International Telecommunication Union

ITU-T

TELECOMMUNICATION
STANDARDIZATION SECTOR
OF ITU

H.230

(05/2019)

SERIES H: AUDIOVISUAL AND MULTIMEDIA SYSTEMS

Infrastructure of audiovisual services – Systems aspects

Frame-synchronous control and indication signals for audiovisual systems

Recommendation ITU-T H.230

ITU-T H-SERIES RECOMMENDATIONS

AUDIOVISUAL AND MULTIMEDIA SYSTEMS

CHARACTERISTICS OF VISUAL TELEPHONE SYSTEMS	H.100–H.199
INFRASTRUCTURE OF AUDIOVISUAL SERVICES	
General	H.200–H.219
Transmission multiplexing and synchronization	H.220–H.229
Systems aspects	**H.230–H.239**
Communication procedures	H.240–H.259
Coding of moving video	H.260–H.279
Related systems aspects	H.280–H.299
Systems and terminal equipment for audiovisual services	H.300–H.349
Directory services architecture for audiovisual and multimedia services	H.350–H.359
Quality of service architecture for audiovisual and multimedia services	H.360–H.369
Telepresence, immersive environments, virtual and extended reality	H.420–H.439
Supplementary services for multimedia	H.450–H.499
MOBILITY AND COLLABORATION PROCEDURES	
Overview of Mobility and Collaboration, definitions, protocols and procedures	H.500–H.509
Mobility for H-Series multimedia systems and services	H.510–H.519
Mobile multimedia collaboration applications and services	H.520–H.529
Security for mobile multimedia systems and services	H.530–H.539
Security for mobile multimedia collaboration applications and services	H.540–H.549
VEHICULAR GATEWAYS AND INTELLIGENT TRANSPORTATION SYSTEMS (ITS)	
Architecture for vehicular gateways	H.550–H.559
Vehicular gateway interfaces	H.560–H.569
BROADBAND, TRIPLE-PLAY AND ADVANCED MULTIMEDIA SERVICES	
Broadband multimedia services over VDSL	H.610–H.619
Advanced multimedia services and applications	H.620–H.629
Ubiquitous sensor network applications and Internet of Things	H.640–H.649
IPTV MULTIMEDIA SERVICES AND APPLICATIONS FOR IPTV	
General aspects	H.700–H.719
IPTV terminal devices	H.720–H.729
IPTV middleware	H.730–H.739
IPTV application event handling	H.740–H.749
IPTV metadata	H.750–H.759
IPTV multimedia application frameworks	H.760–H.769
IPTV service discovery up to consumption	H.770–H.779
Digital Signage	H.780–H.789
E-HEALTH MULTIMEDIA SYSTEMS, SERVICES AND APPLICATIONS	
Personal health systems	H.810–H.819
Interoperability compliance testing of personal health systems (HRN, PAN, LAN, TAN and WAN)	H.820–H.859
Multimedia e-health data exchange services	H.860–H.869
Safe listening	H.870–H.879

For further details, please refer to the list of ITU-T Recommendations.

Recommendation ITU-T H.230

Frame-synchronous control and indication signals for audiovisual systems

Summary

Digital audiovisual services are provided by a transmission system in which the relevant signals are multiplexed onto a digital path using the frame structure defined in Recommendation ITU-T H.221. In addition to the audio, video, user data and telematic information, these signals include information for the correct functioning of the system. The additional information has been named control and indication (C&I) to reflect the fact that while some bits are genuinely for "control", causing a state change somewhere else in the system, others provide for indications to the users as to the functioning of the system. Recommendation ITU-T H.230 concerns only those C&Is which must be transmission frame-synchronous, or otherwise requiring a rapid response.

This Recommendation details the C&I related to video and audio; the means of transmitting numbers and characters; C&I for maintenance purposes; for simple multipoint conferences not using protocol in the MLP channel; for channel aggregation; and for the transfer of network addresses. The code-point tables also indicate the circumstances under which the various functions may be mandatory or optional.

This revised version of Recommendation ITU-T H.230 introduces a number of clarifications and corrections to the previous version, primarily in the definitions of C&I symbols.

History

Edition	Recommendation	Approval	Study Group	Unique ID*
1.0	ITU-T H.230	1990-12-14	XV	11.1002/1000/1075
2.0	ITU-T H.230	1993-03-12	XV	11.1002/1000/1076
3.0	ITU-T H.230	1995-07-10	15	11.1002/1000/1077
4.0	ITU-T H.230	1997-07-11	16	11.1002/1000/4143
5.0	ITU-T H.230	1999-05-27	16	11.1002/1000/4668
6.0	ITU-T H.230	2004-03-15	16	11.1002/1000/7209
6.1	ITU-T H.230 (2004) Amd. 1	2005-10-07	16	11.1002/1000/8562
7.0	ITU-T H.230	2009-03-16	16	11.1002/1000/9693
8.0	ITU-T H.230	2019-05-14	16	11.1002/1000/13901

Keywords

C&I codes, C&I symbols, H.221, H.320, MBE, SBE

---

* To access the Recommendation, type the URL http://handle.itu.int/ in the address field of your web browser, followed by the Recommendation's unique ID. For example, http://handle.itu.int/11.1002/1000/11830-en.

FOREWORD

The International Telecommunication Union (ITU) is the United Nations specialized agency in the field of telecommunications, information and communication technologies (ICTs). The ITU Telecommunication Standardization Sector (ITU-T) is a permanent organ of ITU. ITU-T is responsible for studying technical, operating and tariff questions and issuing Recommendations on them with a view to standardizing telecommunications on a worldwide basis.

The World Telecommunication Standardization Assembly (WTSA), which meets every four years, establishes the topics for study by the ITU-T study groups which, in turn, produce Recommendations on these topics.

The approval of ITU-T Recommendations is covered by the procedure laid down in WTSA Resolution 1.

In some areas of information technology which fall within ITU-T's purview, the necessary standards are prepared on a collaborative basis with ISO and IEC.

NOTE

In this Recommendation, the expression "Administration" is used for conciseness to indicate both a telecommunication administration and a recognized operating agency.

Compliance with this Recommendation is voluntary. However, the Recommendation may contain certain mandatory provisions (to ensure, e.g., interoperability or applicability) and compliance with the Recommendation is achieved when all of these mandatory provisions are met. The words "shall" or some other obligatory language such as "must" and the negative equivalents are used to express requirements. The use of such words does not suggest that compliance with the Recommendation is required of any party.

INTELLECTUAL PROPERTY RIGHTS

ITU draws attention to the possibility that the practice or implementation of this Recommendation may involve the use of a claimed Intellectual Property Right. ITU takes no position concerning the evidence, validity or applicability of claimed Intellectual Property Rights, whether asserted by ITU members or others outside of the Recommendation development process.

As of the date of approval of this Recommendation, ITU had not received notice of intellectual property, protected by patents, which may be required to implement this Recommendation. However, implementers are cautioned that this may not represent the latest information and are therefore strongly urged to consult the TSB patent database at http://www.itu.int/ITU-T/ipr/.

Table of Contents

Recommendation ITU-T H.230

Frame-synchronous control and indication signals for audiovisual systems

1 Scope

Digital audiovisual services are provided by a transmission system in which the relevant signals are multiplexed onto a digital path. In addition to the audio, video, user data and telematic information, these signals include information for the correct functioning of the system. The additional information has been named control and indication (C&I) to reflect the fact that while some bits are genuinely for "control", causing a state change somewhere else in the system, others provide for indications to the users as to the functioning of the system.

The C&I may be categorized into three groups:

a) call control – these are treated in the Q-series Recommendations;

b) transmission frame-synchronous, or otherwise requiring rapid response;

c) conference, data and telematic control not requiring frame synchronism, governed by the multilayer protocol of Recommendations ITU-T T.122-T.125.

This Recommendation concerns only those C&I appearing in category b) which includes a simplified set of conference C&I for multipoint connections of simple terminals.

1 *bis* References

The following ITU-T Recommendations and other references contain provisions which, through reference in this text, constitute provisions of this Recommendation. At the time of publication, the editions indicated were valid. All Recommendations and other references are subject to revision; users of this Recommendation are therefore encouraged to investigate the possibility of applying the most recent edition of the Recommendations and other references listed below. A list of the currently valid ITU-T Recommendations is regularly published. The reference to a document within this Recommendation does not give it, as a stand-alone document, the status of a Recommendation.

[ITU-T E.164] Recommendation ITU-T E.164 (2010), *The international public telecommunication numbering plan.*

[ITU-T G.719] Recommendation ITU-T G.719 (2008), *Low-complexity, full-band audio coding for high-quality, conversational applications.*

[ITU-T H.221] Recommendation ITU-T H.221 (2009), *Frame structure for a 64 to 1920 kbit/s channel in audiovisual teleservices*.

[ITU-T H.239] Recommendation ITU-T H.239 (2014), *Role management and additional media channels for ITU-T H.300-series terminals.*

[ITU-T H.241] Recommendation ITU-T H.241 (2012), *Extended video procedures and control signals for ITU-T H.300-series terminals.*

[ITU-T H.242] Recommendation ITU-T H.242 (2009), *System for establishing communication between audiovisual terminals using digital channels up to 2 Mbit/s.*

[ITU-T H.243] Recommendation ITU-T H.243 (2019), *Procedures for establishing communication between three or more audiovisual terminals using digital channels up to 1920 kbit/s.*

[ITU-T H.244] Recommendation ITU-T H.244 (1995), *Synchronized aggregation of multiple 64 or 56 kbit/s channels.*

[ITU-T H.245] Recommendation ITU-T H.245 v16 (2011), *Control protocol for multimedia communication.*

[ITU-T H.261] Recommendation ITU-T H.261 (1993), *Video codec for audiovisual services at p x 64 kbit/s.*

[ITU-T H.262] Recommendation ITU-T H.262 (2012), *Information technology – Generic coding of moving pictures and associated audio information: Video.*

[ITU-T H.263] Recommendation ITU-T H.263 (2005), *Video coding for low bit rate communication.*

[ITU-T H.264] Recommendation ITU-T H.264 (V13) (2019), *Advanced video coding for generic audiovisual services.*

[ITU-T H.310] Recommendation ITU-T H.310 (1998), *Broadband audiovisual communication systems and terminals*.

[ITU-T H.320] Recommendation ITU-T H.320 (2004), *Narrow-band visual telephone systems and terminal equipment.*

[ITU-T H.323] Recommendation ITU-T H.323 (2009), *Packet-based multimedia communications systems*.

[ITU-T J.52] Recommendation ITU-T J.52 (1996), *Digital transmission of high-quality sound-programme signals using one, two or three 64 kbit/s channels per mono signal (and up to six per stereo signal).*

[ITU-T T.51] Recommendation ITU-T T.51 (1992), *Latin based coded character sets for telematic services*.

[ITU-T T.122] Recommendation ITU-T T.122 (1998), *Multipoint communication service – Service definition*.

[ITU-T T.123] Recommendation ITU-T T.123 (2007), *Network-specific data protocol stacks for multimedia conferencing.*

[ITU-T T.124] Recommendation ITU-T T.124 (2007), *Generic Conference Control*.

[ITU-T T.125] Recommendation ITU-T T.125 (1998), *Multipoint communication service protocol specification*.

[ISO 639-1] ISO 639-1:2002, *Codes for the representation of names of languages – Part 1: Alpha-2 code*.

[ISO/IEC 10646] ISO/IEC 10646:2017, *Information technology – Universal Coded Character Set (UCS)*.

2 Procedures

There are two procedures: some frame-synchronous C&I are provided for directly as bit-rate allocation signal (BAS) codes in [ITU-T H.221], while the remainder require the use of an escape code.

2.1 C&I codes provided in [ITU-T H.221]

The following codes, whose functions are defined in clause 3, are provided in [ITU-T H.221]:

– VCF, VCU (procedures for use in multipoint calls according to [ITU-T H.243]);

– LCV, LCD, LCA, LCO (for maintenance).

In each case, the code is transmitted in the BAS position at an appropriate time.

2.2 Other C&I codes

All frame-synchronous C&I codes not listed in clause 2.1 are transmitted by a sequence involving the BAS positions in two or more consecutive sub-multiframes. The full definitions of these symbols are set out in clause 3, assigning to each an alphabetic code name; the first letter of this indicates the type; the second is C for command, I for indication; the third is for the specific function.

Code-point values are listed in Table 1 and Table 2. For convenience, the occupancy of Table 1 is shown in Table 4.

2.2.1 SBE method

The single-byte extension method involves two consecutive BAS codes. In the first, the code (111) [10001] is transmitted. In the second, the code defined in Table 1 is transmitted.

It should be noted that only one symbol is transmitted by this method – the code in the subsequent sub-multiframe is again treated as a normal BAS code.

2.2.2 Double and triple SBE symbols

A "double symbol" consists of two SBE code pairs, the second immediately following the first. The first is one of the symbols listed as having an associated SBE number or SBE character parameter to be conveyed by the second. Thus, a double symbol occupies four successive BAS positions and takes 80 ms to transmit.

A "triple symbol" similarly consists of three SBE code pairs in succession; the first is one of the symbols listed as having an associated numerical or character parameter to be conveyed by the second and third. Thus, a triple symbol occupies six successive BAS positions and takes 120 ms to transmit.

A "quadruple symbol" consists of four SBE code pairs in succession, occupies eight successive BAS positions and takes 160 ms to transmit.

In the case of TII*[1], it may be double or triple, or longer, but the succession of symbols shall end with the symbol TIS.

2.2.3 MBE method

The multiple-byte extension method involves three or more consecutive BAS codes, in the following format:

{Start-MBE} / N / <x> / (N – 1) bytes

where:

{Start-MBE} is specified in Table A.1 of [ITU-T H.221];

N is a binary number in the range 1..223;

<x> is a value from Table 2.

3 Definitions of C&I symbols

3.1 C&I related to video

3.1.1 video indicate suppressed (VIS): This symbol is used to indicate that the content of the video channel does not represent a normal camera image. The video encoder may be without video input or an electronically-generated pattern may have been substituted.

3.1.2 video indicate active (VIA): Complementary to VIS. The video source is the only one, or, in the case that more video sources are to be distinguished, it is that designated "video No. 1".

---

1 For the significance of the asterisk, see Table 4.

3.1.3 VIA2: Equivalent to VIA, but designating "video No. 2" as the source.

3.1.4 VIA3: Equivalent to VIA, but designating "video No. 3" as the source.

3.1.5 video indicate ready-to-activate (VIR): This symbol is transmitted by a terminal whose user has decided not to send video unless he will also receive video from the other end.

3.1.6 video command "freeze picture request" (VCF): This symbol may be transmitted prior to the "video-off" mode switch, to prepare the video decoder for this event (see Note). This symbol is also transmitted by a multipoint control unit (MCU) prior to video switching. On receipt, a terminal video decoder should complete updating of the current video frame but subsequently display the frozen picture until receipt of the freeze-picture release control which is embedded in the video.

NOTE – If an ITU-T H.261 or other ITU-T H.260-series decoder receives "freeze picture request", it freezes pictures until a freeze-picture release signal is received, or a timeout period of at least six seconds has expired. If a terminal wishes to continue the freezing of the picture at the remote end for more than six seconds, it should send VCF/H.230 repeatedly with an appropriate period.

3.1.7 video command "fast update request" (VCU): This symbol is transmitted by an MCU after performing a video switch. It may also be transmitted by a terminal at the start of communication when the video decoder is first ready to receive. On receipt the terminal video encoder shall enter the fast-update mode at its earliest opportunity.

3.1.8 video indicate "video spatial temporal tradeoff preference" (ØVSTRD): This requests the far-end video encoder to change its trade-off between temporal and spatial resolution. It shall be followed by an SBE number between 0 and 31 (see clause 3.4). A value of 0 commands a high spatial resolution and a value of 31 commands a high frame rate. The values from 0 to 31 indicate monotonically a desire for a higher frame rate. Actual values do not correspond to precise values of spatial resolution or frame rate. On receipt of a value of zero the encoder should send video at the highest possible spatial fidelity, and on receipt of the value of 31 the encoder should send video at the highest possible frame rate. Intermediate values will indicate a preference on a sliding scale. The actual interpretation will vary for encoders.

3.1.9 video indicate "video spatial temporal tradeoff encoder level" (VSTRDEL): This informs the receiver of the current spatial temporal trade-off level being used by the far-end encoder. It is followed by an SBE number between 0 and 31 which indicates the current trade-off level. This should be used by the receiver to determine an appropriate value for ØVSTRD preference.

NOTE – The abbreviation VSTRDEL was known as abbreviation VSTRDENCLVL in a previous version of this Recommendation.

3.1.10 video indicate "custom picture clock frequency" (ØCPCF): This informs the transmitter of the receiver picture clock frequency preference. This shall be followed by an SBE with values of the clockDivisor and the clockConversionCode as defined in customPCFByte1 in clause 5.2.4 of [ITU-T H.242]. On receipt of this message the encoder should switch to the indicated custom picture clock frequency at the earliest opportunity.

3.1.11 video indicate "H.263 GOB header on preference" (ØGHOP): This informs the transmitter of the receiver preference for GOB headers in [ITU-T H.263]. This shall be followed by an SBE number N which specifies the frequency of GOB headers. GOB syncs should be sent for GOB numbers N, 2N, 3N,… in every picture. On receipt of this the encoder should send GOB syncs for the indicated GOBs at the earliest opportunity.

3.1.12 video indicate "Cancel – H.263 GOB header on preference" (Øcancel-GHOP): This informs the transmitter that the receiver no longer prefers to receive GOB headers in [ITU-T H.263]. On receipt of this preference the terminal encoder may stop sending GOB headers at the earliest opportunity.

3.1.13 video indicate "H.263 Custom Source Format Preference" – using MBE ØCSFMT: This is sent to indicate the receiver preference for custom source format. The message has the form:

{start-MBE / 3 / <ØCSFMT> / frameHeight/8-1 / frameWidth/8-1}

where the frameHeight/8-1 and frameWidth/8-1 shall be binary representations of frameHeight/8-1 and frameWidth/8-1 in pixels and shall take values between 0 and 223. On receipt of this message the encoder should switch to ITU-T H.263 video at the indicated format, at the earliest opportunity.

3.1.14 video indicate "H.263 Custom Pixel Aspect Ratio Preference" – using MBE ØCPAR: This is sent to indicate the receiver preference for custom pixel aspect ratio. The message has the form:

{start-MBE / 3 / <ØCPAR> / pixelHeight-1 / pixelWidth-1}

where the pixelHeight-1 and pixelWidth-1 shall be binary representations of pixelHeight-1 and pixelWidth-1. The two numbers shall be relatively prime to each other and shall take values between 0 and 223. PixelHeight shall be set to 0 if and only if pixelWidth is also set to 0. If both pixelHeight and pixelWidth are set to 0, any pixel aspect ratio may be sent. On receipt of this message the encoder should switch to ITU-T H.263 video at the indicated pixel aspect ratio at the earliest opportunity.

3.1.15 video indicate "H.263 Scalability Preference" – using MBE ØSCLPREF: This is sent to indicate the receiver preference for scalability mode. The message has the form:

{start-MBE / (numberOfLayers/3 + 2) / <ØSCLPREF> / InitByte / LayerSpecificationByte1 / …. / LayerSpecByte numberOfLayers / 3}

The MBE code shall first specify the number of layers. This shall be followed by a two-bit specification for each layer using the following convention:

00 – Spatial Scalable layer of one dimension

01 – Spatial Scalable layer of two dimensions

10 – SNR layer

11 – Temporal Scalable with one B-picture

The number of bytes in the message depends on the number of enhancement layers. Any layer definitions beyond the number of layers specified shall be ignored. The structure of initByte and layerSpecificationByte is as follows:

initByte:

0-3 Number of layers (n)-1. Valid Range: 0-13

4-5 Layer 1 specification

6-7 Layer 2 specification

layerSpecificationByte i + 1 (starting from i = 0):

0-1 00

2-3 Layer 3 × (i + 1) specification

4-5 Layer 3 × (i + 1) + 1 specification

6-7 Layer 3 × (i + 1) + 2 specification

On receipt of this message the encoder should switch to ITU-T H.263 video with the indicated scalability at the earliest opportunity.

3.1.16 video indicate "videoNotDecodedMBs" – using MBE videoNotDecodedMBs: The message has the form:

{start-MBE / 7 / <videoNotDecodedMBs> / firstMBByte1 / firstMBByte2 / numberOfMBsByte1 / numberOfMBsByte2 / trByte1 / trByte2}

This indicates to the far-end video encoder that a set of MBs has been received erroneously and that any MB in the specified set has been treated as not coded (note that "not coded" macroblocks in

ITU-T H.263 terminology corresponds to "not transmitted" macroblocks in ITU-T H.261 terminology). This command shall only be used with video compression algorithms that define MBs, for example, ITU-T H.261 and ITU-T H.263. In this message, the macroblock at the top left-hand corner is numbered 1 and the macroblock numbers increase in the scanline order from top left to bottom right. The encoder may use this information to compensate transmission errors, as illustrated in Appendix I of [ITU-T H.263]. firstMBByte1 and firstMBByte2 together indicate the number of the first MB treated as not coded and numberOfMBsByte1 and numberOfMBsByte2 together indicate the total number of successive MBs treated as not coded. firstMBByte1 and numberOfMBsByte1 shall take values from 0-223. firstMBByte2 and numberOfMBsByte2 shall also take values from 0-223. The first MB received erroneously is given by 224 × firstMBByte1 + firstMBByte2. Similarly, the total number of successive MBs treated as not coded is given by 224 × numberOfMBsByte1 + numberOfMBsByte2. The decoder shall ensure that the first MB treated as not coded and the total number of successive MBs treated as not coded are within the valid range of the video compression algorithm in use. The encoder should ignore the message if values outside the valid range are received. The temporal reference of the picture containing not decoded MBs is indicated by trByte1 and trByte2 which shall take values from 0-223. The temporal reference is given by 224 × trByte1 + trByte2. The decoder shall ensure that the temporal reference is valid for the video compression algorithm in use. The encoder should ignore the message if a value outside the valid range is received.

3.1.17 video command "videoFastUpdateGOB" – using MBE videoFastUpdateGOB: The message has the form:

{start-MBE / 3 / <videoFastUpdateGOB> / firstGOB / numberOfGOBs}

This commands the far-end video encoder to perform a fast update of one or more GOBs. This command shall only be used with video compression algorithms that define GOBs, for example, [ITU-T H.261] and [ITU-T H.263]. firstGOB indicates the number of first GOB to be updated and corresponds to the GOB number (GN) as defined by the video compression algorithm in use. For example, valid values for [ITU-T H.261] are 1, 3 and 5 in QCIF resolution and 1 to 12 in CIF resolution. In the case of [ITU-T H.263], valid values are 0 to (G-1), where G is the total number of GOBs in a picture. numberOfGOBs indicates the total number of successive GOBs to be updated and has a minimum value of 1. firstGOB and numberOfGOBs shall consist of one byte each and shall not take values greater than 223. The decoder shall ensure that the values sent are valid for the video compression algorithm in use. The encoder should ignore the message if any value outside the valid range is received.

3.1.18 video command "videoFastUpdateMB" – using MBE videoFastUpdateMB: The message has the form:

{start-MBE / 5 / <videoFastUpdateMB> / firstMBByte1 / firstMBByte2 /
numberOfMBsByte1 / numberOfMBsByte2}

This commands the far-end video encoder to perform a fast update of one or more MBs. This command shall only be used with video compression algorithms that define MBs, for example, [ITU-T H.261] and [ITU-T H.263]. In this message, the macroblock at the top left-hand corner is numbered 1 and the macroblock numbers increase in the scanline order from top left to bottom right. firstMBByte1 and firstMBByte2 together indicate the number of the first MB to be updated. numberOfMBsByte1 and numberOfMBsByte2 together indicate the total number of successive MBs to be updated. firstMBByte1 and numberOfMBsByte1 shall take values from 0-223. firstMBByte2 and numberOfMBsByte2 shall also take values from 0-223. The first MB to be updated is given by 224 × firstMBByte1 + firstMBByte2. Similarly, the total number of successive MBs to be updated is given by 224 × numberOfMBsByte1 + numberOfMBsByte2. The decoder shall ensure that the first MB to be updated and the total number of successive MBs to be updated are within the valid range of the video compression algorithm in use. The encoder should ignore the command if values outside the valid range are received. Terminals may respond to this command with a GOB update which includes the MBs requested.

3.1.19 video capability "videoBadMBsCap" (VBMBC): When present, this indicates the capability of a video encoder to process videoBadMBs commands and to take appropriate corrective action towards the recovery of video quality.

3.1.20 video command "videoBadMBs" – using MBE videoBadMBs: The message has the form:

{start-MBE / 7 / <videoBadMBs> / firstMBByte1 / firstMBByte2 / numberOfMBsByte1 / numberOfMBsByte2 / trByte1 / trByte2}

videoBadMBs commands the far-end video encoder to take corrective action when a set of MBs has not been properly received. The encoder shall use this information to take action towards the recovery of video quality. Unlike videoNotDecodedMBs, the videoBadMBs command lacks any specific definition of how the decoder has treated the specified set of MBs. The encoder should respond to this command by ensuring that the specified set of macroblocks is not used for the prediction of video pictures subsequent to the encoder's receipt of the command. The specific action to be taken by the encoder is not defined, but may include any appropriate remedial action, such as sending an INTRA frame.

This command shall not be transmitted by a video decoder if the corresponding far-end encoder has not indicated the VBMBC capability. This command shall only be used with video compression algorithms that define MBs, for example, [ITU-T H.261], [ITU-T H.262] and [ITU-T H.263]. The MB numbering is done according to raster-scan order within the picture, with the upper left MB of the picture defined as macroblock number 1 and the MB number increasing first from left to right and then from top to bottom.

firstMBByte1 and firstMBByte2 together indicate the index number of the first MB that has been erroneously received and numberOfMBsByte1 and numberOfMBsByte2 together indicate the total number of successive MBs that have been erroneously received. firstMBByte1 and numberOfMBsByte1 shall take values from 0-223. firstMBByte2 and numberOfMBsByte2 shall also take values from 0-223. The first MB received erroneously is given by 224 × firstMBByte1 + firstMBByte2. Similarly, the total number of successive MBs that have been erroneously received is given by 224 × numberOfMBsByte1 + numberOfMBsByte2. The decoder shall ensure that the first referenced and the total number of successive MBs are within the valid range of the video compression algorithm in use. The encoder should ignore the message if values outside the valid range are received.

The temporal reference of the picture containing erroneously received MBs is indicated by trByte1 and trByte2 which shall take values from 0-223. The temporal reference is given by 224 × trByte1 + trByte2. The decoder shall ensure that the temporal reference is valid for the video compression algorithm in use. The encoder should ignore the message if a value outside the valid range is received.

3.1.21 video command "lostPicture" – using MBE lostPicture: The message has the form:

{start-MBE / 3/ <lostPicture> / Byte1 / Byte2}, where the most significant bits of Byte1 and Byte2 must be set to 0 by the transmitter.

lostPicture message commands the far-end video encoder to take corrective action due to the loss or corruption of the indicated pictures. The message body contains two bytes. The two bytes together represent two parameters: shortOrLongTermPictureIndication and picNumberOrIndex.

shortOrLongTermPictureIndication = (Byte1 >> 6) & 0x1

picNumberOrIndex = ((Byte1 & 0x7) << 7) | (Byte2 & 0x7F)

The first parameter indicates the lost picture is a short-term picture or long-term picture. If shortOrLongTermPictureIndication is 1 the lost picture is a short-term picture, and picNumberOrIndex represents the picture number of the lost picture. If shortOrLongTermPictureIndication is 0 the lost picture is a long-term picture, and picNumberOrIndex represents the long-term picture index of the lost picture. An encoder capable of

Annex U of [ITU-T H.263] (Enhanced reference picture selection, with or without sub-picture removal) and/or clause W.6.3.12 of [ITU-T H.263] (Picture Number) shall be capable of understanding this message and taking corrective action.

3.1.22 video command "recoveryReferencePicture" – using MBE recoveryReferencePicture: The message has the form:

{start-MBE / 3 / <recoveryReferencePicture> / Byte 1/ Byte2}, where the most significant bits of Byte1 and Byte2 must be set to 0 by the transmitter.

recoveryReferencePicture message commands the far-end encoder to use only the indicated pictures for prediction. The message body contains two bytes, which together represent two parameters: shortOrLongTermPictureIndication and picNumberOrIndex.

shortOrLongTermPictureIndication = (Byte1 >> 6) & 0x1

picNumberOrIndex = ((Byte1 & 0x7) << 7) | (Byte2 & 0x7F)

The first parameter indicates the requested picture is a short-term picture or long-term picture. If shortOrLongTermPictureIndication is 1, the requested picture is a short-term picture and picNumberOrIndex represents the picture number of the requested picture. If shortOrLongTermPictureIndication is 0, the requested picture is a long-term picture and picNumberOrIndex represents the long-term picture index of the requested picture. An encoder capable of Annex U of [ITU-T H.263] (Enhanced reference picture selection, with or without sub-picture removal) and/or clause W.6.3.12 of [ITU-T H.263] (Picture Number) shall be capable of understanding this message and taking corrective action. It may be sent from a decoder that considers the indicated pictures to have been received and decoded correctly, and considers other (unspecified) pictures to have been corrupted by transmission.

3.1.23 video command "lostPartialPicture" – using MBE lostPartialPicture: The message has the form:

{start-MBE / 7 / <lostPartialPicture> / Byte1 / Byte2 / Byte3 / Byte4 / Byte5 / Byte6}

where the most significant bits of Byte1, Byte2, Byte3, Byte4, Byte5 and Byte6 must be set to 0 by the transmitter.

lostPartialPicture commands the far-end video encoder to take corrective action when a set of MBs has not been properly received. It is the same as videoBadMBs except that the picture is indicated by either pictureNumber, a short-term picture number, or longTermPictureIndex, a long-term picture index. The message body contains 6 bytes and collectively represents four parameters: shortOrLongTermPictureIndication, picNumberOrIndex, firstMB and numberOfMBs.

shortOrLongTermPictureIndication = (Byte1 >> 6) & 0x1

picNumberOrIndex = ((Byte1 & 0x7) << 7) | (Byte2 & 0x7F)

firstMB = ((Byte3 & 0x7F) << 7) | (Byte4 & 0x7F)

numberOfMBs = ((Byte5 & 0x7F) << 7) | (Byte6 & 0x7F)

The meanings of the first two parameters are exactly the same as those of the lostPicture message, while the firstMB and numberOfMBs indicate the spatial location of the partial picture lost. firstMB is the index of the first macroblock that is lost or corrupted. numberOfMBs indicates the number of MBs lost or corrupted. The MB numbering is done according to raster-scan order within the picture, with the upper left MB of the picture defined as macroblock number 1 and the MB number increasing first from left to right and then from top to bottom. An encoder capable of Annex U of [ITU-T H.263] (Enhanced reference picture selection, with or without sub-picture removal) and/or clause W.6.3.12 of [ITU-T H.263] (Picture Number) shall be capable of understanding this message and taking corrective action.

3.1.24 video capability "h264SetSubmode": When present this indicates the capability to support ITU-T H.264 video encoding submodes as defined in clause 6.2 of [ITU-T H.241].

The video commands clauses 3.1.8-3.1.24 shall be supported only by terminals with the relevant video capabilities. These commands shall be ignored by terminals without these capabilities.

3.2 C&I related to audio

3.2.1 audio indicate muted (AIM): This symbol is used to indicate that the content of the audio channel does not represent a normal audio signal. The audio encoder may be without audio input or an electronically-generated tone may have been substituted. A terminal receiving AIM shall not mute its loudspeakers in response (otherwise, such tones and the restoration of normal audio would go unheard).

3.2.2 audio indicate active (AIA): This is complementary to AIM.

3.2.3 audio command equalize (ACE): This is sent by a terminal to request that the delay of the audio signal be equalized to that of the video signal ("lip synchronization"), in both directions. A terminal sending this request shall itself equalize the delays in the same way.

3.2.4 audio command zero-delay (ACZ): This is sent by a terminal to request that the audio signal not be delayed to match that of the video signal.

3.2.5 audio command "ISO/IEC14496-3Command": This MBE commands the far-end terminal to start receiving audio according to ISO/IEC 14496-3 (MPEG-4 audio). The message has the form:

{Start-MBE / N / <ISO/IEC14496-3Command> / profileAndLevelByte1 / profileAndLevelByte2 / audioObjectType / MaxAudioObjects / muxConfig}

The coding of the parameters within the MBE message avoids emulation of the escape codes defined in Table A.1 of [ITU-T H.221]. N is the number of the following bytes within the MBE.

profileAndLevel, audioObjectType and MaxAudioObjects are defined in Annex H of [ITU-T H.245].

profileAndLevel indicates the particular profiles in combination with the level to be used. This integer parameter is sent thus:

If profileAndLevel is ≤ 127, profileAndLevelByte1 equals profileAndLevel and profileAndLevelByte2 is not present.

If profileAndLevel is > 127, profileAndLevelByte1 is constructed with the two high order bits (bit 1 and 2) equal to binary '10' and the least significant 6 bits of profileAndLevel placed into the least significant 6 bits of profileAndLevelByte1. profileAndLevelByte2 is constructed with the 6 high order bits (bit 1 to 6) equal to binary '000000' and the most significant 2 bits of profileAndLevel placed into the least significant 2 bits of profileAndLevelByte2.

audioObjectType is a byte that indicates the set of tools to be used by the decoder of the bitstream contained in the logical channel.

MaxAudioObjects is a byte that specifies the maximum number of multiplexed audio objects in the audio payload.

muxConfig is a byte that indicates the used bit rates and bit positions as defined in [ITU-T H.221]. The format of muxConfig is shown below:

(MSB) 1	2	3	4	5	6	7	(LSB) 8
0	Reserved	Reserved	Reserved	128 kbit/s	64 kbit/s	56 kbit/s	48 kbit/s

Bit 1 (value 128) shall be set to 0 to avoid MBE emulation.

Bits 2, 3 and 4 are reserved and shall be set to 0.

Bit 5 when 1 indicates MPEG-4 audio at 128 kbit/s.

Bit 6 when 1 indicates MPEG-4 audio at 64 kbit/s.

Bit 7 when 1 indicates MPEG-4 audio at 56 kbit/s.

Bit 8 when 1 indicates MPEG-4 audio at 48 kbit/s.

NOTE – The MBE could be extended in the future to accommodate additional bit rates or features.

3.2.5.1 Example

This example assumes the following configuration:

– profileAndLevel: Main Audio Profile = 1

– audioObjectType: AAC main = 1

– MaxAudioObjects = 1

– muxConfig: MPEG-4 audio at 56 kbit/s = 2

{start-MBE / 5 / <ISO/IEC14496-3Command> / 1 / 1 / 1 / 2}

3.2.6 audio command "G.719Command": This MBE commands the far-end terminal to start receiving audio according to [ITU-T G.719]. The message has the form:

{Start-MBE / N / <G.719Command> / rateNchannel}

The coding of the parameters within the MBE message avoids emulation of the escape codes defined in Table A.1 of [ITU-T H.221]. N is the number of the following bytes within the MBE.

rateNchannel is a byte that indicates the used bit rate and bit positions as defined in [ITU-T H.221] and if one or two channels are used. When using two channels, the rates of 32 and 48 kbit/s shall not be used. The format of rateNchannel is shown below:

(MSB) (LSB)

1	2	3	4	5	6	7	8
0	Reserved	Channels	128 kbit/s	96 kbit/s	64 kbit/s	48 kbit/s	32 kbit/s

Bit 1 (value 128) shall be set to 0 to avoid MBE emulation.

Bit 2 is reserved and shall be set to 0.

Bit 3 when 1 indicates two channels

Bit 4 when 1 indicates ITU-T G.719 audio at 128 kbit/s.

Bit 5 when 1 indicates ITU-T G.719 audio at 96 kbit/s.

Bit 6 when 1 indicates ITU-T G.719 audio at 64 kbit/s.

Bit 7 when 1 indicates ITU-T G.719 audio at 48 kbit/s.

Bit 8 when 1 indicates ITU-T G.719 audio at 32 kbit/s.

NOTE – The MBE could be extended in the future to accommodate additional bit rates or features.

3.2.6.1 Example

This example assumes the following configuration:

rateNchannel: G.719 audio at 96 kbit/s = 8 mono.

{start-MBE / 2/ <G.719Command> / 8}

3.3 C&I for maintenance purposes

3.3.1 loopback command "video loop request" (LCV): On receipt of this symbol, a terminal shall connect the output of the video decoder to the input of the video encoder.

3.3.2 loopback command "digital loop request" (LCD): On receipt of this symbol, the terminal shall disconnect the output of the multiplexer from the outgoing path, replacing it with the input to the demultiplexer. In the case of multiple B or H_0 connections, loopback is activated in each connection.

NOTE – If this digital loopback command is issued again, it would come back from the remote terminal. Then the original terminal would respond to this loopback command making a complete loop of the transmission path. Maintenance terminals shall avoid this situation by sending the command only once, or by ignoring the received loopback command.

3.3.3 loopback command "audio loop request" (LCA): On receipt of this symbol, the terminal should, if possible, connect the output of the audio decoder to the input of the audio encoder.

3.3.4 loopback command off (LCO): On receipt of this symbol, the terminal shall disconnect all loops and restore audio, video and data paths to their normal condition.

3.4 SBE numbers and characters

SBE numbers

The escape code (111) [19] defined in [ITU-T H.221] gives access to a table of 224 numbers which have the values 0-223 according to the 8-bit binary code. These SBE values are referred to as "SBE numbers". One SBE number or a string of such numbers is normally preceded by another SBE symbol indicating the purpose for which the number is being sent.

Terminal numbers (see [ITU-T H.243]) are of the form <M> <T>, where <M> and <T> are each SBE numbers.

SBE characters

The escape code (111) [20] defined in [ITU-T H.221] gives access to a table of characters coded as in Table 3. A character or string of characters is normally preceded by another SBE symbol indicating the purpose for which they are being sent.

Where asterisks are used, they identify symbols which shall be followed (always) by at least one SBE number or SBE character. See also Table 4.

3.5 SBE and MBE symbols used in multipoint working (see [ITU-T H.243])

NOTE 1 – Some of the following codes may be cancelled by transmission of appropriate codes as listed in Table 1 but not separately defined here.

NOTE 2 – Any of the symbols prescribed here may be repeated without ill effect: they are part of a set currently in force. An MCU shall expect propagation and processing delays to slow responses from terminals and other MCUs; terminals may repeat a request that an MCU has already satisfied. It is important that terminals receiving SBE symbols that they do not recognize or cannot use shall *ignore* these and not enter any fault recovery process.

MCV	*Multipoint Command Visualization-forcing* – transmitted by a terminal to force an associated MCU to broadcast its video signal used to transmit the picture of a chairman or VIP, alternatively to hold a picture source during the transmission of graphics.
MIV	*Multipoint Indication Visualization* – transmitted by an MCU to indicate to a terminal that its video signal is being seen by at least one other terminal (otherwise known as "On-air" or "SeenByAtLeastOneOther" indication).
MVC	*Multipoint Visualization Capability* – included in the cap-set of an MCU or terminal to show that it can properly generate or process the codes MVA and MVR.
MVA	*Multipoint Visualization Achieved* – transmitted by an MCU to indicate that it has granted visualization in response to the command MCV.
MVR	*Multipoint Visualization Refused/Revoked* – transmitted by an MCU when it cannot comply with the command MCV, when visualization status has been withdrawn due to a higher priority switch request, e.g., VCB, or as a response to Cancel-MCV.
MCC	*Multipoint Command Conference* – transmitted by an MCU. An end point receiving MCC shall make its outgoing transfer rate equal to its incoming transfer rate and its outgoing audio rate equal to its incoming audio rate. NOTE 1 – The command could also be used to invoke an on-screen user indication.
MCS	*Multipoint Command Symmetrical data-transmission* – transmitted by an MCU when setting up data broadcasting. On receipt a terminal shall prepare itself for data reception and ensure, by mode change if necessary, that its outgoing data channel occupies the same capacity as its incoming data channel. A terminal in receipt of MCS cannot initiate data broadcasting.
MCN	*Multipoint Command Negating MCS* – transmitted by an MCU at the completion of data broadcasting. On receipt a terminal shall close any outgoing data channel which it has opened as a result of the previous reception of MCS. Following the end of data reception and the receipt of MCN, a terminal is permitted to initiate data broadcasting.
MMS	*Multipoint command Mode-Symmetrize* – transmitted by an MCU. When in receipt of MMS, end points shall respond to the MCU with whatever mode they receive, including audio coding algorithm and rate, data path(s) and video coding algorithm and image format, and also image profile in the case of [ITU-T H.262]. NOTE 2 – If MMS has not been received, terminals are free to follow the mode asymmetry allowed by MCC, e.g., to send ITU-T H.263 while receiving ITU-T H.261.
MIZ	*Multipoint Indication Zero-communication* – transmitted by an MCU to a terminal for information, with the meaning that no other terminals are yet connected to the MCU.
MIS	*Multipoint Indication Secondary-status* – transmitted by an MCU to a terminal for information, with the meaning that since other terminals of a higher capability are participating in the conference call, this terminal will not necessarily receive all the signals that are sent to those other terminals (see [ITU-T H.243]).
MIM	*Multipoint Indicate Master-MCU* – transmitted by an MCU which has claimed the master-MCU role.
MIL*	*Multipoint Indication Loop* – See clause 12 of [ITU-T H.243]; shall be followed by an SBE number.
MIH	*Multipoint Indicate Hierarchy* – This capability value indicates that the MCU can operate as a master, a slave, or a sub-slave, in a multilevel hierarchy.
MIJ	*Multipoint Indicate Joined_Real_Conference* – sent by an MCU to a terminal to indicate that the terminal has joined an actual conference and that any terminal numbers or identifiers previously transmitted are no longer valid.
RAN*	*Random Number* – must be followed by a random SBE number in the range 0-223.
TIA*	*Terminal Indicate Assignment* – used by an MCU to transmit the assigned terminal number to another MCU or to a terminal; shall be followed by <M> <T>.

TIN*	*Terminal Indicate Number* – used to pass information concerning terminal number assignments made; shall be followed by <M> <T>.
TIL	*Terminal Indicate List* – An MBE message used to transmit a list of terminal numbers currently added into the conference; the message has the form {start-MBE/N/<til>/<M>/(N – 2) values of <T>}, where <til> has the value given in Table 2, <M> is a one-byte number assigned to an MCU and each value of <T> is a one-byte value assigned to a terminal by its local MCU. One such message will be sent for each MCU participating.
TID*	*Terminal Indicate Dropped* – used to pass information concerning any terminal number no longer effective; shall be followed by <M><T>.
TCU	*Terminal Command Update* – transmitted by a terminal or MCU to an MCU to request an updated list of terminals connected.
TIF*	*Terminal Indicate Floor-request* – transmitted by a terminal to its MCU; shall be followed by <M> <T> – when forwarded from one MCU to another, <T> is that of the terminal requesting the floor; when transmitted by the terminal itself, <0> <0> shall follow.
TIC	*Terminal Indicate Capability* – included in the initial cap-set of a terminal to tell an MCU that it can recognize TIA and return TIX in the additional channels; included in the cap-set of an MCU to say that it can accept additional calls to the same access number and correctly associate additional channels according to the procedure described in [ITU-T H.243].
TIX*	*Terminal Indicate additional-channel-X* – sent by a terminal which has capability TIC in response to TIA; shall be followed by <M> <T>.
TCI	*Terminal Command Identify* – sent by an MCU to a directly-connected terminal or vice versa to exact identification by means of a symbol TII*.
TCS-*n*	*Terminal Command String* – sent by an MCU to a directly-connected terminal or vice versa to exact information in the form of a symbol IIS; the meaning according to the different values of *n* is thus: *n* = 0: reserved *n* = 1: password *n* = 2: ASCII identity (person or terminal) *n* = 3: conference identity *n* = 4: extension address *n* = 5: Unicode identity (person or terminal) *n* = 6 to 31: reserved
TII*	*Terminal Indicate Identity* – sent in response to TCI; shall be followed by an SBE alphanumeric character according to clause 3.4, the content being prescribed by the MCU service provider.
IIS	*Information Indicate String* – An MBE message sent in response to TCS-*n*; the message has the form {start-MBE//N/<iis>/<n>/(N – 2) characters} where <iis> has the value given in Table 2, where *n* corresponds to the value of *n* in TCS-*n*; characters are as specified for TIP. When *n* = 5, the message has the form {start-MBE/N/<iis>/<n>/languageID/(N – 4) characters} where languageID and characters are as specified for TIP-5.
TIS	*Terminal Indicate identity-Stop* – end-marker to indicate the end of a sequence of TII symbols.
TIE	*Terminal Indicate End_of_Listing* – sent by an MCU when it has completed the transmission of a series of complementary TIL messages.
TCP*	*Terminal Command Personal-identifier* – sent by a terminal requesting the MCU to provide the personal identity string associated with the terminal specified by the following identifier <M>, <T>. The MCU responds with TIP.
TCP-5*	*Terminal Command Unicode Personal-identifier* – sent by a terminal requesting the MCU to provide the Unicode personal identity string associated with the terminal specified by the following identifier <M>, <T>. The MCU responds with TIP-5.

TIP	*Terminal Indicate Personal-identifier* – response to TCP in the form {start-MBE/N/<tip>/m/t/(N – 3) characters}, where <tip> has the value given in Table 2. Characters are given in Table 3 and m and t are binary numbers representing the terminal number associated with this personal identifier. The null response is of the form {start-MBE/3/<tip>/m/t}.
TIP-5	*Terminal Indicate Unicode Personal-identifier* – response to TCP-5 in the form {start-MBE/N/<tip-5>/m/t/languageID/(N – 5) characters}, where: <tip-5> has the value given in Table 2. m and t are binary numbers representing the terminal number associated with this personal identifier. LanguageID consists of 2 octets representing a two-letter code as defined in ISO 639-1 encoded using the letter values given in Table 3. LanguageID identifies the language associated with the following Unicode characters. Characters are drawn from the Unicode set as defined in ISO/IEC 10646 and shall be encoded as specified in clause 7.4 of [ITU-T H.243]. The null response is of the form {start-MBE/3/<tip-5>/m/t}.
TCA	*Token Command Association* – sent by a terminal requesting the MCU to provide the terminal numbers associated with each token. The MCU responds with an MBE TIR.
TIR	*Token Indicate Response* – message of the form {start-MBE/7/<tir>/m1/t1/m2/t2/m3/t3} in response to a TCA where <tir> has the value given in Table 2 and m1/t1 is the terminal number of the end point with the LSD token, m2/t2 is the terminal number of the end point with the HSD token and m3/t3 is the terminal number of the end point with the chair token.
VIN*	*Video Indicate Number* – transmitted by an MCU to indicate the source (terminal identity number) of the video in the signal; shall be followed by <M> <T>.
VIN2*	*Video Indicate Number (2)* – This indication is similar to VIN, except that it applies to a composed image and is sent when a terminal is added to a composed image by the MCU. <M><T> is the terminal number and can be used to request the associated terminal identity string. <N> is a sub-picture number taken from figures 2 to 4 of [ITU-T H.243].
VIC*	*Video Indicate Compose* – This indication informs terminals that picture composition is beginning. The value <M> is a number taken from the rightmost column of Table 4 of [ITU-T H.243] that indicates which picture composition method is in use.
VIM	*Video Indicate Mixing* – capability value indicating support for both VIC and VIN2; only applies to an MCU.
VCB*	*Video Command Broadcast* – transmitted by a chair-control terminal or an MCU to an MCU to cause broadcasting of the video from the terminal whose identity number follows VCB.
Cancel-VCB	*Cancel Video Command Broadcasting* – returns the conference to voice-activated video switching.
VCS*	*Video Command Select* – transmitted by a terminal to an MCU to cause transmission to itself of the video from the terminal whose identity number follows VCS, if this requirement does not conflict with a VCB requirement.
Cancel-VCS	*Cancel Video Command Select* – transmitted by a terminal to return to automatic video switching at the MCU.
VCR	*Video Command Release/Refuse* – transmitted by an MCU when it cannot comply with the commands VCB or VCS, for whatever reason.
CIC	*Chair-control Indicate Capability* – included in the cap-set of an MCU to show that it can properly process the codes (CCA, CIT, CCR, CIS, CCD, CIR, CCK), (TIA, TIN, TID, TIL, TCU, TIF), (VCB, VIN, VCR, VCE).

CCD*	*Chair Command Disconnect* – transmitted by a chair-control terminal to an MCU to cause dropping of the terminal whose identity number follows.
CIR	*Chair Indicate Release/refuse* – transmitted by an MCU when it cannot comply with the command CCD.
CCK	*Chair Command Kill* – transmitted by a chair-control terminal to drop all terminals from the conference.
CCA	*Chair Command Acquire* – transmitted by a terminal or MCU to claim a chair-control token.
DCA-L* DCA-H*	*LSD/HSD Command Acquire-token* – transmitted by a terminal or MCU to claim an LSD/HSD token; shall be followed by an SBE number indicating the data rate requested (see tables 2 and 3 of [ITU-T H.243]).
CIT	*Chair Indicate Token* – used by an MCU to pass the chair-control token.
DIT-L	*LSD Indicate Token* – used by an MCU to pass the LSD token.
DIT-H	*HSD Indicate Token* – used by an MCU to pass the HSD token.
CCR	*Chair Command Release/refuse* – used by an MCU to withdraw/refuse the assignment of a chair-control token.
DCR-L DCR-H	*LSD/HSD Command Release/refuse* – used by an MCU to withdraw/refuse the assignment of the LSD token, or by the chair-control terminal to cause this withdrawal.
CIS	*Chair Indicate Stopped-using-token* – transmitted by a terminal holding the chair token to release it.
DIS-L	*LSD Indicate Stopped-using-token* – transmitted by a terminal holding the LSD token to release it.
DIS-H	*HSD Indicate Stopped-using-token* – transmitted by a terminal holding the HSD token to release it.
DCC-L DCC-H	*LSD/HSD Command Close* – transmitted by a terminal holding the LSD/HSD token to release it and close the LSD/HSD channel.
DCM	*Data Command MLP* – transmitted by a terminal to trigger the establishment of an MLP channel.

3.6 SBE symbols used in channel aggregation and restricted network situations

3.6.1 [AggIN]*: a double SBE symbol indicating the number **n** as determined by the procedure described in [ITU-T H.244]. The sequence is (111) [17] (011) [5] followed by an SBE number.

3.6.2 network indicate incompatible-aggregators (NII): transmitted by a channel aggregator when this is the cause of the call remaining on the initial connection only (see [ITU-T H.244]).

3.6.3 Restricted_network Indicate Restrict (RIR): used between MCUs – see [ITU-T H.243].

3.6.4 Restricted_network Indicate Denied (RID): used between MCUs – see [ITU-T H.243].

3.6.5 Restricted_network Indicate Unrestrict (RIU): used between MCUs – see [ITU-T H.243].

3.7 Symbols used in the transfer of network addresses ([ITU-T H.242])

3.7.1 network indicate address – using MBE (NIA-m): sent in response to NCA-i or NCA-a when the remote terminal has MBE capability. The message has the form:

{start-MBE/N/<nia>/n/d_1,d_2/d_3,d_4/.....}

where:

n = number of the channel that the network address is to be used for

d_1 = first digit of the number to be dialled coded as a 4-bit binary number

d_2 = second digit to be dialled, etc.

There are N-2 groupings of packed digits. Between the country code (see [ITU-T E.164]) and the national number, the 4-bit nibble 1100 is inserted; no local prefix is included. If the last digit occupies the first four bits of the Nth byte, the remaining four bits are filled also with 1100.

As an example, the address +44 1473 642402 is transmitted as:

{start-MBE/9/<nia>/n/0100 0100/1100 0001/0100 0111/0011 0110/0100 0010/0100 0000/0010 1100}

Partial network addresses:

{start-MBE/N/<niap>/n/p_1,p_2/p_3,p_4/.....p_x}

Here the address of channel n = (n_0 + 1) is indicated by taking the address of channel n = n_0 by replacing the last x digits by the values p_1.....p_x. If x is odd, again the vacant final four bits are filled with 1100. This allows much time to be saved if all the NIAs differ by one or two digits. Clearly, if channels n_0 and n_0 + 1 have the same address, the latter is conveyed by {start-MBE/2/<niap>/n_0+1}.

Following the above example, if the next address is +44 1473 64 2403 the message is:

{start-MBE/3/<niap>/n+1/0011 1100}

3.7.2 network command send_address-initial (NCA-i): sent by a calling equipment to elicit details of network addresses of the initial connection.

3.7.3 network command send_addresses-additional (NCA-a): sent by a calling equipment to elicit details of network addresses of additional connections.

3.7.4 network indicate addresses – using SBE (NIA-s): sent in response to NCA-i or NCA-a when the remote terminal has no MBE capability. This symbol is followed by a string of SBE numbers: the first is the number N of following numbers forming the complete "message" and the subsequent symbols have the same form as the string defined above for <nia>, namely d_1,d_2/d_3,d_4/..... Thus the number +44 1473 642402 is conveyed by:

{NIA}{num/7}{num/0100 0100}{num/1100 0001}{num/0100 0111}{num/0011 0110}
{num/0100 0010}{num/0100 0000}{num/0010 1100}

Other BAS codes may be inserted between {bracketed} byte groups in the sequence but not between <NIA> and the following symbol.

3.7.5 network indicate same_addresses (NIS): sent in response to NCA-a when the called end has all its additional addresses the same as the initial one.

3.7.6 network indicate consecutive_addresses (NIC): sent in response to NCA-a when the called end has all its additional addresses consecutively in a sequence above the initial one.

3.7.7 network indicate double_addresses (NID): sent in response to NCA-a when there are two connections available at each network address and the addresses are consecutive.

3.7.8 network indicate query_address – using SBE (NIQ-s): sent when a called terminal wishes to advise the calling terminal that it should seek the full network address before attempting to establish additional connections – see [ITU-T H.242].

3.7.9 network indicate query_address – using MBE (NIQ-m): as for NIQ-s, additionally informing that MBE-coded addresses can be processed.

3.7.10 network indicate refuse-address (NIR): Sent by a terminal in response to NCA-i or NCA-a when the requested address information is not to be divulged.

3.8 Symbols used in the indication of mode preferences ([ITU-T H.242])

The values (100) [0]-[31] of Table 4 are assigned for mode-preference indication according to the procedure of clause 9.5 of [ITU-T H.242]; the prefix Ø is used to distinguish the names from capabilities and commands. In the case of audio modes, these correspond to commands listed in clause A.1 of [ITU-T H.221]. Video modes, however, correspond to capabilities listed in clause A.5 of [ITU-T H.221] and clause 5 of [ITU-T H.242], the parameters of transmitted video signals being contained within the video stream. The MLP-rate value is used as the first symbol in a string defined in [ITU-T H.243].

3.9 Symbols to indicate conformance with later versions of Recommendations

1997Recs.	Transmitted by an end point to indicate conformance to 1997 revised versions of [ITU-T H.221], [ITU-T H.242] and [ITU-T H.230].

3.10 Symbols used for role management and additional media channels ([ITU-T H.239])

h239ControlCapability	Indicates that the terminal or MCU supports [ITU-T H.239] and the flowControlReleaseRequest and flowControlReleaseResponse messages defined there.
h239ExtendedVideoCapability	This MBE signals video capabilities for use with [ITU-T H.239]. Despite its name and function, this is not signalled as part of an ITU-T H.320 capability set. The message has the form {Start-MBE/N/<h239ExtendedVideoCapability>/ B_1/ . . . /B_{N-1}} where h239ExtendedVideoCapability has the value given in Table 2.
H.239-message	This MBE signals C&I messages for role management according to [ITU-T H.239]. The message has the form {Start-MBE/N/<H.239-message>/subMessageIdentifier/zero or more message content bytes} where ITU-T H.239-message has the value given in Table 2.
AMC-open*	*Additional Media Channel Open* – transmitted by a terminal to open an AMC. Shall be followed by two SBE numbers indicating the role label, channel ID and sub-timeslot count.
AMC-close*	*Additional Media Channel Close* – transmitted by a terminal to close an AMC. Shall be followed by an SBE number indicating the channel ID.
AMC-C&I	This MBE signals C&I messages that apply to the additional media channel according to [ITU-T H.239]. The message has the form {Start-MBE/N/<AMC-C&I>/AMC-C&IByte1/B_2 . . . B_{N-1}} where AMC-C&I has the value given in Table 2.

4 Requirements for C&I

The C&I functions are defined so that, under various appropriate circumstances, the audiovisual system will operate in a fault-free manner and also so that sympathetic presentation to users is possible. Some functions should, therefore, be mandatory, others optional. This clause, together with the categorization in Table 1, clarifies the circumstances under which C&I functions are mandatory.

CM Conditionally mandatory: If the terminal (or MCU) is capable of entering the given state, then it shall transmit the given code and, when leaving that state, the complementary code. If it has no such capability, it can ignore both.

M Mandatory: for all equipment of either terminal or MCU type.

X Non-mandatory: On receipt of such a code, it may be unrecognized or recognized but not acted upon, or recognized and acted upon, entirely at the discretion of the manufacturer or user.

NA The code is not applicable in this case.

Directivity of the C&I signal: See [ITU-T H.243] to determine whether it is mandatory or optional to the terminal or MCU.

It will be noted that there are only a few mandatory requirements on most terminals. All audiovisual terminals shall recognize and obey the command to make or break the digital loopback and video loopback if they have video capability. All terminals which have a video capability shall also obey fast-update, freeze-picture and MCS/MCN; otherwise, there will be system misoperation on a multipoint call.

Table 1 – C&I functions categorization

Code		**Abbreviation**	**Transmit**		**Receive**		**Reference for procedures**
first 3 bits	**last 5 bits** (decimal form)		**Terminal**	**MCU**	**Terminal**	**MCU**	
(000)	[0,1]	Reserved for audio-related symbols					
	[2]	AIM	CM	CM	X	X	3.2
	[3]	AIA	CM	CM	X	X	3.2
	[4]	ACE	CM	CM	CM	CM	3.2
	[5]	ACZ	CM	CM	CM	CM	3.2
	[6]-[7]	Reserved for audio-related symbols					
	[8]	TCI	#	#	#	#	[ITU-T H.243]
	[9]	TII*	#	#	#	#	[ITU-T H.243]
	[10]	TIS	#	#	#	#	[ITU-T H.243]
	[11]-[15]	Reserved					
	[16]	VIS	CM	CM	X	X	3.1
	[17]	VIA	CM	CM	X	X	3.1
	[18]	VIA2	X	NA	X	X	[ITU-T H.320]
	[19]	VIA3	X	NA	X	X	[ITU-T H.320]
	[20]	VIC*	#	#	#	#	[ITU-T H.243]
	[21]	VSTRDEL	X	X	X	X	3.1
	[22]	VIN2***	#	#	#	#	[ITU-T H.243]
	[23]	VIM	#	#	#	#	[ITU-T H.243]
	[24]	VBMBC	X	X	X	X	3.1
	[25]	h264SetSubmode	X	X	X	X	3.1
	[26]-[30]	Reserved for video-related symbols					
	[31]	VIR	X	NA	X	NA	[ITU-T H.320]
(001)	[0]	MCC	NA	M	M	CM	[ITU-T H.243]
	[1]	Cancel-MCC	NA	M	M	CM	[ITU-T H.243]
	[2]	MIZ	#	#	#	#	[ITU-T H.243]

Table 1 – C&I functions categorization

Code		Abbreviation	Transmit		Receive		Reference for procedures
first 3 bits	**last 5 bits** (decimal form)		**Terminal**	**MCU**	**Terminal**	**MCU**	
	[3]	Cancel-MIZ	#	#	#	#	[ITU-T H.243]
	[4]	MIS	#	#	#	#	[ITU-T H.243]
	[5]	Cancel-MIS	#	#	#	#	[ITU-T H.243]
	[6]	MIM	#	#	#	#	[ITU-T H.243]
	[7]	TIC	#	#	#	#	[ITU-T H.243]
	[8]	TIX**	#	#	#	#	[ITU-T H.243]
	[9]	RAN*	#	#	#	#	[ITU-T H.243]
	[10]	MIH	#	#	#	#	[ITU-T H.243]
	[11]	TIA**	#	#	#	#	[ITU-T H.243]
	[12]	TIN**	#	#	#	#	[ITU-T H.243]
	[13]	TID**	#	#	#	#	[ITU-T H.243]
	[14]	TCU	#	#	#	#	[ITU-T H.243]
	[15]	TCA	#	#	#	#	[ITU-T H.243]
	[16]	MCV	#	#	#	#	[ITU-T H.243]
	[17]	Cancel-MCV	#	#	#	#	[ITU-T H.243]
	[18]	MIV	#	#	#	#	[ITU-T H.243]
	[19]	Cancel-MIV	#	#	#	#	[ITU-T H.243]
	[20]	MCS	#	#	#	#	[ITU-T H.243]
	[21]	MCN	#	#	#	#	[ITU-T H.243]
	[22]	VIN**	#	#	#	#	[ITU-T H.243]
	[23]	VCB**	#	#	#	#	[ITU-T H.243]
	[24]	Cancel-VCB	#	#	#	#	[ITU-T H.243]
	[25]	VCS**	#	#	#	#	[ITU-T H.243]
	[26]	Cancel-VCS	#	#	#	#	[ITU-T H.243]
	[27]	VCR	#	#	#	#	[ITU-T H.243]
	[28]	MMS	#	#	#	#	[ITU-T H.243]
	[29]	Cancel-MMS	#	#	#	#	[ITU-T H.243]
	[30]	Cancel-MIM	#	#	#	#	[ITU-T H.243]
	[31]	MIL*	#	#	#	#	[ITU-T H.243]
(010)	[0]	CIC	#	#	#	#	[ITU-T H.243]
	[1]	CCD**	#	#	#	#	[ITU-T H.243]
	[2]	CIR	#	#	#	#	[ITU-T H.243]
	[3]	CCK	#	#	#	#	[ITU-T H.243]
	[4]	CCA	#	#	#	#	[ITU-T H.243]
	[5]	CIT	#	#	#	#	[ITU-T H.243]
	[6]	CCR	#	#	#	#	[ITU-T H.243]
	[7]	CIS	#	#	#	#	[ITU-T H.243]

Table 1 – C&I functions categorization

Code		Abbreviation	Transmit		Receive		Reference for procedures
first 3 bits	**last 5 bits** (decimal form)		**Terminal**	**MCU**	**Terminal**	**MCU**	
	[8]	TIF**	#	#	#	#	[ITU-T H.243]
	[9]	TIE	#	#	#	#	[ITU-T H.243]
	[10]-[11]	Reserved					
	[12]	MVC	#	#	#	#	[ITU-T H.243]
	[13]	MVA	#	#	#	#	[ITU-T H.243]
	[14]	MVR	#	#	#	#	[ITU-T H.243]
	[15]	MIJ	#	#	#	#	[ITU-T H.243]
	[16]	DCA-L*	#	#	#	#	[ITU-T H.243]
	[17]	DIT-L	#	#	#	#	[ITU-T H.243]
	[18]	DCR-L	#	#	#	#	[ITU-T H.243]
	[19]	DIS-L	#	#	#	#	[ITU-T H.243]
	[20]	DCC-L	#	#	#	#	[ITU-T H.243]
	[21]-[23]	Reserved					
	[24]	DCA-H*	#	#	#	#	[ITU-T H.243]
	[25]	DIT-H	#	#	#	#	[ITU-T H.243]
	[26]	DCR-H	#	#	#	#	[ITU-T H.243]
	[27]	DIS-H	#	#	#	#	[ITU-T H.243]
	[28]	DCC-H	#	#	#	#	[ITU-T H.243]
	[29]-[30]	Reserved					
	[31]	DCM	#	#	#	#	[ITU-T H.243]
(011)	[0]	TCS-0	#	#	#	#	[ITU-T H.243]
	[1]	TCS-1	#	#	#	#	[ITU-T H.243]
	[2]	TCS-2	#	#	#	#	[ITU-T H.243]
	[3]	TCS-3	#	#	#	#	[ITU-T H.243]
	[4]	TCP**	#	#	#	#	[ITU-T H.243]
	[5]	AggIN*			CM	CM	[ITU-T H.244]
	[6]	NCA-i	CM	CM	CM	CM	[ITU-T H.242]
	[7]	NCA-a	CM	CM	CM	CM	[ITU-T H.242]
	[8]	NIS	CM	CM	CM	CM	[ITU-T H.242]
	[9]	NIC	CM	CM	CM	CM	[ITU-T H.242]
	[10]	NID	CM	CM	CM	CM	[ITU-T H.242]
	[11]	NII			CM	CM	[ITU-T H.244]
	[12]	TCP-5**	#	#	#	#	[ITU-T H.243]
	[13]	NIA-s	CM	CM	CM	CM	[ITU-T H.242]
	[14]	NIQ-s	CM	CM	CM	CM	[ITU-T H.242]
	[15]	NIQ-m	CM	CM	CM	CM	[ITU-T H.242]
	[16]	NIR	CM	CM	CM	CM	[ITU-T H.242]

Table 1 – C&I functions categorization

Code		Abbreviation	Transmit		Receive		Reference for procedures
first 3 bits	**last 5 bits** (decimal form)		**Terminal**	**MCU**	**Terminal**	**MCU**	
	[17]	TCS-4	#	#	#	#	[ITU-T H.242]
	[18]	TCS-5	#	#	#	#	[ITU-T H.243]
	[19]-[28]	Reserved					
	[29]	RIR	NA	#	NA	#	[ITU-T H.243]
	[30]	RID	NA	#	NA	#	[ITU-T H.243]
	[31]	RIU	NA	#	NA	#	[ITU-T H.243]
(101)	[0]	1997Recs.	X	NA	X	NA	3.9
	[1]	h239Control Capability	X	X	X	X	[ITU-T H.239]
	[2]	AMC-open**	CM	CM	CM	CM	[ITU-T H.239]
	[3]	AMC-close*	CM	CM	CM	CM	[ITU-T H.239]
	[4]-[31]	Reserved					
(111)	All values forbidden						
Codes listed in Annex A of [ITU-T H.221]							
		VCF	X	M	M	M	
		VCU	X	M	M	M	
		LCV	NA	NA	CM	NA	
		LCA	NA	NA	X	X	
		LCD			M	–	[ITU-T H.242], [ITU-T H.320]
		LCO			M	–	[ITU-T H.242], [ITU-T H.320]

* The number of * indicates how many SBE number or SBE character values must follow the symbol.

\# Indicates the direction in which the symbol is transmitted.

Table 2 – Values assigned to type identification bytes in MBE messages

Value	Abbreviation	Reference for procedure
0000 0000	Reserved	
0000 0001	Reserved	
0000 0010	<til>	[ITU-T H.243]
0000 0011	<iis>	[ITU-T H.243]
0000 0100	<tir>	[ITU-T H.243]
0000 0101	<tip>	[ITU-T H.243]
0000 0110	<nia>	[ITU-T H.242]
0000 0111	<niap>	[ITU-T H.242]
0000 1000	<Au_MAP>	[ITU-T J.52]
0000 1001	<Au_COM>	[ITU-T J.52]
0000 1010	<H.262/H.263>	[ITU-T H.242]
0000 1011	<ident>	[ITU-T H.242]
0000 1100	<ØCSFMT>	3.1
0000 1101	<ØCPAR>	3.1
0000 1110	<ØSCLPREF>	3.1
0000 1111	<videoNotDecodedMBs>	3.1
0001 0000	<videoFastUpdateGOB>	3.1
0001 0001	<videoFastUpdateMB>	3.1
0001 0010	<videoBadMBs>	3.1
0001 0011	<lostPicture>	3.1
0001 0100	<recoveryReferencePicture>	3.1
0001 0101	<lostPartialPicture>	3.1
0001 0110	<H.264>	[ITU-T H.241]
0001 0111	<h239ExtendedVideoCapability>	[ITU-T H.239]
0001 1000	<H.239-message>	[ITU-T H.239]
0001 1001	<AMC-cap>	[ITU-T H.239]
0001 1010	<AMC-C&I>	[ITU-T H.239]
0001 1011	<ISO/IEC14496-3Capability>	[ITU-T H.242]
0001 1100	<ISO/IEC14496-3Command>	3.2
0001 1101	<tip-5>	[ITU-T H.243]
0001 1110	<H.264Submode-message>	[ITU-T H.241]
0001 1111	<G.719Capability>	[ITU-T H.242]
0010 0000	<G.719Command>	3.2
0010 0001 to 1101 1111	Reserved	
1110 0000 to 1111 1111	Forbidden	

Table 3 – Table of characters accessed by escape code (111) [20]

		0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
		(000)	(000)	(001)	(001)	(010)	(010)	(011)	(011)	(100)	(100)	(101)	(101)	(110)	(110)	(111)	(111)
		[0-15]	[16-31]	[0-15]	[16-31]	[0-15]	[16-31]	[0-15]	[16-31]	[0-15]	[16-31]	[0-15]	[16-31]	[0-15]	[16-31]	[0-15]	[16-31]
[0]	[16]			SP	0	@	P	`	p				°				
[1]	[17]			!	1	A	Q	a	q			¡	±	grave			
[2]	[18]			"	2	B	R	b	r			¢	²	acute			
[3]	[19]			#	3	C	S	c	s			£	³	circumflex			
[4]	[20]			$	4	D	T	d	t				×	tilde			
[5]	[21]			%	5	E	U	e	u			¥	µ	macron			
[6]	[22]			&	6	F	V	f	v				¶	breve			
[7]	[23]			'	7	G	W	g	w			§	·	dot-above			
[8]	[24]			(	8	H	X	h	x			¤	÷	umlaut			
[9]	[25]			)	9	I	Y	I	y								
[10]	[26]			*	:	J	Z	j	z					ring			
[11]	[27]			+	;	K	[	k	{			«	»	cedilla			
[12]	[28]			,	<	L	\	l	|				¼				
[13]	[29]			-	=	M	]	m	}				½	double acute			
[14]	[30]			.	>	N	^	n	~				¾	ogonek			
[15]	[31]			/	?	O	_	o					¿	caron			
		0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
The diacritical marks in column 12 apply to the adjacent character in the same way as in [ITU-T T.51].																	

Table 4 – Occupancy of escape table reached from (111) [17] of Table A.1 of [ITU-T H.221]

	(000)	(001)	(010)	(011)	(100)	(101)	(110)	(111)
[0]		MCC	CIC (cap)	TCS-0	ØA-law,0F	1997Recs.		
[1]		Cancel-MCC	CCD**	TCS-1	Øμ-law,0F	h239Control Capability (cap)		
[2]	AIM	MIZ	CIR	TCS-2	ØG.722-m2	AMC-open**		
[3]	AIA	Cancel-MIZ	CCK	TCS-3	ØG.722-m3	AMC-close*		
[4]	ACE	MIS	CCA	TCP**	ØG.728			
[5]	ACZ	Cancel-MIS	CIT	AggIN*				
[6]		MIM	CCR	NCA-I				
[7]		TIC (cap)	CIS	NCA-a				
[8]	TCI	TIX**	TIF**	NIS	ØH.261/QCIF			
[9]	TII*	RAN*	TIE	NIC	ØH.261/CIF			
[10]	TIS	MIH (cap)		NID	ØH.262S_SIF			
[11]		TIA**		NII	ØH.262S_2SIF			
[12]		TIN**	MVC	TCP-5**	ØH.262S_4SIF			
[13]		TID**	MVA	NIA-s	ØH.262M_SIF			
[14]		TCU	MVR	NIQ-s	ØH.262M_2SIF			
[15]		TCA	MIJ	NIQ-m	ØH.262M_4SIF			
[16]	VIS	MCV	DCA-L*	NIR	ØH.263_SQCIF			
[17]	VIA	Cancel-MCV	DIT-L	TCS-4	ØH.263_QCIF			
[18]	VIA2	MIV	DCR-L	TCS-5	ØH.263_CIF			
[19]	VIA3	Cancel-MIV	DIS-L		ØH.263_4CIF			
[20]	VIC*	MCS	DCC-L		ØH.263_16CIF			
[21]	VSTRDEL*	MCN			ØCPCF*			
[22]	VIN2***	VIN**			ØVSTRD*			
[23]	VIM (cap)	VCB**			ØGHOP*			
[24]	VBMBC (cap)	Cancel-VCB	DCA-H*		Øcancel-GHOP			
[25]	h264SetSubmode	VCS**	DIT-H					
[26]		Cancel-VCS	DCR-H					
[27]		VCR	DIS-H					
[28]		MMS	DCC-H					
[29]		Cancel-MMS		RIR				
[30]		Cancel-MIM		RID				
[31]	VIR	MIL*	DCM	RIU	ØMLP_rate			

The number of * indicates how many SBE number or SBE character values must follow the symbol.

Ø Prefix identifying mode-preference indication symbols.

(cap) identifies the only values that are allowed inside a capability set (see [ITU-T H.242]).

Annex A

ITU-T H.230 generic capabilities and messages

(This annex forms an integral part of this Recommendation.)

A.1 Scope

This annex defines ITU-T H.230 generic capabilities and messages used in ITU-T H.245-signalling based systems. Generic capabilities and messages allow recently defined ITU-T H.230 messages that do not equate to existing ITU-T H.245 messages to be signalled in ITU-T H.310, H.323 and H.324 systems.

A.2 References

[ITU-T H.245] Recommendation ITU-T H.245 (2011), *Control protocol for multimedia communication*.

[ITU-T H.310] Recommendation ITU-T H.310 (1998), *Broadband audiovisual communication systems and terminals*.

[ITU-T H.320] Recommendation ITU-T H.320 (2004), *Narrow-band visual telephone systems and terminal equipment*.

[ITU-T H.323] Recommendation ITU-T H.323 (2009), *Packet-based multimedia communications systems*.

[ISO 639-1] ISO 639-1:2002, *Codes for the representation of names of languages – Part 1: Alpha-2 code*.

[ISO/IEC 10646] ISO/IEC 10646:2017, *Information technology -- Universal Coded Character Set (UCS)*.

A.3 Generic capabilities

For further study. Note that the following OID has been reserved for generic capabilities: { itu-t(0) recommendation(0) h(8) 230 generic-capabilities(1) }.

A.4 Generic messages

For ITU-T H.245, each ITU-T H.230 generic message shall consist of a GenericRequest, GenericResponse, GenericCommand or GenericIndication according to Table A.1 containing a **GenericMessage.messageIdentifier** with the OID { itu-t(0) recommendation(0) h(8) 230 generic-message(2) } and a **subMessageIdentifier**. Each particular **subMessageIdentifier**, listed in Table A.1, may have an associated **messageContent** described in the following clauses.

Table A.1 – subMessageIdentifier values

subMessageIdentifier	Message name	Message type (for ITU-T H.245)
1	requestUnicodeTerminalID	GenericRequest
2	mCUnicodeTerminalIDResponse	GenericResponse
3	enterH243UnicodeTerminalID	GenericRequest
4	unicodeTerminalIDResponse	GenericResponse

A.4.1 Generic parameters used in ITU-T H.230 messages

Table A.2 lists the **GenericParameters** used in **messageContent** sequences.

Table A.2 – Generic parameters used in ITU-T H.230 messageContent sequences

Parameter identifier	Parameter name	Parameter value
41	terminalLabel	Integer (0..65535)
42	languageID	Octet string (Size (2))
43	unicodeTerminalID	Octet string (Size (1..128))

A.4.1.1 Terminal label

The terminalLabel parameter value shall contain both the terminal number and MCU number as defined in clause 7 of [ITU-T H.243]. The MCU number M and the terminal number T shall be combined into a single integer as follows: terminalLabel = (M × 256) + T.

NOTE – When in a point-to-point call (without an MCU), terminalLabel shall be set to 0.

A.4.1.2 Language ID

The languageID parameter value shall contain the language ID as defined for TIP-5 and described in clause 7 of [ITU-T H.243].

A.4.1.3 Unicode terminal ID

The unicodeTerminalID parameter value shall contain the Unicode characters as defined for TIP-5. When communicating between an ITU-T H.323 terminal and an ITU-T H.320 terminal via an ITU-T H.323 Gateway, unicodeTerminalID will be truncated so as not to exceed 32 octets.

A.4.2 Conference request and response Messages

A.4.2.1 Request Unicode Terminal ID

requestUnicodeTerminalID equates to TCP-5 as described in this Recommendation. The response to this request is **mCUnicodeTerminalIDResponse**. The **messageContent** field contains a terminalLabel parameter.

A.4.2.2 MC Unicode Terminal Response

mCUnicodeTerminalIDResponse equates to TIP-5 as described in this Recommendation. The **messageContent** field contains a sequence of terminalLabel, languageID and unicodeTerminalID parameters.

A.4.2.3 Enter ITU-T H.243 Unicode Terminal ID

enterH243UnicodeTerminalID equates to TCS-5 as described in this Recommendation. The response to this request is **unicodeTerminalIDResponse**.

A.4.2.4 Unicode Terminal ID Response

unicodeTerminalIDResponse equates to IIS-5 (value of n = 5) as described in this Recommendation. The **messageContent** field contains a sequence of terminalLabel, languageID and unicodeTerminalID parameters.

SERIES OF ITU-T RECOMMENDATIONS

Series A	Organization of the work of ITU-T
Series D	Tariff and accounting principles and international telecommunication/ICT economic and policy issues
Series E	Overall network operation, telephone service, service operation and human factors
Series F	Non-telephone telecommunication services
Series G	Transmission systems and media, digital systems and networks
Series H	**Audiovisual and multimedia systems**
Series I	Integrated services digital network
Series J	Cable networks and transmission of television, sound programme and other multimedia signals
Series K	Protection against interference
Series L	Environment and ICTs, climate change, e-waste, energy efficiency; construction, installation and protection of cables and other elements of outside plant
Series M	Telecommunication management, including TMN and network maintenance
Series N	Maintenance: international sound programme and television transmission circuits
Series O	Specifications of measuring equipment
Series P	Telephone transmission quality, telephone installations, local line networks
Series Q	Switching and signalling, and associated measurements and tests
Series R	Telegraph transmission
Series S	Telegraph services terminal equipment
Series T	Terminals for telematic services
Series U	Telegraph switching
Series V	Data communication over the telephone network
Series X	Data networks, open system communications and security
Series Y	Global information infrastructure, Internet protocol aspects, next-generation networks, Internet of Things and smart cities
Series Z	Languages and general software aspects for telecommunication systems

Printed in Switzerland
Geneva, 2019