,4	0000 1001

Acknowledgement messages: M0(P1)

Sent by a PC or a videophone to acknowledge receipt of another message, this being indicated by the value of the parameter P1. A value of P1 in the range 0 to 127 is positive; where applicable, a negative acknowledgement is indicated by the corresponding value in the range 128 to 255.

P1=128 is a general negative acknowledgement, for use where a received message is unrecognised. A PC or videophone receiving this message shall retransmit the message last sent.

Data capability messages: M1, M4

M1 is transmitted by a PC to the videophone, conveying the fact of T.120 availability and optionally stating the **maximum** MLP rate which might be needed for an application; the acknowledgement message is M0(1 or 129).

Parameter: P1=value according to table 4; P1=0 signifies that the default (based on ITU-T Recommendation V.24 [2] rate) shall be used.

M4 is transmitted by a videophone to a PC, stating the MLP rate capabilities included in the capset of both the videophone and the remote terminal, which may be activated. The acknowledgement message is M0(4 or 132).

Parameters: P1=0 indicates that the incoming capability set from the remote terminal does not contain T.120-cap.

P1 to Pn = other values, according to table 4.

Transmit Request: M2

M2 is transmitted by a PC to the videophone, stating the **desired** MLP rate needed for an application; the acknowledgement message is M0(2 or 130).

Parameter: P1=value, according to table 4.

Data channel established: M3

M3 is transmitted by a videophone to the PC, stating the **actual** MLP rate established; the acknowledgement message is M0(3 or 131).

Parameter: P1=value, according to table 4.

Flow control: M7

Optional message sent from a videophone to the PC, giving information about the buffer states; the acknowledgement message is M0(7 or 134).

Parameters P1:

- P1=0: positively acknowledges receipt of a HDLC data frame, with permission to send another;
- P1=128: negatively acknowledges receipt of a HDLC data frame, with permission to resend;
- P1=1: positively acknowledges receipt of a HDLC data frame, without permission to send another;
- P1=255: warns that the videophone is unable to receive more data;
- P1=127: cancels P1=255 and P1=1 - the videophone is now able to receive another HDLC data frame;
- P1=32: indicates that the incoming channel is idle - no data is being received from the remote terminal.

Host Poll: M8

Sent by a PC at intervals of 1 ± 0.2 seconds when no messages have been received from the videophone; the acknowledgement is M0(8). In the absence of acknowledgement no other communication shall be attempted.

Parameters: none

Videophone Poll: M9

Sent by a videophone when no messages have been received from the PC; the acknowledgement is M0(9). In the absence of acknowledgement no other communication shall be attempted.

Parameters: none

Data channel Clear Request: M20

Sent by a PC to the videophone to initiate the closure of the data channel; the acknowledgement is M0(20 or 147).

Parameters P11:

- P1 = 0: absolute - a command to the videophone to close the data channel;

- P1 = 1: conditional.

Data Channel Cleared

Sent by a videophone to the PC to indicate that the data channel has been closed - command (MLP-off) has been both sent and received; the acknowledgement is M0(21 or 148).

Parameters: none

5.3.2 Data transfer primitives

The transmission of data is in HDLC frames according to ISO/IEC 3309 [13].

In the address field of the HDLC frame, it is necessary to avoid emulation of the header (DF Hex) of a Control packet as in subclause 5.2. When the address field has this value, it shall be preceded by the control-escape byte (1011 1110).

EXAMPLES:

/flag/.../flag/DF/x/...	control message, value M from table 3 indicated by byte x
/flag/.../flag/esc/DF*/x/... (*6th bit complemented)	data message, address field value = DF Hex
/flag/add/ctrl/i/i/.../esc/flag/DF/x/...	data message containing the byte sequence /i/flag/DF/x/...

Asynchronous-synchronous conversion mechanism

Such a conversion is required within the videophones to transfer data (in either direction) between the asynchronous flow on the local connection to the PC and the synchronous transmission within the ISDN connection (NB: synchronism to the H.221 framing is not implied here).

The implementation involves two buffers in the videophone: in order to be able to receive a message from the PC while simultaneously sending a message to the remote videophone.

Layer 1 acknowledges each message when it starts to be transmitted to line, a buffer is then freed ready for the reception of a message from the host. In this fashion the ITU-T Recommendation Q.922 [9] timer T200 is started when the message is sent to the layer one (at most 1 message state).

5.3.3 Interleaving of control and data packets

EXAMPLE:

/flag/add/ctrl/i/i/...../i/fcs/fcs/flag**/** H / M / P1 /fcs/fcs/flag/...../flag/add/ctrl/i/i/....

HDLC data packet>>>>>>>>Control packet>>>>>Optional flags>>>HDLC data>>

5.4 Opening, using and closing the end-to-end data channel

The process is represented by the sequence in table 5. The > symbols indicate direction of transmission, and the action given in each row results from completion of that on the preceding row, if any. A detailed explanation follows.

Table 5: Process for opening, using and closing a data channel

PC1	ITU-T Recommendation V.24 [2] Messages	VP1	I-channel messages	VP2	ITU-T Recommendation V.24 [2] Messages	PC2	Row
					>M9>		0
					< M0(9) <		
	>M1(P1) >				<M1(P1)<		1
	<M0(1)<		**>**{MLP value(s), T.120-cap}**>**		>M0(1)>		2
			<{MLP value(s), T.120-cap}**<**		>M4(P1,P2...) >		3
	< M4(P1,P2...) <				<M0(1)<		4
	>M0(4)>						5
							-
	>M2(R1d)>						6
	<M0(2)<		>[MLP-1a][T.120-on]>				7
			<[MLP-1a][T.120-on]<		>M3(Ra)>		8
	<M3(Ra)<				<M0(3)<		9
	>DataTX(1)>						13
	<M7(0)<		>>Data(1)>>				14
	>DataTX(2)>				>DataTX(1)>		15
	<M7(1)<		>>Data(2)>>		<M0(0)< (optional)		16
	<M7(127)<				>DataTX(2)>		17
	>DataTX(3)>				<M0(0)< (optional)		18
	<M7(0)<		>>Data(3)>>				19
					etc.		
	>M20(0)>						50
			>[MLP-off]>				51
			<[MLP-off]<		>M21>		52
	< M21<						53

Rows 0-5: Capability exchange on establishment of connection, if both PCs are connected and active. No data path results, but both terminals are in a position to start T.120 dialogue when an application requires it. M1 may be sent when the T.120 software is booted up, or when the RS232 serial interface Data Set Ready (DSR) is set, if this occurs later. When M9 is received from the videophone, M0(9) shall be sent in response. The MLP values included in the transmitted capability sets are as specified in table 1, unless the message M1(P1>0) received at the videophone from the PC indicates a different maximum MLP capability to be sent.

The use of M0(1) to acknowledge receipt of M1 is optional; however, if M1 received by the videophone is found to be corrupted then M0(129) or M8 shall be sent to the PC to elicit a repeat - response to this is mandatory.

When M1 is received at the videophone, indicating that the previously transmitted capset is no longer correct, a new capability exchange shall be initiated according to ETS 300 143 [12], the transmitted capset containing the values now appropriate. However, a new capability exchange shall not be initiated if there is no change to the transmitted capset, or if the new capset is being transmitted in response to a capability exchange initiated from the remote end-point.

If the incoming capset does not contain T.120-cap, M4(0) shall be sent to the PC. This message shall be interpreted at an Application Program Interface (API) as "The remote terminal does not have standardized (T.120) data protocol capability" and should be presented to the user in appropriate language if and when an attempt is made to run a telecommunication application using T.120 protocol. Subsequent action may be according to clause 6.

Rows 6-19: Starting a data application from Terminal 1.

Having received M4 with P1 value other than zero, the PC may initiate T.120 operation at any time by transmitting message M2, indicating the desired MLP rate which shall be equal to one of the values included in message M4.

The videophone receives M2 from the PC (this rate shall be established using MLP-rate and T.120-on command values defined in ETS 300 144 [1]).

If the videophone receives MLP-rate and T.120-on commands from the remote end-point, it shall not await M2 from its PC but immediately send those same commands, thus opening a symmetrical bidirectional MLP channel.

When the videophone has both sent and received these commands, it shall send M3 to the PC.

It is entirely possible that both terminals initiate the data channel request by sending M2; in this case the channel will be established, both terminals having an equal right to begin transmission and any conflict being resolved within the higher layers of the T.120 protocol.

The use of M0(2) and M0(3) to acknowledge M2 and M3 is optional; however if corrupted values are detected then M0(130) and M0(131) respectively may be used to elicit repeats: response to these is mandatory.

On receipt of M3, transmission of a first HDLC data frame may be made at any time. Subsequent frames may be transmitted under conditions stated below, according to messages received from the videophone.

Message received	**Next packet transmission**
None	None: if no response is received in 1 second, M8 may be sent
M7(0 or 32 or 33 or 127)	New packet (optional, with arbitrary delay)
M7(128)	Resend previous packet (mandatory)
M7(1)	None: await next message
M7(255)	None

The videophone shall only forward packets received without error from the PC to the remote end-point, but shall acknowledge every HDLC packet received from the PC according to the following buffer state:

Received packet and buffer states	**Message sent to the PC**	**Data packet forwarded to remote videophone**
Data packet received without error; alternate buffer free to receive next packet	M7(0)	Yes
Data packet received without error; alternate buffer not yet free to receive next packet	M7(1)	Yes
Data packet received but errored	M7(128)	No

Rows 50-53: Clearing down the data channel.

Clear-down of the data channel may be initiated from the PC by means of a message within the T.120 protocol or (in the case that the T.120 software is disabled), by transmission of M20(0).

On receipt of M20(0) the videophone shall close the MLP channel using the MLP-off command defined in ETS 300 144 [1]. If the videophone receives MLP-off without first receiving M20, it shall immediately send the same command, thus closing the MLP channel. Having both sent and received MLP-off, the videophone shall send M21 to the PC.

The use of M0(20) and M0(21) to acknowledge these messages is optional.

6 Data communication without using T.120 protocol

If a videophone has detected DTR on the ITU-T Recommendation V.24 [2] interface, but not received the message M1 from the connected PC; it may, according to user action applied directly to the videophone, send appropriate capability values as specified in ETS 300 144 [1] within its capset, and open a channel at a suitable rate if similar action has been taken at the remote terminal. In such a case the capability value shall not be included in the capset, and the procedure to be followed is as specified in this clause.

The purpose of the format is to allow the terminal to emulate all the modem connections defined in the ITU-T V series Recommendations.

There are no inherent error checking, error correction or retransmission facilities.

Transmitted data consists of 8-bit bytes.

The data communication may be switched on and off using the appropriate commands.

6.1 Format

The LSD/MLP channels may be active for any number of submultiframes. The transmit rate shall be negotiated and shall be identical for the two terminals communicating. The actual transmit rate at the ITU-T Recommendation V.24 [2] interface will be lower than that of the LSD/MLP channel rate because flow control characters need to be inserted. It shall be possible to configure the asynchronous to synchronous conversion process to accept one or more of the modes defined in ITU-T Recommendation V.14 [14], Section 4. The character format used shall be the same in both transmission directions.

6.2 Asynchronous to synchronous conversion

The method of conveying start-stop characters over the synchronous LSD/MLP channel shall be as specified in ITU-T Recommendation V.14 [14].

NOTE: Annex A presents information about the ITU-T Recommendation V.24 [2] interface when using a 25 pin connector and an example of a procedure for transmission of data and handling of buffer.

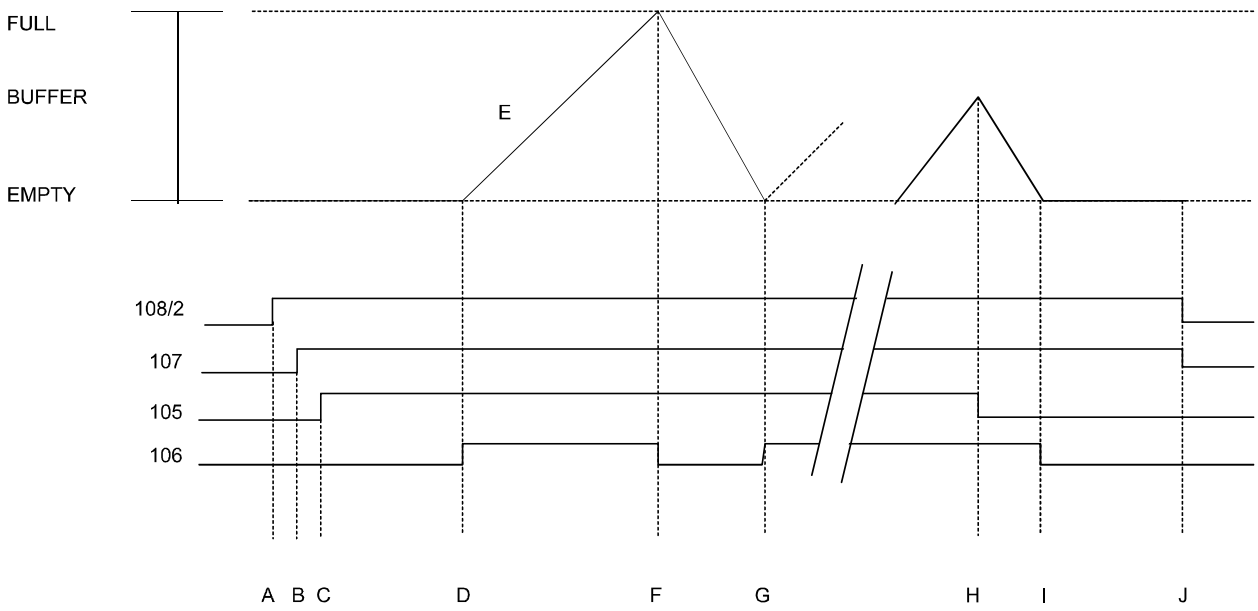
Annex A (informative): An example of implementation and procedures

A.1 Mapping of ITU-T Recommendation V.24 signals

Table A.1: An example implementation of the ITU-T Recommendation V.24 signals

Circuit number	Signal	Implementation
102	Signal ground or common return	Signal ground
103	Transmitted data	Data stream generated by the external data terminal
104	Received data	Data stream received from the LSD channel
105	Request to send	Indicate the need for an LSD transmit channel. In asynchronous external data terminals this signal can be neglected, for the synchronous case the LSD-channel should be turned on as soon as possible when this signal is ON
106	Ready for sending	ON during a connection when mutual capabilities allow ITU-T Recommendation V.24 [2] LSD communications and received R-bit are ON
107	Data set ready	ON during a connection when mutual capabilities allow ITU-T Recommendation V.24 [2] LSD communications
108/1	Connect data set to line	Indicates to the videophone terminal that the external data terminal is switched on
108/2	Data terminal ready	Indicates to the videophone terminal that the external data terminal is switched on
109	Data channel received line signal detector	ON when there is a LSD channel in the received frame
110	Data signal quality detector	May be derived from the CRC4 bits in the received frame and/or checksum bits in the LSD submultiframe header
111	Data signal rate selector	May be used to determine which of the available LSD-rates that shall be used on the transmit frame
112	Data signalling rate selector (DCE source)	Derived from incoming LSD BAS-commands
113	Transmitter signal element timing (DTE source)	Local clock in the data terminal
114	Transmitter signal element timing (DCE source)	Timing derived from the network clock
115	Receiver signal element timing (DCE source)	Timing derived from the network clock
118	Transmitted backward channel data	Equivalent to 103
119	Receive backward channel data	Equivalent to 104
120	Transmitted backward channel line signal	Equivalent to 105
121	Backward channel ready	Equivalent to 106
122	Backward channel received line signal detector	Equivalent to 109
124	Select frequency group	Not applicable
125	Calling indicator	May be turned ON by the first appearance of an ITU-T Recommendation V.24 [2] LSD channel in the incoming frame
129	Request to receive	Not applicable to the LSD channel controls
130	Transmit backward tone	Not applicable
131	Received character timing	Derived from the network clock
140	Loopback/maintenance test	Signalled by the L-bit in the LSD submultiframe header
141	Local loop back	Implemented in the local terminal
142	Test indicator	Generated by local terminal
191	Transmitted voice answer	Connected to the audio transmit unit in the terminal
192	Received voice answer	Connected to the audio receive unit in the terminal

A.2 Open/close procedure



A: Data Equipment ready; a capability exchange can take place.

B: End of capability change and negotiation.

C: Data equipment request a transmission and the LSD/MLP data channel is opened.

D: The LSD/MLP channel is opened and the audiovisual terminal is ready to transmit.

E: Buffer is filled because the LSD/MLP rate is higher than the effective rate on the ITU-T Recommendation V.24 [2] interface.

F: The buffer is full; the audiovisual terminal stops the data transmission on the LSD/MLP channel.

G: The buffer is empty; the data transmission is continued.

H: End of data transmission is requested by the DTE.

I: When the buffer is empty, the LSD/MLP channel is closed and the 106 signal on the ITU-T Recommendation V.24 [2] interface is reset.

J: Data application is no longer available. If the 108/2 is reset or if the DTE is disconnected, a capability exchange sequence is initiated.

Figure A.1

History

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