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SERIES H: AUDIOVISUAL AND MULTIMEDIA SYSTEMS

Infrastructure of audiovisual services – Systems aspects

Role management and additional media channels for H.300-series terminals

ITU-T Recommendation H.239

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ITU-T Recommendation H.239

Role management and additional media channels for H.300-series terminals

Summary

This Recommendation defines the procedures for use of more than one video channel in H.320-based systems, and for labelling individual channels with a "role", which indicates requirements for processing the channel and the role of the channel content in the call. Role labels are applicable to both H.320 and H.245 signalling-based systems. The defined procedures include control, indication, and capability exchange mechanisms

This 2005 revision is corrected, including corrections formerly contained in the H.239 (2003) Implementor's Guide.

Source

ITU-T Recommendation H.239 was approved on 13 September 2005 by ITU-T Study Group 16 (2005-2008) under the ITU-T Recommendation A.8 procedure.

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AMC, capability exchange, commands, dual streams, H.310, H.320, H.321, H.322, H.323, H.324, multiple streams, roles, role labels, signalling, video channels, videoconferencing, videotelephony.

FOREWORD

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ITU-T Recommendation H.239

Role management and additional media channels for H.300-series terminals

1 Scope

This Recommendation defines the procedures for use of more than one video channel in H.320-based systems, and for labelling individual channels with a "role", which indicates requirements for processing the channel and the role of the channel content in the call. Role labels are applicable to both H.320 and H.245 signalling-based systems.

The defined procedures include control, indication, and capability exchange mechanisms.

2 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 Recommendation H.221 (2004), *Frame structure for a 64 to 1920 kbit/s channel in audiovisual teleservices*.

– ITU-T Recommendation H.230 (2004), *Frame-synchronous control and indication signals for audiovisual systems*.

– ITU-T Recommendation H.242 (2004), *System for establishing communication between audiovisual terminals using digital channels up to 2 Mbit/s*.

– ITU-T Recommendation H.245 (2005), *Control protocol for multimedia communication*.

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

– ITU-T Recommendation H.323 (2003), *Packet-based multimedia communications systems*.

– ITU-T Recommendation H.324 (2005), *Terminal for low bit-rate multimedia communication*.

– ISO/IEC 13871:1995, *Information technology – Telecommunications and information exchange between systems – Private telecommunications networks – Digital channel aggregation*.

3 Definitions

This Recommendation defines the following terms:

3.1 bonding: ISO/IEC 13871.

3.2 cap: Capability message.

3.3 channel: A transport mechanism for a stream of data, such as a video stream. For example, an H.245 Logical Channel, or the H.320 BAS and HSD channels.

3.4 control & indication: Messages, including requests, responses, commands, and indication messages, but not including capability messages.

3.5 **device**: An end-user system, gateway, or MCU.

3.6 **end-user system**: A terminal which is an ultimate source or sink of multimedia streams, such as a device which is meant for use by a human end user. Intermediary devices such as MCUs or gateways are not end-user systems.

3.7 **intermediary device**: An MCU or gateway.

3.8 **kbits**: Units of 1000 bits.

3.9 **main video channel**: For H.320, the remainder of the traditional video channel, after subtracting the AMC channel. When no AMC channel exists, this is the same as the traditional video channel. For H.245-based systems, this is any logical channel which does not have a role label.

3.10 **role**: A label which may be applied to a channel, identifying the nature of the content of the data carried in the channel. The phrase "the <*role label*> channel" should be read as meaning "the channel for which <*role label*> has been indicated".

3.11 **second video channel**: For H.320, the proposed new additional media channel (AMC). For H.245-based systems this channel is any logical channel with an explicit role label.

3.12 **stream**: The data content carried in a channel.

3.13 **timeslot**: A single 64 kbit/s (or in the case of restricted calls, 56 kbit/s) ISDN B-channel, or in the case of an H_0, H_{11} or H_{12} channel, a single 64 kbit/s (or in the case of restricted calls, 56 kbit/s) Time-Slot, as described in clause 1/H.221 and Figure 2/H.221. Timeslots are numbered from 1 to N (where N is the total number of timeslots) as shown in ITU-T Rec. H.221. This term is used in this Recommendation instead of "channel" to avoid confusion with H.245 Logical Channels or the H.320 BAS, FAS, LSD, HSD, MLP, ECS, or AMC channels.

3.14 **traditional video channel**: For H.320, the video channel as defined by ITU-T Rec. H.320 when no AMC is in use. For H.245-based systems, this is the same as the main video channel.

3.15 **sub-timeslot**: An H.221 sub-channel of 8 kbit/s. It consists of a single bit position of a timeslot, with the timeslot considered as octets (or in the case of restricted calls, septets) transmitted at 8 kHz. Sub-timeslots are numbered from 1 to 8 within each timeslot, corresponding to the bit-numbers shown in ITU-T Rec. H.221. For restricted calls, sub-timeslot 8 is considered to exist, but to be unavailable for use. This term is used in this Recommendation instead of "sub-channel" to avoid confusion with H.245 Logical Channels or the H.320 BAS, FAS, LSD, HSD, MLP, ECS, or AMC channels.

4 Abbreviations

This Recommendation uses the following abbreviations:

ASN.1 Abstract Syntax Notation One (see ITU-T Rec. H.245)

AMC Additional Media Channel

BAS Bit-rate Allocation Signal (see ITU-T Rec. H.221)

C&I Control & Indication

HSD High Speed Data (see ITU-T Rec. H.221)

MBE Multiple Byte Extension (see ITU-T Rec. H.230)

OID Object Identifier (see ITU-T Rec. H.245)

SBE Single Byte Extension (see ITU-T Rec. H.230)

5 Conventions

5.1 System terminology

In order to simplify references, this Recommendation refers to two classes of signalling systems for H.300-series devices.

"H.320" refers to ITU-T Rec. H.320 systems.

"H.245" refers to those systems that use signalling according to ITU-T Rec. H.245; these include H.310, H.323, and H.324 systems.

5.2 Transport channel terminology

In this Recommendation, the traditional H.320 video channel, and in the case of H.245-based systems, the **sessionID** 2 video channel, is referred to as the "main" video channel. The terminology used to describe these is given in Table 1.

Table 1/H.239 – Transport channel terminology

H.239 term	H.320 channels	H.245 based channels
"control channel"	BAS	LC 0
"main video channel"	Traditional H.320 video channel	LC with no role label
"second video channel"	AMC	LC with an explicit role
"3rd video channel"	AMC2 (for future study)	LC nn
etc.	AMC3, etc. (for future study)	LC nn

5.3 Message names

In this Recommendation signalling messages which are common to both H.245 and H.320 signalling systems are referred to by their names as given in Annex A/H.245, except in cases where their use in the unique H.320 signalling environment is described. Message names are presented in **bold font** to distinguish them from the other text of this Recommendation.

Table 2 provides a reference for corresponding H.245 and H.242/H.230 messages mentioned in this Recommendation.

Table 2/H.239 – Corresponding H.245 and H.320 video signals

H.245 name	H.320/H.230 mnemonic
cancelMultipointConference	cancel-MCC
cancelMultipointModeCommand	cancel-MMS
logicalChannelActive	VIA, VIA2, VIA3
logicalChannelInactive	VIS
multipointConference	MCC
multipointModeCommand	MMS
terminalYouAreSeeing	VIN
videoFastUpdatePicture	VCU
videoFreezePicture	VCF
NOTE – H.320 symbols VIA2 and VIA3 signal activity of alternate video sources (for example a document camera, VCR, or DVD player) on a single video channel, as described in 4.4/H.320. They do not indicate activity on alternate video channels. Activity of the primary video source on any video channel should be signalled with VIA.	

5.4 Requirement terminology

In this Recommendation the following conventions are used:

– "Shall" indicates a mandatory requirement.

– "Should" indicates a suggested but optional course of action.

– "May" indicates an optional course of action rather than a recommendation that something take place.

6 Overview

H.245-based systems provide for multiple channels of video, while H.320 systems provide for only a single video channel. However, neither of these define a one-way transmission method, methods to label a video channel's content as a presentation video stream, or methods to control presentation video in a multipoint conference. This Recommendation provides these extensions, as well as a means to add an additional video channel to H.320.

The mechanisms are designed for both one-way and two-way video transmission. One-way transmission is particularly advantageous for presentation video; it reduces computational complexity in the devices, and it simplifies the distribution of the presentation stream in MCUs.

6.1 Roles and role labels

The architecture of this Recommendation separates the idea of transport channels (logical channels in H.245, BAS, main video, main audio, LSD, HSD, MLP, etc. in H.320) from "roles".

Roles, which are indicated by "role labels" on a channel, indicate both the purpose of the stream carried on a channel, and indicate how the stream should be presented at the end-user system and processed by an MCU.

The general architecture is that a role label may be assigned to any channel (audio, video, or data) where it is useful to establish policies for presentation, management, or distribution of the information on that channel.

6.2 Additional media channels

While H.320 has no provision for multiple video channels, it does provide a variety of data channels (LSD, HSD, MLP, H-MLP), which could be used to transport a second video stream. However, these channels are commonly used for both H.224 and T.120 services. Permitting a second video stream to run over these channels would interfere with these services, and complicates the allocation of these channels in a multipoint conference. In addition, use of the existing data channels is not extensible.

Therefore, for H.320, a second video channel called the Additional Media Channel (AMC) is described. In principle, this framework could be extended to include more than one AMC channel (AMC2, AMC3, etc.) but as applications for more than one AMC are not well defined, this functionality is for further study.

The H.320 AMC is described in Annex B.

7 H.239 capabilities exchange

The capabilities given in this clause are distinct from those given in Annex B for the AMC.

H.239 capabilities use very similar structures for both H.320 and H.245-based signalling systems, to ease the implementation of gateways and MCUs.

The **h239ControlCapability** indicates that the device supports ITU-T Rec. H.239 and the flowControlReleaseRequest and flowControlReleaseResponse messages defined in Table 7.

A separate **h239ExtendedVideoCapability** message expresses video capabilities used with roles.

The H.239 capability signals permit a device to send capabilities that correspond to the following H.245 capability structure:

> {1 or more capabilities for traditional video channel},
> {{1 or more capabilities for second video channel}, {1 or more capabilities for main video channel while second video channel is open}}

The {1 or more capabilities for traditional video channel} shall be sent via the normal capability exchange mechanism.

The {1 or more capabilities for second video channel} shall be sent via the **h239ExtendedVideoCapability** message as described below.

The {1 or more capabilities for main video channel while second video channel is open} may be sent via the **h239ExtendedVideoCapability** message as described below, if this capability differs from the capability for the traditional video channel.

NOTE – For example, the capability for the main video channel, while the second video channel is open, may be less capable than the traditional video channel due to the computational requirements of operating two video streams simultaneously.

The **h239ExtendedVideoCapability** message binds together a set of alternative video channel capabilities for a single channel with the channel's capability to operate in one or more roles.

7.1 H.239 capabilities signals

H.239 capabilities shall be carried by two separate signals, as shown in Table 3.

Table 3/H.239 – H.239 capabilities signals

H.245-signalling based systems		H.320 systems	
GenericCapability OID	**Appears in H.245 structure**	**BAS name**	**BAS signal type**
{ itu-t(0) recommendation(0) h(8) 239 generic-capabilities(1) h239ControlCapability(1) }	Capability.genericControl Capability	h239ControlCapability	SBE
{ itu-t(0) recommendation(0) h(8) 239 generic-capabilities(1) h239ExtendedVideoCapability(2) }	VideoCapability. extendedVideoCapability. videoCapabilityExtension	h239ExtendedVideoCapability (NOTE – This is an MBE *indication*, despite its name)	MBE indication

The traditional and main video channels shall not signal a role capability.

The second video channel shall signal a role capability.

Systems which support H.239 shall signal the following capabilities as listed below:

a) The traditional video channel, signalled normally as required by the system specification.

b) A second video channel – In H.245 signalling-based systems, this shall be signalled in an **ExtendedVideoCapability** containing a **videoCapability** and a **videoCapabilityExtension** containing the h239ExtendedVideoCapability as in Table 5 and the roleLabel parameter as in Table 6. In H.320 systems, this shall be signalled in an **h239ExtendedVideoCapability** MBE indication. These signals mean that the device supports any of the roles indicated in the roleLabel parameter, on a video channel conforming to any of the indicated video capabilities.

c) For H.245 signalling-based systems, the main video channel shall be included in a set of **simultaneousCapabilities** together with the **ExtendedVideoCapability** for the second video channel. This indicates that the main video channel may be used simultaneously with the second video channel. In H.320 systems, capabilities applicable to the main video channel while operating simultaneously with the second video channel may optionally be signalled using **h239ExtendedVideoCapability**.

d) The **h239ControlCapability** as in Table 4. This indicates that the device supports ITU-T Rec. H.239 and the flowControlReleaseRequest and flowControlReleaseResponse messages defined in Table 7.

Except for H.320-H.245 gateways, unrecognized **GenericParameter** structures shall be ignored by receivers.

7.1.1 Capabilities for H.245

Table 4/H.239 – h239ControlCapability capability identifier

Capability name	h239ControlCapability
Capability identifier type	Standard
Capability identifier value	{ itu-t(0) recommendation(0) h(8) 239 generic-capabilities(1) h239ControlCapability(1) }
maxBitRate	This parameter is not used.
Collapsing	This field shall not be used and shall be ignored by receivers.
nonCollapsing	This field shall not be used and shall be ignored by receivers.
nonCollapsingRaw	This field shall not be used and shall be ignored by receivers.
Transport	This field shall not be used and shall be ignored by receivers.

Table 5/H.239 – h239ExtendedVideoCapability capability identifier

Capability name	h239ExtendedVideoCapability
Capability identifier type	Standard
Capability identifier value	{ itu-t(0) recommendation(0) h(8) 239 generic-capabilities(1) h239ExtendedVideoCapability(2) }
maxBitRate	This parameter is not used.
Collapsing	This field contains the roleLabel parameter.
nonCollapsing	This field shall not be used and shall be ignored by receivers.
nonCollapsingRaw	This field shall not be used and shall be ignored by receivers.
Transport	This field shall not be used and shall be ignored by receivers.

Table 6/H.239 – roleLabel Boolean parameter

Parameter name	roleLabel
Parameter description	This parameter is a Boolean array. If bit 7 (value 2) is 1, this indicates support of the "Live" role. If bit 8 (value 1) is 1, this indicates support of the "Presentation" role. All other bits are reserved and shall be set to 0. In a decoder capability, for each bit set to 1, this means that the device supports the indicated Role(s). In an OpenLogicalChannel message, only 1 bit shall be set, corresponding to the channel Role.
Parameter identifier type	Standard
Parameter identifier value	1
Parameter status	Mandatory
Parameter type	booleanArray
Supercedes	This field is not used.

NOTE – If, in the future, more Roles are defined than the number of reserved bits can accommodate, additional Roles could be signalled by allocating another parameter for additional Roles. If this is done, in order for H.320 receivers using H.239 to avoid incorrectly interpreting the roleLabel parameter as indicating the main video channel, at least one bit in the roleLabel booleanArray should be set even if some other

parameter is used to indicate the Role. One way to accomplish this would be to allocate one reserved bit in roleLabel to be set to 1 when another parameter indicates the Role.

7.1.2 Capabilities for H.320

In H.320 systems, the H.239 capabilities shall be signalled in two different BAS messages, <h239ControlCapability> (see 3.10/H.230) and <h239ExtendedVideoCapability> (see Table 2/H.230).

<h239ExtendedVideoCapability> is an H.320 MBE indication (see 2.2.3/H.230). Despite its name, it is not a formal H.320 capability, and it shall not be included in the formal H.320 capability set.

NOTE 1 – This separation of the <h239ControlCapability> BAS capability from the longer <h239ExtendedVideoCapability> MBE indication serves to reduce the length of the H.320 system's capability set, which is already too long.

This MBE has the format:

{ Start-MBE / N / <h239ExtendedVideoCapability> / B_1 / . . . / B_{N-1} }

Bytes B_1 through B_{N-1} within the MBE shall begin with the roleLabel parameter, as defined in Table 6 and coded as a **GenericParameter** as described in Annex A, followed by a single byte of 0, which marks the end of the sequence of one or more **GenericParameter**s. (The use of more than one **GenericParameter** in this structure is for further study.)

If all bits in the roleLabel parameter are set to 0, this indicates that the capability applies to the main video channel.

Receivers shall parse the MBE as a sequence of one or more **GenericParameter**s according to Annex A, followed by a single byte of 0 marking the end of the **GenericParameter** sequence.

Immediately following the 0 byte marking the end of the **GenericParameter** sequence, the remaining bytes of the MBE shall contain a concatenated list of 1 or more video capabilities in the syntax given in Table A.1/H.221, as specified with all escape codes, extensions, or MBE sequences. The list of capabilities shall not include H.221 Cap-mark.

NOTE 2 – This <h239ExtendedVideoCapability> MBE indication may contain nested MBE messages.

H.320 devices shall not transmit video on a second video channel unless the far-end device has indicated support for at least one role and an associated video channel.

8 C&I messages

C&I messages are used in this Recommendation to manage tokens for the "Presentation" role, and to permit devices to request release of video flow control to enable the operation of additional media channels.

All C&I messages defined in this clause shall be carried as follows.

8.1 Signalling of messages in H.239

For H.245, each H.239 message shall consist of a **GenericRequest**, **GenericResponse**, **GenericCommand** or **GenericIndication** according to Table 7 containing a **GenericMessage.messageIdentifier** with the OID { itu-t(0) recommendation(0) h(8) 239 generic-message(2) }, and a **subMessageIdentifier**. Each particular **subMessageIdentifier** listed in Table 7 has an associated **messageContent** syntax given in the following clauses.

For H.320, each H.239 message shall be carried by a separate MBE message (see 2.2.3/H.230) which shall contain the same **subMessageIdentifier** value and parameter sequence as its H.245 equivalent, coded according to the procedures in Annex A. This MBE message uses the BAS code <H.239-message> (see Table 2/H.230). The MBE contents are in the format:

{ Start-MBE / N / <H.239-message> / **subMessageIdentifier** / zero or more message content bytes }

H.320-H.245 gateways shall translate these H.239 messages between the H.320 and H.245 signalling systems as specified in Annex A.

Except for H.320-H.245 gateways, devices that receive **messageContent** containing an unrecognized **parameterIdentifier** shall ignore such **parameterIdentifiers** and any associated **parameterValues.**

C&I messages for the AMC are treated differently, and are described separately in Annex B.

8.2 H.239 messages

Table 7 lists the messages defined in this Recommendation, except for those in Annex B.

Table 7/H.239 – subMessageIdentifier values

subMessageIdentifier	Message name	Message type (for H.245)
1	flowControlReleaseRequest	GenericRequest
2	flowControlReleaseResponse	GenericResponse
3	presentationTokenRequest	GenericRequest
4	presentationTokenResponse	GenericResponse
5	presentationTokenRelease	GenericCommand
6	presentationTokenIndicateOwner	GenericIndication

For each message, the clauses below present a table indicating the message content and syntax. The sequence of **GenericParameters** in the **messageContent** shall be transmitted in the order given in each table. The parameter names given in each table correspond to those in Table 7 above. Parameters shall be sent as indicated in the "Required Presence" column of each table.

8.3 GenericParameters used in H.239 messages

Table 8 lists the **GenericParameters** used in all **messageContent** sequences in this Recommendation.

Table 8/H.239 – GenericParameters used in H.239 messageContent sequences

Parameter identifier	Parameter name	Parameter value	Parameter value type
0	reserved	0	unsignedMin
41	bitRate	Integer (1..19200)	unsignedMin
42	channelId	Integer (0..65535)	unsignedMin
43	symmetryBreaking	Integer (0..127)	unsignedMin
44	terminalLabel	Integer (0..65535)	unsignedMin
126	acknowledge	None	logical
127	reject	None	logical
NOTE – Parameter identifier 0 is reserved, and should not be defined in the future, as the value 0 is used to demarcate the end of the GenericParameter sequence in the <h239ExtendedVideoCapability> MBE indication.			

8.3.1 bitRate

The bitRate parameter shall be a channel bit rate in units of 100 bit/s.

8.3.2 channelID

The channelID parameter shall be an AMC channel ID on H.320 systems. On H.245 systems, it shall be a **logicalChannelNumber**. Intermediary devices such as gateways and MCUs that forward this parameter shall convert the parameter value to the appropriate AMC channel ID or **logicalChannelNumber** for the device to which the message is forwarded.

The AMC channel ID values for H.320 are shown in Table 9.

Table 9/H.239 – AMC channelID values

ChannelID	Description
1	Main video channel
2	Second video channel (AMC)
All other values	Reserved

8.3.3 symmetryBreaking

The **symmetryBreaking** parameter shall be a random number with a uniformly distributed probability of having a value between 1 and 127 inclusive. In circumstances defined below, the MCU shall send a 0 value.

8.3.4 terminalLabel

The **terminalLabel** parameter value shall contain both the terminal number and MCU number as defined in clause 7/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.

8.3.5 acknowledge and reject

The **acknowledge** and **reject** parameters are used in response messages.

8.4 Flow control release request and response messages

The flowControlReleaseRequest and flowControlReleaseResponse messages may be used to request the far end to release flow control or **multipointConference** restrictions to permit a device to send the indicated channel at the indicated bit rate.

Devices shall not send these messages unless the far end has expressed the H.239 capability in its capability set.

8.4.1 flowControlReleaseRequest

This message may be used when a device wants to add a channel toward an MCU that has sent **multipointConference**, or if the device wants to increase a channel bit rate when the channel is flow-controlled.

Table 10/H.239 – flowControlReleaseRequest syntax

GenericParameter order	Parameter name	Required presence
1	channelID	Mandatory
2	bitRate	Mandatory

The originating channelID value shall be that of the device making the request.

8.4.2 flowControlReleaseResponse

Devices shall send this message in response to the **flowControlReleaseRequest** message.

Table 11/H.239 – flowControlReleaseResponse syntax

GenericParameter order	Parameter name	Required presence
1	acknowledge	Exactly 1 of these 2 parameters shall be present.
	reject	
2	channelID	Mandatory

The "acknowledge" response indicates that the far-end device intends to make a best-effort attempt to comply with the request. The exact bit rate requested may not be allocated. Devices receiving the "acknowledge" response shall continue to comply with the signalled flow control or other restrictions until the far end modifies these restrictions in separate signals.

The "reject" response indicates that the far-end device does not intend to comply with the request.

The originating channelID value shall be that of the device making the request.

8.5 Presentation role token messages

The presentationTokenRequest, presentationTokenResponse, presentationTokenRelease, and presentationTokenIndicateOwner messages shall be used to manage the token associated with the "Presentation" role, according to the token management procedures given in clause 11.

Devices shall not send these messages unless the far end has expressed the H.239 capability in its capability set.

8.5.1 presentationTokenRequest

This message is a request by the sender to acquire the indicated token. The receiver shall respond with presentationTokenResponse.

Table 12/H.239 – presentationTokenRequest syntax

GenericParameter order	Parameter name	Required presence
1	terminalLabel	Mandatory
2	channelID	Mandatory
3	symmetryBreaking	Mandatory

The originating channelID and terminalLabel values shall be those of the device making the request.

8.5.2 presentationTokenResponse

Devices shall send this message in response to the presentationTokenRequest message.

This response shall confirm or reject assignment of the indicated token to the sender of presentationTokenRequest. It shall include the parameter values from the original request.

Table 13/H.239 – presentationTokenResponse syntax

GenericParameter order	Parameter name	Required presence
1	acknowledge	Exactly 1 of these 2 parameters shall be present.
	reject	
2	terminalLabel	Mandatory
3	channelID	Mandatory

The originating channelID and terminalLabel values shall be those of the device making the request.

8.5.3 presentationTokenRelease

The presentationTokenRelease message shall be sent by a device holding the token in order to relinquish the token.

Table 14/H.239 – presentationTokenRelease syntax

GenericParameter order	Parameter name	Required presence
1	terminalLabel	Mandatory
2	channelID	Mandatory

The originating channelID and terminalLabel values shall be those of the device releasing the token.

8.5.4 presentationTokenIndicateOwner

This message indicates which device owns the token. This message should be sent periodically by the device holding the token, and forwarded by MCUs and gateways.

NOTE – This message permits resynchronization in case of transmission errors.

Table 15/H.239 – presentationTokenIndicateOwner syntax

GenericParameter order	Parameter name	Required presence
1	terminalLabel	Mandatory
2	channelID	Mandatory

The originating channelID and terminalLabel values shall be those of the device indicating ownership.

9 H.245 OpenLogicalChannel procedure

When a second video channel is opened in H.245, the **OpenLogicalChannel** message shall include an **extendedVideoCapability** with the **videoCapabilityExtension** including the h239ExtendedVideoCapability and roleLabel parameter. Changing the role may be accomplished by reopening the logical channel.

H.245 devices should not use the existing 3 primary sessionIDs for the second video channel.

10 Role policies and procedures

Role labels shall be assigned by the end-user system which sources the channel. Support for receiving role labels shall be signalled by devices in their capability set.

The defined role labels are:

- Live – video is processed normally; suitable for live video of people.
- Presentation – a token-managed presentation to be distributed to all devices.

For simplicity, role labels shall only be applied to the second video channel for H.320.

NOTE 1 – Application of role labels to other channels is for future study.

No explicit role label shall be used on a channel unless support for that role is explicitly signalled by the receiving device.

Regardless of roles, all C&I shall be used as specified elsewhere, except where this Recommendation makes specific mention otherwise.

NOTE 2 – For example, the use of **videoIndicateReadyToActivate** and corresponding BAS signal **VIR** is not affected by this Recommendation.

For any role, if a device is unable to open a channel due to flow control or **multipointConference** restrictions, the device may use the flowControlReleaseRequest message to request the far end to change its restrictions.

10.1 "Live" role procedures

The "Live" role indicates that the video channel shall be distributed, managed, and presented using the traditional means. The "Live" role is appropriate for live video of meeting participants. The "Live" video channel supplements the other video channel: it should carry a stream which is less important to display at end-user systems than the Presentation channel or channels without role labels.

"Live" video is two-way transmission; multiple devices may transmit "Live" video simultaneously.

10.1.1 MCU procedures

MCUs that support roles and process "Live" video streams distribute all live video in accordance with manufacturer-defined conference policies and shall identify the source of the video channel(s) in use by sending **terminalYouAreSeeing** for the channel.

MCUs should distribute a device's "Live" video stream to all participants who are also receiving the other video stream from the device.

10.1.2 End-user system procedures

To send a "Live" video stream, end-user systems that support roles shall open the channel (if closed), indicate **logicalChannelActive**, and start sending the stream.

To stop sending a "Live" video stream, end-user systems that support roles shall indicate **logicalChannelInactive**, stop sending the stream, and optionally close the channel.

10.2 "Presentation" role procedures

The "Presentation" role is used to indicate that the video channel contains a presentation which is intended to be seen by all conference participants. Transmission on the Presentation channel shall be managed by the token mechanism in clause 11 in order to provide the one-way transmission described above. Generally, the Presentation channel, when it is in use, should carry the stream which is most important to display at end-user systems.

Presentation token management procedures are described in clause 11.

10.2.1 MCU procedures

For the "Presentation" role, MCUs shall distribute the presentation video to all devices in the conference which support the "Presentation" role and its associated video mode, except when it is optional to send the presentation video to the sender.

The MCU shall also manage the presentation token in a multipoint call (grants the token, and may also withdraw the token), and shall identify the presenter by sending **terminalYouAreSeeing** for the channel in use.

10.2.2 End-user system procedures

To send a presentation video stream, devices that support roles shall request the token. When the device obtains the token, it shall open the channel (if closed); indicate video active, and start sending the stream.

To stop the presentation video stream, devices shall indicate **logicalChannelInactive**, stop sending the stream, and optionally close the channel. Then the end-user device shall release the token.

10.3 Multipoint considerations

The **multipointModeCommand** signal requires algorithm and image format symmetry for the Live role. However, since the "Presentation" role is one-way, devices shall ignore **multipointModeCommand** with respect to the Presentation channel.

11 Token management

The "Presentation" role is token-controlled. The token management procedure is described in this clause. There is one token in a conference.

NOTE – A larger number of Presentation tokens in a conference might, in the future, be indicated by a signal; this is for further study.

Token transfers should not drive video display rendering; instead existing explicit C&I messages should be used for this purpose.

The token messages are defined in 8.5.

The requirements in this clause apply to end-user systems only. MCU procedures for token management may follow specific manufacturer-defined conference polices. Such conference policies shall take into account the behaviour of devices according to this clause.

11.1 Procedure syntax

In this Recommendation, role token procedures are described using the following syntax:

subMessageIdentifier name (**GenericParameter** name)

For example, to indicate transmission of the H.239 presentationTokenResponse **subMessageIdentifier** with the **messageContent** field containing the acknowledge **GenericParameter**, the following syntax is used:

presentationTokenResponse(acknowledge)

Unless otherwise mentioned in the following clauses, token messages not described in each case should be ignored.

11.2 End-user system procedures

11.2.1 End-user system does not own and does not want the token

The end-user system shall respond to presentationTokenRequest by sending presentationTokenResponse(acknowledge).

The end-user system shall respond to presentationTokenResponse(acknowledge) by sending presentationTokenRelease.

11.2.2 End-user system owns the token and wants to retain the token

The end-user system shall respond to presentationTokenRequest by sending presentationTokenResponse(acknowledge), giving up the token.

While the token is held, the end-user system should send presentationTokenIndicateOwner periodically.

11.2.3 End-user system owns the token and wants to release the token

The end-user system shall send presentationTokenRelease.

11.2.4 End-user system does not own but wants the token

The end-user system shall send presentationTokenRequest.

If, prior to receiving a response, presentationTokenRequest is received from another device, then the end-user system shall:

If (transmitted symmetryBreaking < received symmetryBreaking),
send presentationTokenResponse(acknowledge) – abandoning the request.

If (transmitted symmetryBreaking = received symmetryBreaking)
send new presentationTokenRequest with a new symmetryBreaking parameter.

If (transmitted symmetryBreaking > received symmetryBreaking)
send presentationTokenResponse(reject) – rejecting the far-end request.

In all cases, the end-user system owns the token on receipt of presentationTokenResponse(acknowledge).

11.3 Master MCU procedures

At the start of a conference, the MCU should consider the token to be unowned.

When the MCU receives presentationTokenIndicateOwner from a device that is not the token owner, it should send presentationTokenRequest with a 0 symmetryBreaking value to it, and should then consider the token to be unowned.

11.3.1 Token unowned

When the MCU receives presentationTokenRequest, it should assign the token to the sender and send presentationTokenResponse(acknowledge) to it.

11.3.2 Token owned

When the MCU receives presentationTokenRequest from a device that does not own the token, it should forward the presentationTokenRequest to the current token owner with a 0 symmetryBreaking parameter value.

When the MCU receives presentationTokenResponse(acknowledge), it should assign the token by forwarding the presentationTokenResponse(acknowledge) to the new owner. The MCU should then send a presentationTokenIndicateOwner indication to all connected devices, indicating the owner.

When the MCU receives presentationTokenRelease from the token owner, it should consider the token to be unowned.

The MCU should forward presentationTokenIndicateOwner messages from the token owner to all connected devices in the conference.

When the end user system owning the token or slave MCU whose device owns the token disconnects, the MCU should consider the token to be unowned.

11.4 Slave MCU procedures

Slave MCUs shall forward all token messages received from its end-user systems or slave MCUs to the master MCU.

presentationTokenRequest, presentationTokenResponse, and presentationTokenRelease messages received from the master MCU shall be routed to the end-user system based on the terminalLabel parameter value.

presentationTokenIndicateOwner messages from the Master MCU shall be forwarded to all other connected devices.

Annex A

Procedures for translation of signalling between H.320 and H.245 systems

A.1 Introduction

This annex defines a procedure to transport H.245 generic messages in H.320 MBEs which enables H.320-H.245 gateways to automatically translate the signalling between the two systems. This method also ensures that the parameter syntax and semantics are the same between H.320 and H.245-based systems.

A.2 Carriage of variable length integers in MBEs

This clause specifies a procedure for the carriage of integers of any length in MBEs.

This procedure avoids emulation of the MBE BAS code.

A.2.1 Non-negative integers

Non-negative integers shall be carried in MBEs by the following method:

1) If the integer is ≤ 127, construct an MBE byte with a value equal to the integer. The procedure is complete. Otherwise, continue.
2) Construct an MBE byte with the two high order bits (bits 1 and 2) equal to binary '10', and place the least significant 6 bits of the integer in the least significant 6 bits of the MBE byte.
3) Discard the least significant 6 bits of the integer (shift the integer 6 bits to the right). Continue from step 1.

The result of this procedure is that each MBE byte with a high order bit set to 1 contains 6 bits of the integer, starting with the least significant 6 bits and proceeding with each MBE to more significant bits. The final MBE byte has the high order bit set to 0, and contains the 7 most significant bits of the integer.

Another result is that if the integer value is ≤ 127, it is represented by a single MBE byte.

A.2.2 Negative integers

Negative integers shall be carried in MBEs by the following method:

1) Set a non-negative integer I to have the absolute value of the negative integer.
2) Construct an MBE byte with the three high order bits (bits 1, 2 and 3) equal to binary '110', and place the least significant 5 bits of I in the least significant 5 bits of the MBE byte.

3) Discard the least significant 5 bits of I (shift I 5 bits to the right).

4) If I is ≤ 127, construct an MBE byte with a value equal to I. The procedure is complete. Otherwise, continue from step 2.

The result of this procedure is that one or more MBE bytes with the 3 high order bits equal to binary '110' contain 5 bits of the absolute value of the negative integer each, starting with the least significant 5 bits and proceeding with each MBE to more significant bits. The final MBE byte has the high order bit set to 0, and contains the 7 most significant bits of the absolute value of the negative integer.

Another result is that if the negative integer value is ≥ – 4095, it is represented by two MBE bytes.

This procedure shall not be used to code the value negative zero. The use of negative zero is reserved for possible future signalling.

A.2.3 Decoding variable length integers

In the position within an MBE where a variable-length integer begins, high order bits equal to:

binary 0 indicates the final (and only) byte of a non-negative integer;

binary 10 indicates the first byte of a non-negative integer; and

binary 11 indicates the first byte of a negative integer.

A.3 GenericParameter classes and associated translation procedures

In order to facilitate efficient translation to H.320 systems, three classes of **GenericParameter** within the **messageContent** sequence are defined here.

Each **GenericParameter** class is identified by its own range of **standard ParameterIdentifier**. Table A.1 shows these classes, called PID/VALUE (representing a **parameterIdentifier**/**parameterValue** pair), X/VALUE (representing an omitted **parameterIdentifier** and a present **parameterValue**), and PID/X (representing a present **parameterIdentifier** and omitted **parameterValue**).

H.320-H.245 gateways shall translate all **messageContent** regardless of whether the content is understood by the gateway. This procedure allows gateways to properly parse and translate messages even if new **GenericParameters** are added to the **messageContent** in the future.

Table A.1/H.239 – H.239 standard ParameterIdentifier classes

GenericParameter class	standard ParameterIdentifier range
PID/VALUE	1-39
X/VALUE	40-79
PID/X	80-127

The **standard ParameterIdentifer** value 0 is reserved.

NOTE – The value 0 in the place of a **ParameterIdentifier** is used in some circumstances, for example in the coding of the <h239ExtendedVideoCapability> MBE BAS sequence, as a special signal demarcating the end of a list of **GenericParameter** items. To avoid future ambiguity, a **standard ParameterIdentifier** with the value 0 should not be defined.

A.3.1 Translation of PID/VALUE

To translate a PID/VALUE parameter from H.245 to H.320, the **ParameterIdentifier** shall be inserted into the MBE string as a single byte, followed by the **ParameterValue** coded as a variable-length integer.

To translate a PID/VALUE parameter from H.320 to H.245, the **ParameterIdentifier** shall be copied from a single byte in the MBE, and the **ParameterValue** shall be decoded from the MBE variable-length integer.

A.3.2 Translation of X/VALUE

To translate a X/VALUE parameter from H.245 to H.320, the **ParameterIdentifier** shall be discarded, and the **ParameterValue** shall be coded into the MBE as a variable-length integer.

To translate a X/VALUE parameter from H.320 to H.245, the **ParameterIdentifier** shall be the one specified for the **GenericParameter** corresponding to the X/VALUE parameter in the H.320 syntax, and the **ParameterValue** shall be decoded from the MBE variable-length integer.

NOTE – Because **GenericParameters** in the X/VALUE class are coded in MBEs with no **ParameterIdentifier**, such parameters are not extensible in the same way as other classes. Such parameters should be defined in the future only when extensibility is not required. When this class is used, the syntax of the MBE must specify the location of such **ParameterValues**.

A.3.3 Translation of PID/X

To translate a PID/X parameter from H.245 to H.320, the **ParameterIdentifier** shall be inserted into the MBE string as a single byte, and the **ParameterValue** shall be discarded.

To translate a PID/X parameter from H.320 to H.245, the **ParameterIdentifier** shall be copied from a single byte in the MBE, and the **ParameterValue** shall be set to "logical".

Annex B

H.320 additional media channel

B.1 H.320 additional media channel

This clause defines the H.320 Additional Media Channel (AMC). It does not apply to H.245 signalling-based systems, as H.245 already supports multiple logical channels.

The H.320 AMC creates a partition of the traditional H.320 video channel. When the AMC is in use, the total video bit rate is split into two separate subchannels: the main video channel and the AMC.

Each video sub-channel shall use its own BCH (511,493) code for forward error correction.

The partitioning shall be determined from the subTimeslotCount value signalled in the AMC-open command by the procedure described below.

Starting from sub-timeslot 8 in the highest-numbered timeslot that is not occupied by the HSD channel, and progressing toward lower numbered sub-timeslots in each lower-numbered timeslot, the AMC shall occupy all bit positions in subTimeslotCount sub-timeslots that would otherwise have been allocated to the H.320 traditional video channel. Bit positions which are occupied by channels other than the H.320 traditional video channel (audio, FAS, BAS, LSD, ECS, etc.) shall not be included in the AMC. For restricted calls, in which sub-timeslot 8 is not available for use, sub-timeslot 8 is considered to exist, but as occupied by a channel other than the H.320 traditional video channel.

The video channel bit positions not included in the AMC shall be occupied by the main video channel.

To simplify management of the AMC, a limited set of numbers of sub-timeslots for the AMC are permitted to be signalled in the **AMC-cap** capability and **AMC-open** command.

Coexistence of HSD and AMC is an optional capability which shall be signalled as part of the AMC-cap (see B.4).

B.2 AMC multiplex example 1

For example, assume that the AMC channel is signalled as using the "Presentation" role and occupying 5 sub-timeslot positions in a 2 × 64 kbit/s call as shown in Figure B.1. This AMC channel would be opened using the command <AMC-open><0x22><0x05> (see clause B.5).

All video bits from timeslot 2, sub-timeslot 4 to timeslot 2, sub-timeslot 8, inclusive, are used for the AMC. These 5 timeslots represent 40 kbit/s (5 * 8000), but since some of the bits in sub-timeslot 8 are used for FAS and BAS, the actual AMC bit rate is 38.4 kbit/s.

The remaining video bits are occupied by the main video channel (marked "V" in Figure B.1), also providing 38.4 kbit/s in this example.

Initial timeslot (B-channel 1)								**Additional timeslot (B-channel 2)**							
sub-timeslot 1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**
a	a	a	a	a	a	V		V	V	V	AMC	AMC	AMC	AMC	
a	a	a	a	a	a	V	FAS	V	V	V	AMC	AMC	AMC	AMC	FAS
a	a	a	a	a	a	V		V	V	V	AMC	AMC	AMC	AMC	
. .	. .	. .	. .	. .	. .	V		V	V	V	AMC	AMC	AMC	AMC	
						V	BAS	V	V	V	AMC	AMC	AMC	AMC	BAS
						V		V	V	V	AMC	AMC	AMC	AMC	
						V	V	V	V	V	AMC	AMC	AMC	AMC	AMC
						V	V	V	V	V	AMC	AMC	AMC	AMC	AMC
						V	V	V	V	V	AMC	AMC	AMC	AMC	AMC
						V	V	V	V	V	AMC	AMC	AMC	AMC	AMC
						V	V	V	V	V	AMC	AMC	AMC	AMC	AMC
						V	V	V	V	V	AMC	AMC	AMC	AMC	AMC
						V	V	V	V	V	AMC	AMC	AMC	AMC	AMC
						V	V	V	V	V	AMC	AMC	AMC	AMC	AMC
						V	V	V	V	V	AMC	AMC	AMC	AMC	AMC
. .	. .	. .	. .	. .	. .	. .	. .	. .	. .	. .	. .	. .	. .	. .	. .

Figure B.1/H.239 (modified from ITU-T Rec. H.221) – Example bit positions for video in two B-channels

B.3 AMC multiplex example 2

Figure B.2 below gives an example of a call using six 56 kbit/s timeslots according to ISO/IEC 13871 (Bonding) Mode 1, with 64 kbit/s HSD and 12 AMC sub-timeslots used for the "Live" role. This AMC channel would be opened using the command <AMC-open><0x12><0x0C> (see clause B.5).

Using the given rules, the distribution of the available bits is shown.

This figure illustrates that H.239 treats the timeslots as if each contained all 8 possible sub-timeslots, even in the case of restricted calls in which only sub-timeslots 1 through 7 are available.

In the figure each letter represents a single sub-timeslot position as follows:

– "a" represents audio bits;

– "x" represents sub-timeslot 8 which is not available in this example;

– "V" represents the main video channel;

– "A" represents the AMC channel; and

– "H" represents the HSD channel.

Initial timeslot								2nd timeslot		3rd timeslot		4th timeslot								5th timeslot		6th timeslot	
a	a	a	a	a	a	F	x	VVVVVVV	x	VVVVVVV	x	V	V	V	V	A	A	A	x	AAAAAAA	x	HHHHHHH	x
a	a	a	a	a	a	A	x	VVVVVVV	x	VVVVVVV	x	V	V	V	V	A	A	A	x	AAAAAAA	x	HHHHHHH	x
a	a	a	a	a	a	S	x	VVVVVVV	x	VVVVVVV	x	V	V	V	V	A	A	A	x	AAAAAAA	x	HHHHHHH	x
a	a	a	a	a	a	B	x	VVVVVVV	x	VVVVVVV	x	V	V	V	V	A	A	A	x	AAAAAAA	x	HHHHHHH	x
a	a	a	a	a	a	A	x	VVVVVVV	x	VVVVVVV	x	V	V	V	V	A	A	A	x	AAAAAAA	x	HHHHHHH	x
a	a	a	a	a	a	S	x	VVVVVVV	x	VVVVVVV	x	V	V	V	V	A	A	A	x	AAAAAAA	x	HHHHHHH	x
a	a	a	a	a	a	V	x	VVVVVVV	x	VVVVVVV	x	V	V	V	V	A	A	A	x	AAAAAAA	x	HHHHHHH	x
a	a	a	a	a	a	V	x	VVVVVVV	x	VVVVVVV	x	V	V	V	V	A	A	A	x	AAAAAAA	x	HHHHHHH	x
a	a	a	a	a	a	V	x	VVVVVVV	x	VVVVVVV	x	V	V	V	V	A	A	A	x	AAAAAAA	x	HHHHHHH	x
a	a	a	a	a	a	V	x	VVVVVVV	x	VVVVVVV	x	V	V	V	V	A	A	A	x	AAAAAAA	x	HHHHHHH	x
a	a	a	a	a	a	V	x	VVVVVVV	x	VVVVVVV	x	V	V	V	V	A	A	A	x	AAAAAAA	x	HHHHHHH	x
a	a	a	a	a	a	V	x	VVVVVVV	x	VVVVVVV	x	V	V	V	V	A	A	A	x	AAAAAAA	x	HHHHHHH	x
..	..	..	..	..	..	..	..	.. ..	..	.. ..	..	..	..	..	..	..	..	..	..	.. ..	..	.. ..	..

Figure B.2/H.239 – Example bit positions in restricted call

B.4 AMC capabilities

The H.320 AMC capability exchange is handled by an MBE message (see 2.2.3/H.230). This MBE message uses the type identification byte <AMC-cap> (see Table 2/H.230). A device shall signal the AMC capability by including within its capability set the message:

{ Start-MBE / 3 / <AMC-cap> / optionByte1 / optionByte2 }

The AMC capability MBE bytes shall indicate the capability to receive an AMC with the specified number of sub-timeslots. It shall also indicate whether the device is capable of receiving HSD and AMC simultaneously.

optionByte1 and optionByte2 are shown in Tables B.1 and B.2 respectively. Each bit in the fields subTimeslotCapability1 and subTimeslotCapability2 indicate the ability to support AMC using the shown number of sub-timeslots. All devices that support AMC shall support operation with 8 sub-timeslots and with 0 sub-timeslots. The capability to operate with 0 sub-timeslots is not explicitly signalled.

NOTE – Operation with 0 sub-timeslots permits transmitters to reduce the bit rate to 0 during a presentation when the content is not changing, without closing the AMC channel. Closing the AMC channel may cause some end-user system implementations to stop displaying the most recently transmitted video frame.

The AMC+HSDCap field indicates the capability to simultaneously support the AMC and HSD channels.

Reserved fields shall be set to 0 and ignored by receivers.

Table B.1/H.239 – optionByte1

1 (MSB)	2	3	4	5	6	7	8 (LSB)
Reserved (set to 0)	subTimeslotCapability1						
	5	8	12	16	24	32	48

Table B.2/H.239 – optionByte2

1 (MSB)	2	3	4	5	6	7	8 (LSB)
Reserved (set to 0)	subTimeslotCapability2 64	96	Reserved (set to 0)				AMC+HSDCap 1 = Capable of simultaneous AMC and HSD

B.5 AMC controls & indications

AMC signalling applies only to H.320 devices that have expressed the capability to support AMC by signalling **AMC-cap**.

Mode changes that are signalled by the messages AMC-open and AMC-close, and mode changes affecting the content of the AMC channel, shall conform to the mode switch procedures in 8.2/H.242. C&I messages for mode changes affecting the content of the AMC channel shall be sent using the AMC-C&I facility in B.5.3.

B.5.1 AMC-open

This command shall be sent to open an AMC in the H.221 multiplex. It shall be immediately followed by two SBE numbers, AMCOpenByte1 and AMCOpenByte2:

AMC-open<AMCOpenByte1><AMCOpenByte2>

Tables B.3 and B.4 show the syntax for AMCOpenByte1 and AMCOpenByte2.

Table B.3/H.239 – AMCOpenByte1

1 (MSB)	2	3	4	5	6	7	8 (LSB)
roleLabel				channelID			

The roleLabel field shall be coded as in Table B.5.

The channelID field shall be coded as in Table 9.

Table B.4/H.239 – AMCOpenByte2

1 (MSB)	2	3	4	5	6	7	8 (LSB)
reserved	subTimeslotCount						

The reserved field shall be set to 0 and ignored by receivers.

The subTimeslotCount field shall contain a count of subTimeslots that the AMC occupies, as described in B.1. This value shall be one of those values indicated in the far-end's AMC capability, or zero.

Table B.5/H.239 – roleLabel field values

roleLabel value	Role
1	"Live"
2	"Presentation"

All other values are reserved.

B.5.2 AMC-close

This command shall be sent to close an AMC in the H.221 multiplex. It shall be immediately followed by a single additional SBE numbers, AMCCloseByte1:

AMC-close<AMCCloseByte1>

Table B.6 shows the syntax for AMCCloseByte1.

Table B.6/H.239 – AMCCloseByte1

1 (MSB)	2	3	4	5	6	7	8 (LSB)
reserved (set to 0)				channelID			

The reserved field shall be set to 0 and ignored by receivers.

The channelID field shall be coded as in Table 9.

B.5.3 AMC Control & Indication (AMC-C&I)

The H.320 AMC-C&I MBE message is used to signal a Table A.1/H.221 C&I that applies to the indicated AMC channel.

H.320-H.245 gateways shall convert these signals between the two systems in the same manner as the equivalent signals for the traditional H.320 video channel, according to the procedures of Annex A.

This MBE message uses the type identification byte <AMC-C&I> (see Table 2/H.230). The structure of this MBE is:

{ Start-MBE / N / <AMC-C&I> / AMC-C&IByte1 / B_2 . . . B_{N-1} }

The AMC-C&IByte1 byte is structured as shown in Table B.7.

Table B.7/H.239 – AMC-C&IByte1

1 (MSB)	2	3	4	5	6	7	8 (LSB)
reserved (set to 0)				channelID			

The reserved field shall be set to 0 and ignored by receivers.

The channelID field shall be coded as in Table 9 and shall represent the channel to which the C&I message applies.

Bytes B_2 through B_{N-1} shall contain a single C&I BAS message from Table A.1/H.221. The AMC-C&I message and capability messages are not considered C&I messages for the purposes of this clause.

This message may be 1 or more bytes in length, as specified with all escape codes, extensions, or MBE sequences in Table A.1/H.221.

All C&I messages for the main video channel received within the AMC-C&I shall be treated as if they had been received on the BAS channel.

B.6 Multipoint considerations

When the BAS command **MCS** (see 3.5/H.230) is received within the **AMC-C&I** message, the end-user system shall ensure, by mode change if necessary, that its outgoing AMC occupies the same H.221 multiplex bit positions as its incoming AMC.

If the AMC is not carrying a video stream, the end-user system shall send BCH fill in the AMC to comply with **MCS**.

When the BAS command **MCN** (see 3.5/H.230) is received within the **AMC-C&I** message, the end-user system shall cancel the effect of **MCS**.

Appendix I

ASN.1 OIDs defined in this Recommendation

OID	Clause reference
{ itu-t(0) recommendation(0) h(8) 239 generic-capabilities(1) h239ControlCapability(1) }	7.1
{ itu-t(0) recommendation(0) h(8) 239 generic-capabilities(1) h239ExtendedVideoCapability(2) }	7.1
{ itu-t(0) recommendation(0) h(8) 239 generic-message(2) }	8.1

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