

## **Revised Implementor's Guide for the ITU-T H.324 Recommendation series**

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### **Introduction**

This document is a text revision of the Implementor's Guide for H.324 series recommendations. The changes from the previous published version appear in the following sections:

1. 7.2.5 Clarifications to Section C.6.1 (Q1-A08)
2. 7.3.3 Clarifications to Section D.1 (Q11-L-10)
3. 7.3.4 Clarifications to Section D.4.2 (Q11-L-10)

## **Implementor's Guide for the ITU-T H.324 Recommendation series Version 2 - Terminal for low bit-rate multimedia communication**

### **Abstract**

This document is a compilation of reported defects identified with the 1997-2000 editions of the ITU-T H.324-series Recommendations. It is intended to be read in conjunction with the Recommendations to serve as an additional authoritative source of information for implementors. The changes, clarifications and corrections defined herein are expected to be included in future versions of affected H.324-series Recommendations.

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### **Document history**

<b>Revision</b>	<b>Date</b>	<b>Description</b>
1	8-11 June 1998	Initial version - Reviewed at the Q.11/SG 16 meeting.
2	22 September 1998	Second version - Completed at the ITU-T Study Group 16 Rapporteurs meeting.
3	24 May 1999	Third version - Completed at the ITU-T Study Group 16 Rapporteurs meeting.
4	7-18 February 2000	Fourth version - Completed at the ITU-T Study Group 16 Rapporteurs meeting.
5	13-17 November 2000	Fifth version - Completed at the ITU-T Study Group 16 Rapporteurs meeting.
6	8 June 2001	Sixth version - Completed at the ITU-T Study Group 16 Rapporteurs meeting.

## 1. Introduction

This document is a compilation of reported defects identified with the 1997-2000 editions of the ITU-T H.324-series Recommendations. It is intended to be read in conjunction with the Recommendations to serve as an additional authoritative source of information for implementors. The changes, clarifications and corrections defined herein are expected to be included in future versions of affected H.324-series Recommendations.

The first version of the guide was produced following the September 1998 ITU-T Study Group 16 meeting. Wide distribution of this document is expected and encouraged.

## 2. Scope

This guide resolves defects in the following categories:

- editorial errors;
- technical errors such as omissions or inconsistencies;
- ambiguities.

In addition the Guide may include explanatory text found necessary as a result of interpretation difficulties apparent from the defect reports.

This Guide will not address proposed additions, deletions or modifications to the Recommendations that are not strictly related to implementation difficulties in the above categories. Proposals for new features should be made in the normal way through contributions to the ITU-T.

## 3. Policies for updating this document

This document is managed by the ITU-T Study Group 16 Question 1 Rapporteur's Group. It can be revised at any recognized Q.1/16 Rapporteur's Group meeting provided the proposed revisions are unanimously accepted by the members of the group. A revision history cataloguing the evolution of this document is included.

## 4. Defect resolution procedure

Upon discovering technical defects with any components of the H.324 Recommendations series, please provide a written description directly to the editors of the affected Recommendations with a copy to the Q.1/16 Rapporteur. The template for a defect report is enclosed. Contact information for these parties is included in this document. Return contact information should also be supplied so a dialogue can be established to resolve the matter and an appropriate reply to the defect report can be conveyed. This defect resolution process is open to anyone interested in H.324-series Recommendations. Formal membership in the ITU is not required to participate in this process.

## 5. References

This document refers to the following H.324-series Recommendations:

- ITU-T Recommendation H.324 (1998), *Terminal for low bit-rate Multimedia Communication*.
- ITU-T Recommendation H.324 Annex F (1998), *Multilink operation*

- ITU-T Recommendation H.223 (1996), *Multiplexing protocol for low bit rate multimedia communication*
- ITU-T Recommendation H.223 Annex D (1999), *Optional multiplexing protocol for low bit rate multimedia mobile communication over highly error-prone channels*

## 6. Nomenclature

In addition to traditional revision marks, the following marks and symbols are used to indicate to the reader how changes to the text of a Recommendation should be applied:

Symbol	Description
<u><i>[Begin Correction]</i></u>	Identifies the start of revision marked text based on extractions from the published Recommendations affected by the correction being described.
<u><i>[End Correction]</i></u>	Identifies the end of revision marked text based on extractions from the published Recommendations affected by the correction being described.
...	Indicates that the portion of the Recommendation between the text appearing before and after this symbol has remained unaffected by the correction being described and has been omitted for brevity.
<b>--- SPECIAL INSTRUCTIONS ---</b> <i>{instructions}</i>	Indicates a set of special editing instructions to be followed.

## 7. Technical and editorial corrections

### 7.1 Additions to H.324

In order to allow the use of G.722.1 in H.324 systems, a new section 6.7.4 is being added with the following text:

*[Begin Correction]*

#### 6.7.4 Use of Recommendation G.722.1 for wideband audio

Recommendation G.722.1 may be used for wideband audio applications. G.722.1 frames shall be sent using AL2. Audio frame boundaries within each AL-SDU shall be implied by the ratio of AL-SDU size to G.722.1 frame size at the currently selected G.722.1 bitrate.

*[End Correction]*

## 7.2 Technical and editorial corrections to H.324 Annex C

### 7.2.1 Additions to Section C.2 - General

A clarification to the level change procedure and a reference to H.223 Annex D are being added to the H.223 Level 3 description as follows:

[Begin Correction]

#### C.2 General

...

- H.223 Level 1: Described in Annex A/H.223. The HDLC flag in H.223 used to delimit MUX-PDUs in Level 0 is replaced with a longer flag that leads to improved MUX-PDU synchronization. HDLC bit stuffing is not used. The Control Channel Segmentation and Reassembly Layer (CCSRL) is introduced for the transmission of the control channel.

The transmitter side shall take necessary precaution to prevent possible flag emulation for the control channel. Flag emulation can be prevented, e.g. by detecting N 16-bit flags in each MUX-SDU for the channel and by breaking the SDU into N+1 segments. This may also apply to data channels.

- H.223 Level 2: Described in Annex B/H.223. Includes the features of Annex A/H.223. In addition, the header describing the MUX-PDU contents includes error protection.
- H.223 Level 3: Described in H.223/Annex C. Includes the features of H.223/Annex B. In addition, error protection and other features are provided to increase the protection of the AL-PDUs. Described in H.223/Annex D as an optional definition of H.223/Annex C.

In addition to the hierarchy offered by the level structure, some of the multiplex levels contain options.

If the terminal is connected to an octet oriented network interface, the transmitter shall align the first transmitted bit to the network octet timing. Note that the MUX-PDU of H.223 level 1 and higher levels have an octet-aligned structure. Therefore, the receiver may use the octet timing information from the network interface to detect the start of a MUX-PDU to reduce the mis-synchronisation.

Mobile terminals shall support the NSRP and the SRP mode of H.324/Annex A. If both terminals start the session in level 0 initially the SRP mode shall be used. Otherwise both terminals shall start with NSRP mode.

If both terminals in a session support ~~Annex C/H.223~~ (level 3 of H.223), then adaptation layers AL1M, AL2M, and AL3M as defined in ~~Annex C/H.223~~ level 3 of H.223 may also be used in H.223, H.223 Annex A and B (levels 1 and 2). However, bidirectional channels shall use either the H.223 adaptation layers, or the ~~Annex C/H.223~~ adaptation layers for level 3 of H.223, but not a mixture of the two.

...

[End Correction]

## 7.2.2 Additions to Section C.4 – Interworking

A reference to Annex D is being added to Section C.4 as follows:

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*[Begin Correction]*

### C.4 Interworking

Since all mobile terminals support H.223 level 0, no interworking function is needed when communicating with an H.324 terminal that does not support any of the robust multiplexing annexes (Annexes A, B, ~~and C~~ and D of Recommendation H.223).

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*[End Correction]*

## 7.2.3 Clarifications to Section C.5 - Terminal procedures

Clarifying text to allow H.324 Annex D terminals to support Annex C mode is being added to section C.5 as follows:

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*[Begin Correction]*

### C.5 Terminal procedures

...

- Phase D: The value of timer T401 shall be defined using the procedures in Annex E. The transmission of 16 consecutive HDLC flags is replaced with the level setup procedure defined in section C.6

...

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*[End Correction]*

## 7.2.4 Clarifications to Section C.7 - Dynamic change of level or option during session

### 7.2.4.1 "mobileOperationTransmitCapability"

Text describing the usage of the H.245 **mobileOperationTransmitCapability** in H.324 Annex C is being added as follows:

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*[Begin Correction]*

### C.7 Dynamic change of level or option during session

The procedure described below for changing multiplex options during a session assumes that a capabilities exchange has taken place between a receiver (Terminal A) and a transmitter (Terminal B), and that an H.245 command for a level change will be sent by the receiver terminal to the transmitter terminal. A terminal, which has the capability to change H.223 multiplex levels or options during a session, shall set **modeChangeCapability** in **mobileOperationTransmitCapability** to True. Levels and options supported by the terminal are indicated using the codepoint in **mobileOperationTransmitCapability**.

A terminal, which has the above capability and has received the H.245 message with modeChangeCapability of True, may start the H.223 mode change procedure The procedure is illustrated in Figure C.1. Only levels supported by both terminals may be commanded. Note that the "replacementFor" procedure described in Recommendation H.245 may be used when changing from a mobile adaptation layer (ALXM) to a regular H.223 adaptation layer (ALX) or vice versa.

...

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*[End Correction]*

#### **7.2.4.2 Clarifications to level change procedure**

This section describes editorial corrections to clarify the level change procedure in the H.324 Annex C. The following text is being added at the end of section C.7.

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*[Begin Correction]*

Note that after changing from level 0 to some higher levels, MUX-PDU octet alignment shall be preserved. Therefore, the transmitter shall add as many "0" bits after the level change sequence to octet align the first synchronization flag of the new level. In the transmitter, the reference for the octet alignment is the first bit of the first transmitted synchronization flag. In the receiver, the reference for the octet alignment is the first bit of the first detected synchronization flag in the initial level set-up procedure.

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*[End Correction]*

#### **7.2.5 Clarifications to Section C.6.1 - Definition of stuffing sequences**

Text to clarify the use of flow control in mobile terminals in H.324 Annex C is being added as follows:

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*[Begin Correction]*

The level set-up procedure shall use the stuffing methods described in the appropriate Recommendations as listed in Table C.1. The stuffing sequences are also used when the entire H.223 multiplex is limited by the FlowControlCommand.

...

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*[End Correction]*

### **7.3 Technical and editorial corrections to H.324 Annex D**

#### **7.3.1 Clarifications to Section D.5.1.2 - Received signals**

Clarifying text to allow H.324 Annex D terminals to support Annex C mode is being added to section D.5.1.2 as follows:

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**[Begin Correction]**

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### **D.5.1.2 Received signals**

While executing the V.140 Phase 1 procedure, the H.324/I terminal shall search the received data for signals conforming to:

- V.140 signature;
- H.324 directly on the digital channel (search for initial H.245 messages in H.223 framing) HDLC flags followed by an H.223 MUX\_PDU on the digital channel or, if Annex C is supported, all possible stuffing sequences defined in Table C.1;
- H.320 (search for H.221 FAS and BAS signalling);
- If V.8 *bis* is supported, V.8 *bis* (search for initial V.8 *bis* messages in G.711 audio);
- V.8 (search for initial V.8 messages in G.711 audio).

Additionally, bits 1-6 of each octet may be decoded as audio according to Recommendation G.711 and delivered to the user while executing this procedure, so that voice telephony is established immediately upon connection of the circuit, if the far-end terminal supports voice telephony.

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**[End Correction]**

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### **7.3.2 Clarifications to Section D.5.4 - Phases D through G**

Clarifying text to allow H.324 Annex D terminals to support Annex C mode is also being added to section D.5.4 as follows:

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**[Begin Correction]**

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All remaining phases (D through G) shall proceed as specified in the body of this Recommendation or, as defined in section C.5 if Annex C is supported.

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**[End Correction]**

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### **7.3.3 Clarifications to Section D.1 – Scope**

To clarify the usage of H.324/I and H.320 terminals, section D.1 is changed as follows:

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**[Begin Correction]**

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This annex defines an operation mode for this Recommendation on ISDN circuits at bit rates ranging from 56 kbit/s to 1920 kbit/s. This channel capacity may be provided as a single B/H0/H11/H12-channel or multiple B/H0-channels, according to the multilink procedures. Operation on restricted networks (at 56 kbit/s for each channel) is also covered.

The mode of operation defined by this annex is referred to as "H.324/I".

H.324/I terminals provide backwards compatibility with the installed base of H.320 terminals, and forward compatibility with H.324 Annex C terminals (Mobile). H.324/I provides a second-generation successor standard to Recommendation H.320, while providing direct interoperability with:

~~the installed base of H.320 terminals;~~

- H.324 terminals on the GSTN (using GSTN modems);
- H.324 terminals operating on ISDN through user substitution of I.400-Series ISDN interfaces for V.34 modems; and
- voice telephones (both GSTN and ISDN).

H.324/I offers users and implementors many technical improvements incorporated in the second-generation standards H.310, H.323, and H.324, and corrects limitations and problems discovered with Recommendation H.320.

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*[End Correction]*

### **7.3.4 Clarifications to Section D.4.2 - H.320 ISDN interoperation**

To clarifying the usage of H.324/I and H.320 terminals, section D.1 is changed as follows:

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*[Begin Correction]*

In order to provide continued compatibility for existing users of Recommendation H.320 systems on ISDN, H.324/I terminals shall support operation in conformance with Recommendation H.320. If video transmission or reception is supported in the H.324 mode of the H.324/I terminal, video transmission or reception shall also be supported in the H.320 mode.

~~NOTE—It is the intent of ITU-T to make H.320 support optional in a revision of this Recommendation at some point in the future, once most H.320 equipment has been upgraded or replaced.~~

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*[End Correction]*

## **7.4 Technical and editorial corrections to H.324 Annex F**

### **7.4.1 Clarification to Section F.5.2.2.1 – Responder request to add additional connections**

To clarify the order of the procedures of Annex F, a reference to Section F.5.2.1 is being added to section F.5.2.2.1 as follows:

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*[Begin Correction]*

At any time after exchange of call information according to Section F.5.2.1, the responder may request that the initiator add physical connections. This shall be done using the **MultilinkRequest.addConnection** message in H.245.

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*[End Correction]*

## 8. Implementation clarifications

This section describes the procedures for using the supplementary services Call Hold and Explicit Call Transfer in H.324/ISDN. Implementation of these procedures is optional.

### 8.1 Procedures for Call Hold (CH)

The two procedures as described below should be used if a terminal supports the Call Hold supplementary service.

#### 8.1.1 Invocation procedure for CH

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

Objective: Terminal A wishes to put terminal B on hold.

- 1) In case Multilink is used, terminal A should remove all but one B-channel connections from the H.Multilink Channel Set according to the Multilink procedures.
- 2) Terminal A should proceed with phase F of Annex D/H.324. The **EndSessionCommand** message should indicate to the far end that the terminal will be put on hold by signalling **terminalOnHold** in **isdnOptions**.
- 3) Terminal A should invoke the CH supplementary service by D-channel signalling, requesting the network to put all B-channel connections with terminal B on hold.

#### 8.1.2 Retrieval after invocation of CH

Initial situation: Terminal A has terminal B on hold.

Objective: Terminal A wishes to retrieve the call with terminal B.

- 1) Terminal A should apply D-channel signalling to retrieve all the B-channel connections with terminal B.
- 2) Terminal A should initiate phase A of Annex D/H.324 starting with the execution of H.Dispatch, because the channel is already established.
- 3) Terminal A should add the additional B-channel connections to the H.Multilink Channel Set using the Multilink procedures.

NOTE - The CH procedures should only be used if both terminals A and B are H.324/I terminals.

### 8.2 Procedures for Explicit Call Transfer (ECT)

The procedure as described below should be used if a terminal supports the invocation of ECT.

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

Objective: Terminal A wishes to put terminal B on HOLD, make a call to terminal C and then connect terminal B to terminal C.

#### 8.2.1 Invocation procedure for ECT

- 1) In case Multilink is used, terminal A should disconnect all but one B-channel connections with terminal B according to the Multilink procedures defined in Annex F/H.324.

- 2) Terminal A should put terminal B on hold according to the procedures of the CH supplementary service.
- 3) Terminal A should establish a call with terminal C.
- 4) ECT should not be activated when terminal A does not succeed in establishing a call with terminal C or when terminal C is not a H.324/I terminal; appropriate indications should be given to the user(s).
- 5) In case Multilink is used, terminal A should disconnect all but one B-channel connections with terminal C according to the Multilink procedures defined in Annex F/H.324.
- 6) Terminal A should put terminal C on hold according to the procedures of the CH supplementary service.
- 7) Terminal A should invoke the ECT supplementary service by D-channel signalling, requesting the network to connect terminal B to C.

NOTE 1 - The procedure for ECT should only be used if all terminals A, B and C are H.324/I terminals. The implementation of ECT in case not all the terminals A, B and C are H.324/I terminals is left for further study.

NOTE 2 - The method used for addressing phone numbers in H.Multilink in case calls are transferred is left for further study.

NOTE 3 - The network provider may restrict the invocation of the ECT supplementary service to either the calling or the called terminal.

H.324 RECOMMENDATION SERIES DEFECT REPORT FORM

<b>DATE:</b>	
<b>CONTACT INFORMATION</b>  <b>NAME:</b> <b>COMPANY:</b> <b>ADDRESS:</b>  <b>TEL:</b> <b>FAX:</b> <b>EMAIL:</b>	
<b>AFFECTED RECOMMENDATIONS:</b>	
<b>DESCRIPTION OF PROBLEM:</b>	
<b>SUGGESTIONS FOR RESOLUTION:</b>	

NOTE - Attach additional pages if more space is required than is provided above.

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