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LINE TRANSMISSION OF NON-TELEPHONE SIGNALS

FRAME-SYNCHRONOUS CONTROL AND INDICATION SIGNALS FOR AUDIOVISUAL SYSTEMS

ITU-T Recommendation H.230

(Previously "CCITT Recommendation")

FOREWORD

The ITU Telecommunication Standardization Sector (ITU-T) is a permanent organ of the International Telecommunication Union. The 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 Conference (WTSC), which meets every four years, established the topics for study by the ITU-T Study Groups which, in their turn, produce Recommendations on these topics.

ITU-T Recommendation H.230 was revised by the ITU-T Study Group XV (1988-1993) and was approved by the WTSC (Helsinki, March 1-12, 1993).

NOTES

1 As a consequence of a reform process within the International Telecommunication Union (ITU), the CCITT ceased to exist as of 28 February 1993. In its place, the ITU Telecommunication Standardization Sector (ITU-T) was created as of 1 March 1993. Similarly, in this reform process, the CCIR and the IFRB have been replaced by the Radiocommunication Sector.

In order not to delay publication of this Recommendation, no change has been made in the text to references containing the acronyms "CCITT, CCIR or IFRB" or their associated entities such as Plenary Assembly, Secretariat, etc. Future editions of this Recommendation will contain the proper terminology related to the new ITU structure.

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

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CONTENTS

			Page
1	Introduction		1
2	Procedures		1
	2.1	C&I codes provided in Recommendation H.221	1
	2.2	Other C&I codes	1
3	Definitions of C&I symbols		1
	3.1	C&I related to video	2
	3.2	C&I related to audio	2
	3.3	C&I for maintenance purposes	2
	3.4	C&I related to simple multipoint conferences not using MLP	2
4	Requirements for C&I		6

Recommendation H.230

FRAME-SYNCHRONOUS CONTROL AND INDICATION SIGNALS FOR AUDIOVISUAL SYSTEMS

(Geneva, 1990; revised at Helsinki, 1993)

1 Introduction

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 proper 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 (MLP) of Recommendation H.200/AV.270.

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

2 Procedures

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

2.1 C&I codes provided in Recommendation H.221

The following codes, whose functions are defined in 3, are provided in Recommendation H.221:

– VCF, VCU (procedures for use in multipoint calls according to Recommendation H.200/AV.243);

– LCV, LCD, LCA, LCO (for maintenance – no standardized procedures).

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 2.1 are transmitted by a sequence involving the BAS positions in two consecutive sub-multiframes. 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.

3 Definitions of C&I symbols

The full definitions of these symbols are set out below and code values in Table 1. The first letter of the alphabetic code-name indicates the type; the second is C for command, I for indication; the third is for the specific function.

3.1 C&I related to video

VIS *Video indicate suppressed* – 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.

VIA *Video indicate active* – 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".

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

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

VIR *Video indicate ready-to-activate* – 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.

VCF *Video command "freeze picture request"* – 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 H.261 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 more that six seconds, it should send VCF/H.230 repeatedly with an appropriate period.

VCU *Video command "fast update request"* – 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 should enter the fast-update mode at its earlieast opportunity.

3.2 C&I related to audio

AIM *Audio indicate muted* – 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.

AIA *Audio indicate active* – Complementary to AIM.

3.3 C&I for maintenance purposes

LCV *Loopback command, "video loop request"* – On receipt of this symbol, a terminal must connect the output of the video decoder to the input of the video encoder.

LCD *Loopback command, "digital loop request"* – On receipt of this symbol, the terminal must 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 should avoid this situation by sending the command only once, or by ignoring the received loopback command.

LCA *Loopback command, "audio loop request"* – On receipt of this symbol, the terminal should if possible connect the output of the audio decoder to the input of the audio encoder.

LCO *Loopback command off* – On receipt of this symbol, the terminal must disconnect all loops and restore audio, video and data paths to their normal condition.

3.4 C&I related to simple multipoint conferences not using MLP

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.

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 other terminals (otherwise known as "On-air" indication).

MCC *Multipoint command conference* – Transmitted by an MCU to a terminal. The terminal receiving MCC must make its outgoing transfer rate equal to its incoming transfer rate, and its outgoing audio rate equal to its incoming audio rate.

NOTE 2 – 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 must 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 must 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.

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 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 Recommendation H.200/AV.243).

SBE and MBE symbols used in multipoint working (see Recommendation H.243)

NOTE 3 – Any of the symbols prescribed here may be repeated without ill effect: they are part of a set currently in force. An MCU must 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 should *ignore* these, not enter any fault recovery process.

The asterisks identify symbols which must be followed (always) by at least one SBE number or SBE character (see below).

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.

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

SBE numbers

The escape code (111)[19] defined in Recommendation H.221 gives access to a table of 224 numbers having 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 number (see Recommendation H.243) are of the form <M> <T>, where <M> and <T> are each SBE numbers.

SBE character

The escape code (111)[20] defined in Recommendation H.221 gives access to a table of characters coded as in Figure 2/T.61, except columns 14 and 15. Note that the symbols b1-b8 are used in Figure 2/T.61; these are not the same as in Recommendation H.221, where the order is reversed. For example, the SBE character "&" has the BAS value (001)[00110]. A character or string of characters is normally preceded by another SBE symbol indicating the purpose for which they are being sent.

MIM	*Multipoint indicate master-MCU* – Transmitted by an MCU which has claimed the master-MCU role.
MIL*	*Multipoint indication loop* – See 10/H.243; must be followed by an SBE number.
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; must be followed by <M> <T>.
TIN*	*Terminal indicate number* – Used to pass information concerning terminal number assignments made; must be followed by <M> <T>.
TIL	*Terminal indicate list* – MBE message used to transmit list of terminal numbers currently added into the conference; the message has the form {start-MBE/N/<til>/<M>/½(N-1) pairs of <M><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.
TID*	*Terminal indicate dropped* – Used to pass information concerning any terminal number no longer effective; must 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; must 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> must follow.

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: identity (person or terminal) *n* = 3: conference identity *n* = 4 to 31: reserved
TII*	*Terminal indicate identity* – Sent in response to TCI; must be followed by an SBE alphanumeric character, 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 to T.61 with bit 8 set to zero.
TIS	*Terminal indicate identity-stop* – End-marker to indicate the end of a sequence of TII symbols.
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 Table 2 and m1/t1 is terminal number of the endpoint with the SD token, m2/t2 is the terminal number of the endpoint with the HSD token, and m3/t3 is the terminal number of the endpoint with the chain token.

TIC	*Terminal indicate capability* – Included in the initial capset of a terminal to tell an MCU that it can recognize TIA and return TIX in the additional channels; included in the capset 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 Recommendation H.243.
TIX*	*Terminal indicate additional-channel-X* – Sent by a terminal having capability TIC in response to TIA; must be followed by <M> <T>.

VIN*	*Video indicate number* – Transmitted by an MCU to indicate the source (terminal identity number) of the video in the signal; must be followed by <M> <T>.
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	Transmitted by a terminal to return to automatic video switching at the MCU.
VCR	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 capset 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; must be followed by an SBE number indicating the data rate requested (see Tables 2/H.243 and 3/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 assignment of chair-control token.
DCR-L DCR-H	*LSD/HSD command release/refuse* – Used by an MCU to withdraw/refuse assignment of 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.

4 Requirements for C&I

The C&I functions are defined such that, under various appropriate circumstances, the audiovisual system will operate in a fault-free manner and also such that sympathetic presentation to users is possible. Some functions must 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 must 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 equipments 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 that case.

Directivity of the C&I signal: see Recommendation H.243 for 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 must recognize and obey the command to make or break the digital loopback, and video loopback if they have video capability. All terminals having a video capability must also obey fast-update, freeze-picture, and MCS/MCN, otherwise there will be system misoperation on a multipoint call.

TABLE 1/H.230

Code first 3 bits	Code last 5 bits in decimal form	Abbreviation	Transmit		Receive		Reference for procedures
			Terminal	MCU	Terminal	MCU	
Code (000)	[0,1]	Reserved for audio-related symbols					
	[2]	AIM	CM	CM	X	X	See 3.2
	[3]	AIA	CM	CM	X	X	See 3.2
	[4]-[7]	Reserved for audio-related symbols					
	[8]	TCI	#	#	#	#	H.243
	[9]	TII*	#	#	#	#	H.243
	[10]	TIS	#	#	#	#	H.243
	[11]-[15]	Reserved					
	[16]	VIS	CM	CM	X	X	See 3.1
	[17]	VIA	CM	CM	X	X	See 3.1
	[18]	VIA2	X	NA	X	X	H.320
	[19]	VIA3	X	NA	X	X	H.320
	[20]-[30]	Reserved for video-related symbols					
	[31]	VIR	X	NA	X	NA	H.320
Code (001)	[0]	MCC	NA	M	M	NA	H.243
	[1]	Cancel-MCC	NA	M	M	NA	H.243
	[2]	MIZ	NA	M	M	NA	H.243
	[3]	Cancel-MIZ	NA	M	M	NA	H.243
	[4]	MIS	NA	M	M	NA	H.243
	[5]	Cancel-MIS	NA	M	M	NA	H.243
	[6]	MIM		#		#	H.243
	[7]	TIC	#	#	#	#	H.243
	[8]	TIX	#		#	#	
	[9]	RAN		#		#	

TABLE 1/H/230 *(end)*

Code first 3 bits	Code last 5 bits in decimal form	Abbreviation	Transmit		Receive		Reference for procedures
			Terminal	MCU	Terminal	MCU	
	[10]	Reserved					
	[11]	TIA*		#	#	#	H.243
	[12]	TIN*		#	#	#	H.243
	[13]	TID*		#	#	#	H.243
	[14]	TCU	#	#		#	H.243
	[15]	TCD	#		#		H.243
	[16]	MCV	X	NA	NA	M	H.243
	[17]	Cancel-MCV	X	NA	NA	M	H.243
	[18]	MIV	NA	M	X	NA	H.243
	[19]	Cancel-MIV	NA	M	X	NA	H.243
	[20]	MCS	NA	CM	CM	CM	H.243
	[21]	MCN	NA	CM	CM	CM	H.243
	[22]	VIN*		#	#	#	H.243
	[23]	VCB*	#	#		#	H.243
	[24]	VCE	#	#		#	H.243
	[25]	VCS*	#	#		#	H.243
	[26]	Cancel-VCS	#	#		#	H.243
	[27]	VCR		#	#	#	H.243
	[28]	Reserved					
	[29]	Reserved					
	[30]	Reserved					
	[31]	MIL*		#		#	H.243
Code (010)	[0]	CIC		#	#		H.243
	[1]	CCD*	#	#		#	H.243
	[2]	CIR		#	#	#	H.243
	[3]	CCK	#	#		#	H.243
	[4]	CCA	#	#		#	H.243
	[5]	CIT		#	#	#	H.243
	[6]	CCR		#	#	#	H.243
	[7]	CIS	#	#		#	H.243
	[8]	TIF*	#	#		#	H.243
	[9]-[15]	Reserved					
	[16]	DCA-L	#	#		#	H.243
	[17]	DIT-L		#	#	#	H.243
	[18]	DCR-L		#	#	#	H.243
	[19]	DIS-L	#	#		#	H.243
	[20]	DCC-L	#	#		#	H.243
	[21]-[23]	Reserved					
	[24]	DCA-H	#	#		#	H.243
	[25]	DIT-H		#	#	#	H.243
	[26]	DCR-H		#	#	#	H.243
	[27]	DIS-H	#	#		#	H.243
	[28]	DCC-H	#	#		#	H.243
	[29]-[31]	Reserved					
Code (011)	[0]	TCS-0	#	#	#	#	H.243
	[1]	TCS-1	#	#	#	#	H.243
	[2]	TCS-2	#	#	#	#	H.243
	[3]	TCS-3	#	#	#	#	H.243
	[4]	TCP	#		#		H.243
	[5]-[31]	Reserved					
Code (111)	All values forbidden						
Codes listed in Annex A/H.221							
		VCF	X	M	M	M	
		VCU	X	M	M	M	
		LCV	NA	NA	CM	NA	
		LCA	NA	NA	X	X	
		LCD	NA	NA	M		
		LCO	NA	X	M		

# Indicates the direction in which the symbol is transmitted.

TABLE 2/H.230

Values assigned to type identification bytes in MBE messages

0000 0000 Reserved
0000 0001 Reserved
0000 0010 <til>
0000 0011 <iis>
0000 0100 <tir>
0000 0101 Reserved pour <tip>
0000 0110 à 1111 1111 Reserved