INTERIM EUROPEAN TELECOMMUNICATION STANDARD

I-ETS 300 101

February 1993

Source: ETSI TC-TE

Reference: DI/TE-01006

ICS: 33.020

Key words: ISDN, audiographic teleconference

Integrated Services Digital Network (ISDN); International digital audiographic teleconference

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Foreword

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

This I-ETS sets out the basic elements needed for an international digital audiographic teleconference service, within the framework offered by the Integrated Services Digital Network (ISDN) or other digital network. The requirements are based on the relevant CCITT Recommendations referenced in the text.

Annexes A to G to this I-ETS are normative.

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1 Scope

Audiographic teleconference is a means for teleconferencing, like telephone conference and videoconference. It offers a conference facility of better quality and more possibilities than telephone conference although less than videoconference because of the lack of moving pictures.

Information on human factor aspects is essential, but can only be obtained in the relevant context during a considerable period of experience.

In order to open the new service on the basis of European standard and to avoid any restraints on the service development, this I-ETS offers the basic elements for an international digital audiographic teleconference service.

Reference is made in this I-ETS to compatibility with other related services, for example videoconferencing and visual telephony: at some time in the future it could be anticipated that distinctions between these three services will tend to disappear, and should then be covered by a single standard covering a range of bit rate options.

This I-ETS defines and describes the services and facilities offered, and provides technical specifications for equipment and alignment and operating procedures.

The audiographic teleconference can be offered as a point-to-point or as a multipoint service. Both aspects are covered by this I-ETS, but for the latter only the functional performances of the Multipoint Control Unit (MCU) and the associated in-band signalling and conference procedures are specified.

This I-ETS specifies the use of one 64 kbit/s channel (B-channel) of the ISDN basic access or other 64 kbit/s channel. The channel is framed and carries both high quality speech and meeting aid data like facsimile, still picture and telewriting.

The second B-channel of the ISDN access, or any other second 64 kbit/s channel, in principle, can also be used for transmitting meeting aid information more efficiently. This I-ETS, though not covering this application, gives some examples of the possible bit rate allocation for an extended access.

Audiographic teleconference is defined, for the purpose of this I-ETS, as real time conferencing among individuals, or groups of individuals at separate locations by means of audioterminals together with the possibility of transmission of non-moving visual information, telematic information and control and indications (speaker identification, floor request, etc.).

2 Normative references

This I-ETS incorporates, by dated or undated reference, provisions from other publications. These normative references are cited at the appropriate places in the text and the publications are listed hereafter. For dated references, subsequent amendments to or revisions of any of these publications apply to this I-ETS only when incorporated in it by amendment or revision. For undated references the latest edition of the publication referred to applies.

[1] ETS 300 012 (1992): "Integrated Services Digital Network (ISDN); Basic user-network interface, Layer 1 specification and test principles".

[2] ETS 300 011 (1992): "Integrated Services Digital Network (ISDN); Primary rate user-network interface, Layer 1 specification and test principles".

[3] ETS 300 125 (1991): "Integrated Services Digital Network (ISDN); User-network interface data link layer specification, Application of CCITT Recommendations Q.920/I.440 and Q.921/I.441".

[4] ETS 300 102-1 (1990): "Integrated Services Digital Network (ISDN); User-network interface layer 3, Specifications for basic call control".

[5] prETS 300 144: "Integrated Services Digital Network (ISDN) and other digital telecommunications networks; Audiovisual teleservices, Frame structure for a 64 to 1920 kbit/s channel".

[6] CCITT Recommendation G.722 (1988): "7 kHz audio-coding within 64 kbit/s".

[7] CCITT Recommendation G.711 (1988): "Pulse code modulation (PCM) of voice frequencies".

[8] CCITT Recommendation T.30 (1988): "Procedures for document facsimile transmission in the general switched telephone network".

[9] CCITT Recommendation T.4 (1988): "Standardisation of Group 3 facsimile apparatus for document transmission".

[10] CCITT Recommendation X.30 (1988): "Support of X.21, X.21 bis and X.20 bis based data terminal equipments (DTEs) by an integrated services digital network (ISDN).

[11] CCITT Recommendation G.725 (1988): "System aspects for the use of the 7 kHz audio codec within 64 kbit/s".

[12] IEC 651 (1979): "Sound level meters".

[13] CCITT Recommendation P.51 (1988): "Artificial ear and artificial mouth".

[14] CCITT Recommendation P.54 (1988): "Sound level meters apparatus for the objective measurement of room noise".

[15] CCITT Recommendation P.34 (1988): "Transmission of characteristics of hands-free telephones".

[16] IEC 581-5 (1981): "High fidelity audio equipment and systems; Minimum performance requirements. Part 5: Microphones".

[17] IEC 581-7 (1986): "High fidelity audio equipment and systems; Minimum performance requirements. Part 7: Loudspeakers".

[18] IEC 318 (1970): "An IEC artificial ear, of the wideband type, for the calibration of earphones used in audiometry".

[19] CEPT Recommendation T/R 01-02 (CEPT 1968, revised 1971): "Monitoring of Emissions where Space-Service Stations are involved".

[20] CCITT Recommendation H.130 (1988): "Frame structures for use in the international interconnection of digital codes for videoconferencing or visual telephony".

[21] CCITT Recommendation X.21 (1984): "Interface between data terminal equipment (DTE) and data circuit-terminating equipment (DCE) for synchronous operation on public data networks".

[22] CCITT Recommendation X.75 (1988): "Packet-switched signalling system between public networks providing data transmission services".

[23] CCITT Recommendation X.209: "Specification of basic encoding rules for abstract syntax notation one (ASN.1)".

[24] ISO Recommendation 8885 (1989): "Information processing systems - Data communication - High-level data link control procedures - General purpose X.10 frame information field content and format".

[25] CCITT Recommendation T.35 (1988): "Procedure for the allocation of CCITT members' codes".

[26] prETS 300 143: "Integrated Services Digital Network (ISDN) and other digital telecommunications networks, Audiovisual teleservices, System for establishing communication between audiovisual terminals using digital channels up to 2048 kbit/s".

[27] CCITT Recommendation F.710 (1988): "Teleconference equipment".

[28] CCITT Recommendation V.29 (1988): "9600 bits per second modem standardised for use on point-to-point 4-wire leased telephone-type circuits".

3 Definitions and abbreviations

For the purposes of this I-ETS, the definitions and abbreviations employed are given in Annex A (normative).

4 Services and facilities

This Clause provides descriptive information concerning the audiographic teleconference service from the point of view of customers and marketing organisations. Further details, including technical specifications, are considered in later Clauses of this I-ETS.

4.1 Service description

A service for real time communication between groups of users in different locations, combining a good audio facility with optional auxiliary facilities such as still pictures, facsimile, telewriting, character or graphic format, etc. It is applicable to a variety of types of audiographic teleconference terminals, including multi-purpose committee rooms used only part-time for audiographic teleconference as well as dedicated studios; it is applicable also to "mobile" or "site-transferable" audiographic teleconference facilities and even desk top terminals.

The service is bidirectional via ISDN and provides for interconnection of two or more terminals on an equal basis.

4.2 Basic facilities

The basic facilities consist as the primary means for audiovisual communication, namely an audio channel together with transmission capability for additional control and telematic data and messages. The presence of these facilities shall be signalled by use of the procedures in prETS 300 143 [26]. Additional facilities shall be indicated by the way of the message channel.

4.2.1 Audio system

By the design of the room and/or the equipment, participants should be allowed to listen and speak simultaneously; speech transmission is of 7 kHz bandwidth.

4.2.2 Data transmission

The basic service provides for a data port for the use of the customer in any way he wishes.

4.2.3 Message channel

A message channel is permanently included which may be used to provide for the control and management of the audiographic teleconference system and for user to user messages (see subclause 6.2).

4.3 Other facilities

A wide range of activities may be carried out using an audiographic teleconferencing system. This I-ETS therefore seeks to provide a range of options for the users, leaving to the customer the choice as to which should be implemented. Here follows a (non-exhaustive) list of the facility options which a potential user may consider. Subjectively, the quality of the audio is not greatly affected by providing these meeting aids. Ergonomic reasons suggest that the number of display screens be reduced to a minimum.

The following auxiliary facilities, as outlined in subclauses 4.3.1 to 4.3.4, may be provided by use of a data transmission channel as in subclause 4.2.2.

4.3.1 Still picture TV system

As for videoconferencing, a display camera can be used to capture pictures of objects (charts/diagrams, documents, solid objects). The nature of a still picture TV codec is such that indefinite retention and display of the still picture at the remote end can occur.

4.3.2 Facsimile

Facsimile documents may be transmitted during the conference, using a group 3 facsimile connected to a suitable protocol adapter internal to the terminal.

4.3.3 X-Y devices (including Telewriter)

Several proprietary devices are available which can be used for remote pointing (cursor function) or remote writing, or both. Input devices include writing tablet, light pen, mouse, ball and joy-stick. The resulting information can be displayed independently, or superimposed on another picture.

4.3.4 Still pictures of participants

In the case where a company possesses a videoconference terminal, the videoconference type terminal may be used for audiographic teleconferencing, transmitting only still pictures.

The "split-screen" allows the combination of the outputs from two cameras, each viewing up to three people, into a single video signal; similarly, at the remote end, the two half-height pictures can be separated for display on two adjacent screens.

4.4 Audiographic teleconference terminals

In general, all aspects of audiographic teleconference rooms and equipment can be completely standardised. Much depends on the size and shape of the accommodation which the customer has at his disposal, and on the choice of optional facilities. Furthermore, considerable scope can be allowed to equipment suppliers in the styling and detailed facilities of their products, which shall not materially affect the international service itself.

4.5 Controls

In general, the controls to be operated by the user are kept to a minimum. Apart from call set-up, further controls depend on the facilities available.

4.6 Quality of service

4.6.1 Transmission performance

The worst-case transmission assumed in the above subclauses is of an error rate of 1:10. ISDN is assumed to be specified so that such an error rate may only occur extremely rarely.

4.6.2 Routing

The choice of the routing should, ideally, not influence the quality of service. If satellite transmission is employed, the delay thus introduced affects the quality of service. Therefore more than two satellite hops should be avoided.

4.6.3 Confidentiality

Confidentiality shall be guaranteed (see subclause 8.4.4).

4.6.4 Audio quality

The basic service provides for an audio channel of 7 kHz bandwidth. Details are given in Clause 10 for the case of interworking with telephony, videoconference and videophone.

4.6.5 Data transmission

The data channel provided offers a bit error rate similar to that of the network used.

4.7 Network requirements

Service offerings are based on digital access at 64 kbit/s. Further details are given in subclause 6.1.

4.8 The audiographic teleconference process

4.8.1 Phases in the teleconference process

One can distinguish several phases in the overall process of an audiographic teleconference:

- reservation;
- set-up;
- session;
- recovery and reconfiguration;
- disconnection.

In the following, only the phases involving in band signalling (on the message channel) are described.

4.8.2 Set-up of the conference session

The start of a conference is decided by the conductor. As soon as the connection between a terminal and its Multipoint Control Unit (MCU) is established, the terminal enters the set-up mode. Connected terminals move directly to the conference phase. During the meeting the set-up mode can be re-entered, e.g. when participants change.

In the set-up phase the terminals may exchange information about:

- terminal names;
- names of participants;
- terminal characteristics (meeting aids, etc.).

This information shall not be stored in the MCUs but in the terminals.

4.8.3 The conference session

General

For a successful conduct of the conference the role of conductor shall be defined. The conductor is one of the participants at a given terminal. At the start of the conference session the default mode of conversation shall be "non-conducted".

The token of conductorship can be taken by a terminal during the set-up phase and can be handed over to another terminal during the conference session.

Each terminal shall be equipped in such a way that it can potentially accept the token of conductorship.

The terminal shall offer the conductor and other conferees certain functions to lead the conversation between all participants such as: request for floor signals by a conferee and grant request for floor signal by the conductor. Use of these functions can be realised by manipulating the control and indication facilities of the terminal.

Speaker identification

In all modes of conversation the principle of identification of the current speaker can be used. Therefore, audiographic teleconferencing rooms should be equipped with a display, visible to all participants, on which the identification of the speaker (name, terminal or origin) shall be displayed. Alternatively, this may be an individual display associated with each microphone set.

Speaker localisation could be used.

Conversation modes

Three modes of conversation may be supported in the system:

a) non-conducted mode;
b) half-conducted mode;
c) conducted mode.

a) non-conducted mode: in the case of the non-conducted mode each participant can speak at any moment he wishes. All microphones can be permanently enabled.

b) half-conducted mode: in the case of the half-conducted mode of conversation, the participants shall issue a request to speak and shall wait until this request is granted. The decision shall be taken by the equipment. An upper limit of "n" concurrently speaking participants applies, where "n" (e.g. 3) is a default value or determined by the conductor.

No queue mechanism is used in this mode. When a speaker's request is not granted because the upper limit is exceeded, the speaker shall have to issue another request.

c) conducted mode: in the case of the conducted mode, the participant shall issue a request to speak and shall wait until this request is granted. The participant has the possibility to cancel his request before it is granted.

In the conducted mode, the conductor receives all requests-to-speak and can decide when and until which moment each individual participant is allowed to speak. The conductor shall then enable and disable each participant's microphone set. Alternatively, the outgoing sound signal from each location could be disabled and enabled.

In conducted mode, a queueing mechanism can be used which handles all requests to speak on a first come - first served basis. When queueing is used each participant shall end his speech by issuing a dedicated notification (e.g. by pushing a button). The conductor, however, still has the privilege to interrupt a current speaker, to disable his microphone set and to pass the floor to another participant.

All modes: in all modes of conversation, the conductor shall have an indication of the speakers currently involved. The conductor shall be able to enable or disable each speaker's microphone set.

The actual mode of conversation shall be indicated permanently to all participants at all locations.

4.8.4 Recovery and reconfiguration

Detection of loss of a connection to a terminal is performed by the applicable MCU. The other terminals should get a message saying which terminal has been disconnected. If the conductor terminal is lost then the conference shall return to non-conducted mode.

After reconnection, a procedure for re-assignment of the token of conductor-ship can be performed and the other terminals should receive a message that the lost terminal has been reconnected.

4.8.5 Disconnection

Disconnection can take place from the MCU (e.g. in the case of the end of the reservation period) by the convener or by a participant (his own connection only).

4.9 List of service-attributes

Information transfer attributes

1. Transfer mode	circuit.
2. Transfer rate	64 kbit/s and 2 x 64 kbit/s.
3. Transfer capacity	unrestricted digital.
4. Structure	8 kHz structure.
5. Establishment of comm.	demand.
6. Configuration of comm.	point-to-point.
7. Symmetry	bidirectional symmetric.

Access attributes

8. Access typebasic	ISDN basic.
9. Access channel and rate	64 kbit/s. (see under 2. Transfer rate).
10. Info access structure	multimedia (1 X 64 kbit/s).
11. Signalling access protocols	
11.1 Layer 1	ETS 300 012 [1].
11.2 Layer 2	ETS 300 125 [3].
11.3 Layer 3	ETS 300 102-1 [4].
12. Information access protocols	ETS 300 012 [1].
12.1 Layer 1	prETS 300 144 [5].
12.2 Layer 2	prETS 300 012 [1].
12.3 Layer 3	-
13. Type of user information	Audio, Still Picture Television (SPTV), X-Y devices, facsimile, telewriter, telematic data, user-to-user message.
14. Transport attribute	none.
15. Session attribute	none.

16. Presentation attributes

16.1 Audio	CCITT Recommendations G.722 [6] and G.711 [7] (for compatibility with telephony).
16.2 Video	SPTV.
16.3 Auxiliary	CCITT Recommendations T.30 [8] and T.4 [9] (facsimile).
16.4 Dialogue	message channel (see Annex B).

17. Application attributes

17.1 Audio	microphone and loudspeaker, echo control device, headset
17.2 Video	object/document camera, person camera (for still pictures), monitor(s).
17.3 Auxiliary	Group 3 (facsimile).
17.4 Dialogue	dedicated keyboard and display.

General attributes

18. Supplementary services	in the switched service: as for telephony.
19. Quality of service	see subclause 4.6.
20. Interworking	telephone, videophone.
21. Operational, commercial	

5 Network

5.1 Access

5.1.1 Transmission

The following networks are likely to be used for audiographic teleconferencing:

- ISDN;
- Integrated Digital Network (IDN);
- leased lines;
- data networks;
- satellite networks;
- etc.

5.1.2 Interface

The interface of the terminal and MCU to the ISDN shall be in accordance with ETS 300 012 [1] (layer 1) and interface surface B in figure 7.1 and B' in figure 8.1 of ETS 300 102-1 [4] (layer 3).

Terminal and/or MCUs with CCITT Recommendation X.21 [21] interface may be connected to the network by means of terminal adaptors according to CCITT Recommendation X.30 [10] (user class 30).

NOTE 1: The network used (e.g. leased lines) or the access interface (e.g. terminal adaptors R interface) may, in some cases, not be able to provide 8 kHz timing (octet timing). In these cases the service may not include the capability to interwork with the telephony service.

5.2 Transfer rate

One or two transparent 64 kbit/s transmission paths are necessary. Bit and byte timing are provided by the network at the S/T reference point.

5.3 Call

Call set-up and clearing procedures are in accordance with relevant standards for ISDN call control procedures including ETS 300 102-1 [4].

6 Bit rate allocation, message channel, framestructure

6.1 Bit rate allocation

For the basic service, information is multiplexed within one 64 kbit/s stream. For special cases (fast still picture, fast facsimile, full 64 kbit/s speech) a second 64 kbit/s stream can, in principle, be used. It shall be possible to use the second 64 kbit/s channel temporarily, on a on-demand basis, only during moments in the meeting when it is required. This extension is not covered by this I-ETS. A possible bit rate allocation scheme is given, as an example, in the second column of table 1.

Table 1: Bit rate allocation

	One 64 kbit/s channel	Two 64 kbit/s channels (example)
Speech	56 kbit/s normally 48 kbit/s during facsimile, still picture or data transmission	56 kbit/s in 1st channel
Facsimile or still picture	8 kbit/s with simultaneous speech	64 kbit/s in 2nd channel
Service channel	8 kbit/s	8 kbit/s in 1st channel

The service channel contains the frame-alignment signal, bit rate allocation signal, and user-to-user or terminal-to-terminal (or MCU) information.

6.2 Message channel

The message channel is specified in Annex B of this I-ETS and is accommodated in the application channel as specified in Annex C.

The message channel shall be used for the following purposes:

a) to send initialisation information concerning configuration of terminals (e.g. names of participants) and room parameters between terminals or between terminals and the MCU at the start of an audiographic teleconference;

b) during the audiographic teleconference the message channel shall be used to communicate requests and acknowledgements between terminals for the use of meeting aids;

c) using the keyboard and display, messages may be sent selectively between participants over the message channel.

6.3 Frame structure

The frame structure is described in Annex C of this I-ETS. The data channel (see subclauses 4.2.2 and 4.6.5) occupies bit 7 in the frame thus forming an 8 kbit/s channel. Bits number 8 of octets numbers 41 to 80 are reserved for the message channel. Bits number 8 of octets numbers 17 to 40 may also be used for the message channel or otherwise as specified in prETS 300 144 [5].

6.4 Mode switching

CCITT have defined various combinations of bit rate for wideband speech and data path capability within a 64 kbit/s channel. These combinations of bit rate are known as modes and are defined as follows:

Mode 0: 64 kbit/s Pulse Code Modulation (PCM) speech (A-law).
Mode 1: 64 kbit/s wideband speech.
Mode 2: 56 kbit/s wideband speech plus 8 kbit/s data capability.
Mode 3: 48 kbit/s wideband speech plus 16 kbit/s data capability (8+8 kbit/s).

An unpartitioned 64 kbit/s channel, therefore, corresponds either to Mode 1 above or to a PCM speech channel (A-law, CCITT Recommendation G.711 [7]). In order to provide general compatibility between audiographic teleconference terminals and terminals using an unpartitioned channel, the audiographic teleconference terminal can work in three configurations:

1) Mode 2 or Mode 3 with frame alignment and data capability;
2) Mode 1 with no data capability;
3) Mode 0 - PCM speech to CCITT Recommendation G.711 [7] with no data capability.

At the start of a session it is necessary for terminals to know which mode they should assume in order to enable different types of terminals to be interconnected. For example, an audiographic teleconference terminal would need to switch modes in order to interwork with a digital telephone. It should be possible that the set-up situation (starting mode) be adjusted manually. However, it is preferred that this is performed automatically according to the method given in prETS 300 143 [26]. Mode 2 shall be the normal operating mode.

Mode switching during the conference shall be signalled in the Bit rate Allocation Signal (BAS) word.

7 Coding

The coding of audio is described in CCITT Recommendation G.722 [6], the coding of meeting aids in subclause 8.5 of this I-ETS and the coding of messages in Annex B to this I-ETS.

8 Terminal specification

This Clause consists of a functional description of the terminal, specifications for the audio system divided into: interconnection, far-end and near-end, and a description of the meeting aids that could be used.

As concerns the terms interconnection, far-end and near-end quality specification, the explanations are given below:

Interconnection specifications: the basic requirements to allow the communication between several locations, without paying attention to the quality of the communication.

Far-end quality specifications: the requirements that the local audio terminal shall fulfil in order to ensure a minimum quality on the transmitted signal which is received by the far-end users.

Near-end quality specifications: the requirements on the local audio terminal which allow a certain level of quality as it is perceived by the local users.

8.1 Functional description of an audiographic teleconference terminal

The functions of the equipments are (see also figure 1):

Loudspeaker/microphone unit

This unit contains a (set of) microphone(s) and (a) loudspeaker(s), alternatively headsets can be used.

Loudspeaker microphones and amplifiers

The audio amplifying equipment amplifies the microphone and loudspeaker signals.

Audio processor unit

This unit performs the function of equalising conference room parameters and setting send and receive side audio levels as well as echo suppressing or cancelling (although this could alternatively be done in the digital path). The unit produces a speaker identification signal and microphones can be switched individually on and off by this unit. This unit may contain test generators and audio-level measurement equipment for performing acoustic alignment adjustments.

Headsets

Headsets can be used instead of loudspeakers especially in cases of very noisy or very reverberant environments. Nevertheless, it is cautioned that the use of headsets is much less comfortable with respect to the conventional hands free arrangements and is often the cause of complaints from the users.

Audio codec

The processed audio is coded and decoded in the Codec. The coding scheme used is as described in CCITT Recommendation G.722 [6] with a bit rate of 48 kbit/s, 56 kbit/s or 64 kbit/s. The bit rate in use at any time depends on the activity of other meeting aids (e.g. still picture). The bit rate switching is initiated by signalling from the Timing and Control Unit. For interworking with digital telephones coding according to CCITT Recommendation G.711 [7] should also be provided.

Keyboard/display unit

The keyboard/display unit enables the conferees to exchange messages such as floor request (for this purpose separate pushbuttons for each participant are recommended) and input of names of participants. In addition, messages such as speaker identification would be shown on a display visible to all. Also, this keyboard/display could be used to access databases and other computers (such as management support systems or a computer conference system) via the telephone network. Alternatively, a separate keyboard/display unit could be used for this purpose as shown in figure 1.

Message channel access unit

This unit accesses the message channel for conveying messages between audiographic teleconference units and ensures that information signals such as terminal characteristics, are transmitted to the other terminal or MCU.

Muldex and bit rate adapter

The signals from the audio codec, message channel access unit and from the interface and protocol adapters are multiplexed in the multiplexer/demultiplexer (muldex). The framing structure according to which the multiplexing is performed is described in Annex C of this I-ETS.

Interface and protocol adapters

These units intermediate between the standard meeting aids (e.g. SPTV, telewriting) and the Muldex. Thus, they handle the procedures to interface the CCITT standardised (or still to be standardised) equipments.

Timing & control unit

This unit arranges all timing matters in the terminal, deriving the timing from the network or from the frame. This unit also controls all functions of the terminal. It controls mode-switching. It effects interchange of all system control and set-up information with the other connected terminal or MCU such as terminal characteristics.

Network interface

The network interface provides bit and byte-timing derived from the network clock. This unit is also responsible for call set-up through the D-channel of ISDN.

Meeting aids

Meeting aids (such as facsimile, SPTV, telewriter and telematic terminals) shall be CCITT standardised equipments (unless a Standard is not available and not emerging). The meeting aids are described in more detail in subclause 8.5.

These equipments shall be connected to the interface and protocol adapters which signal the use of a meeting aid to the timing and control unit. When a request to use a meeting aid has been sent, and acknowledged via the message channel, the timing and control unit ensures that the muldex makes available the appropriate time slots and takes care of signalling the accompanying frame partitioning to the MCU (in multipoint connections) or to the other terminal in point-to-point connections.

A keyboard and display unit serves to exchange messages between terminals or between a terminal and the related MCU. In addition, terminal equipment can be connected directly to the network interface, e.g. for database access.

Cursor

Some meeting aids, such as the telewriter and the SPTV system, require a cursor. The cursor position shall be transmitted as part of the telewriter signal.

Equipment for call set-up and clear down

A connection point is indicated in figure 1 which is used to set up and clear down the call through the network interface.

Basic audiographic teleconference terminal

The part of the terminal enclosed by the dashes in figure 1 is termed as a basic audiographic teleconference terminal "or" basic terminal. Every audioconference terminal should contain this part of the system.

Reference interface surfaces

Two reference interface surfaces have been defined, termed interface surface A and B in figure 1, each indicated by a dotted line: ".....".
The interface surface A represents the interface points of (standardised) inputs and outputs from meeting aids.
The interface on surface B is CCITT Recommendation X.21 [21], leased line.

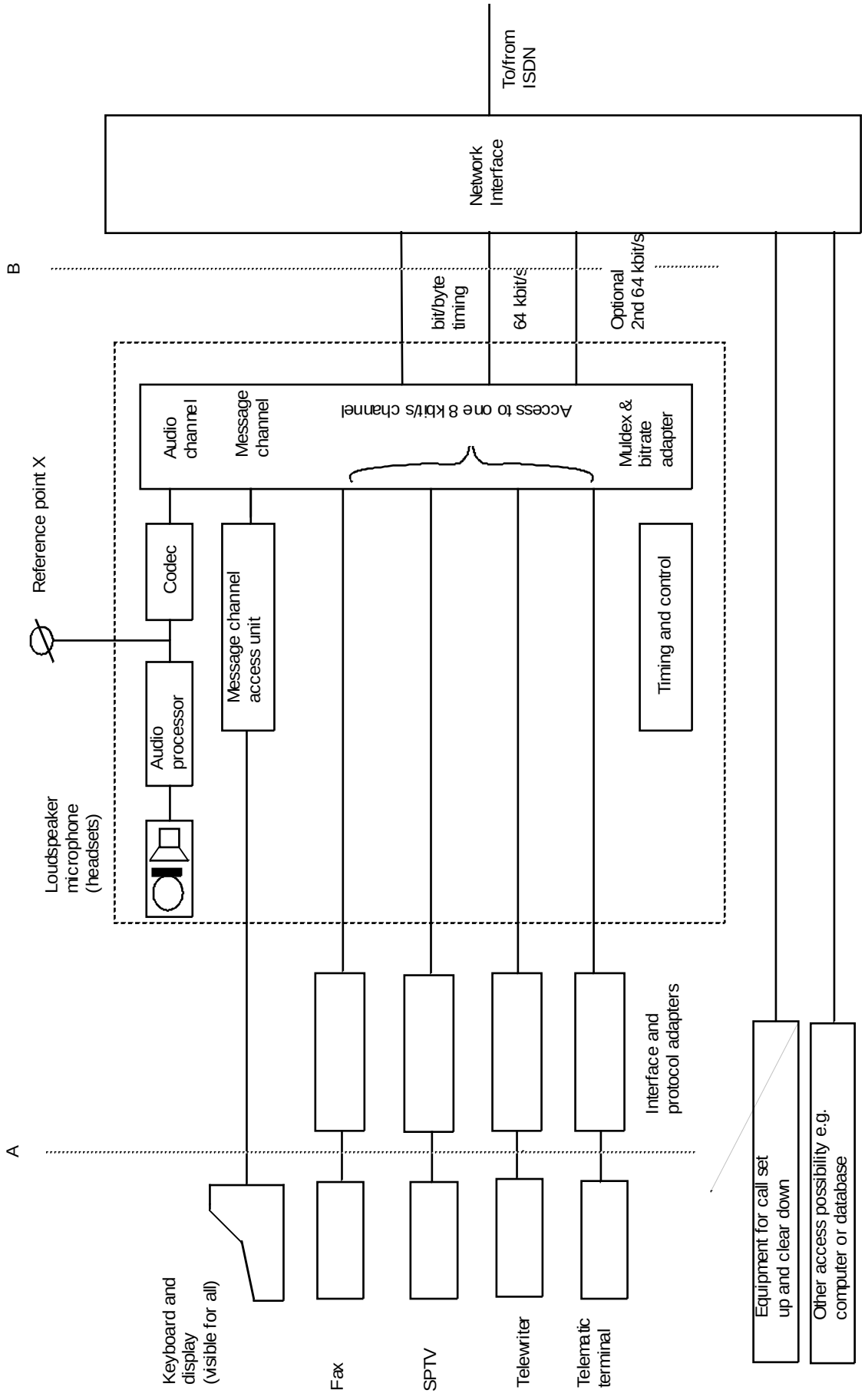


Figure 1: Audioconference terminal

8.2 Interconnection specification for the audio system

8.2.1 Audio channel

In the normal working mode wideband coding is used while the -terminal is equipped with an A-law codec for interworking with digital telephone sets.

Audio coding

An audio channel applying wideband coding shall meet CCITT Recommendation G.722 [6]. An audio channel applying A-law PCM coding shall meet CCITT Recommendation G.711 [7].

Transmission characteristics

The transmission characteristics of the audio channel shall be in accordance with CCITT Recommendation G.722 [6] for a wideband application, and CCITT Recommendation G.711 [7] for an A-law PCM application.

The audio ports (reference point X in figure 1) shall, in addition to the requirements given in CCITT Recommendations G.722 [6]/G.711 [7], fulfil the following requirements:

- Impedance

  The nominal impedance at the input and output audio ports shall be 600 ohms, balanced. The return loss, measured against the nominal impedance, shall not be less than 20 dB over the frequency range:

  * 50 Hz to 7 kHz (wideband)
  * 300 Hz to 3,4 kHz (PCM)

- Relative level

  The nominal relative level at the input and output audio ports shall be 0 dBr at the reference frequency, 1 000 Hz for the wideband as well as the PCM application.

- Overload point

  * + 9 dBmO for wideband coding (CCITT Recommendation G.722 [6])
  * + 3,14 dBmO for PCM coding (CCITT Recommendation G.711 [7])

Care shall be taken to guarantee that any amplitude limiting, where provided, occurs before the input intialising filter.

8.2.2 Measuring instruments and methods of measurement

Acoustic measurements

Acoustic levels shall be measured by a sound level meter according to IEC Recommendation 651 [12] (Class 1).

The sound source calibration should be performed with the sound level meter in "Linear" mode, while the reception alignment and the measurement of the room noise shall be performed in the "A weighting" mode.

Electric measurements

Output line levels and noise level shall be expressed in dBm and measured across a 600 ohms resistive termination at reference point X.

The measuring instrument shall perform a true r.m.s. measurement.

8.2.3 Transmission sensitivity

8.2.3.1 Acoustic test signal

The acoustic signal to be used in the measurements for the audio alignment should be generated by a sound source as shown in figure 3, element a, which consists of two parts:

1) Noise source
   The noise source consists of a noise generator, simulating an average speech spectrum, followed by a 7 kHz low pass filter rolling off at a minimum rate of 48 dB/oct.

2) Artificial mouth
   The artificial mouth shall comply with CCITT Recommendation P.51 [13].

The third octave spectrum of the acoustic signal generated at the Mouth Reference Point (MRP)[1] is given in table 2, together with tolerances.

Table 2: Long term third octave spectrum of the acoustic signal (see CCITT Recommendation P.51 [13])

1/3 oct. centre freq Hz	sound pressure level dBSPL	tolerance dB
100	70,9	--
125	74,8	+3/-6
160	77,6	"
200	79,6	"
250	80,6	± 3
315	80,6	"
400	80,7	"
500	79,9	"
630	78,6	"
800	77,0	"
1 000	75,1	"
1 250	73,0	"
1 600	71,0	"
2 000	68,9	"
2 500	67,1	"
3 150	65,4	"
4 000	64,2	± 6
5 000	63,4	"
6 300	63,4	"

8.2.3.2 Electric test signal

The electric signal used for aligning the receiving side of the equipment should be generated by a source with an internal resistive impedance of 600 ohms. It consists of a noise simulating an average speech spectrum, band limited to 7 kHz by a low pass filter with a roll off of at least 48 dB/oct. It should be applied to the receiving port of the equipment at - 20 dBm. The third octave spectrum of the signal is given in table 3, together with tolerances.

---

1 Located on the axis, at a distance of 25 mm in front of the lip ring (see CCITT Recommendation P.64, Annex A).

Table 3: Long term third octave spectrum of the electric signal

1/3 oct. centre freq Hz	signal level dBm	tolerance dB
100	- 38,4	± 3
125	- 34,5	"
160	- 31,7	"
200	- 29,7	"
250	- 28,7	"
315	- 28,3	"
400	- 28,6	"
500	- 29,4	"
630	- 30,7	"
800	- 32,3	"
1 000	- 34,2	"
1 250	- 36,3	"
1 600	- 38,3	"
2 000	- 40,4	"
2 500	- 42,2	"
3 150	- 43,9	"
4 000	- 45,1	"
5 000	- 45,9	"
6 300	- 46,2	"

8.2.3.3 Send side alignment

The sound source, calibrated for providing 89,3 dBSPL at the MRP, is positioned over the edge of the conference table, as shown in figure 3, element b, (see CCITT Recommendation P.34 [15]) on the centre line of each conferee's position.

The microphone gain controls shall be adjusted to achieve, for each conferee's position of the source, an output line level of - 20 dBm (± 1 dB). Headsets shall be aligned for delivering the same line level, with their microphones placed at the Mouth Reference Point (MRP) of the Artificial Mouth.

8.2.4 Stability test

The audiographic teleconference terminal shall have a stability margin of 3 dB when the microphone and loudspeaker paths are looped in reference point X in figure 1 and the sound source is activated as described in subclause 8.2.3.3. During the measurement the volume control shall be set to the maximum position.

8.2.5 Impedances

The input and output impedances of the audio-processing units shall be 600 ohms. The return loss shall not be less than 20 dB in the frequency range 50 Hz to 7 kHz.

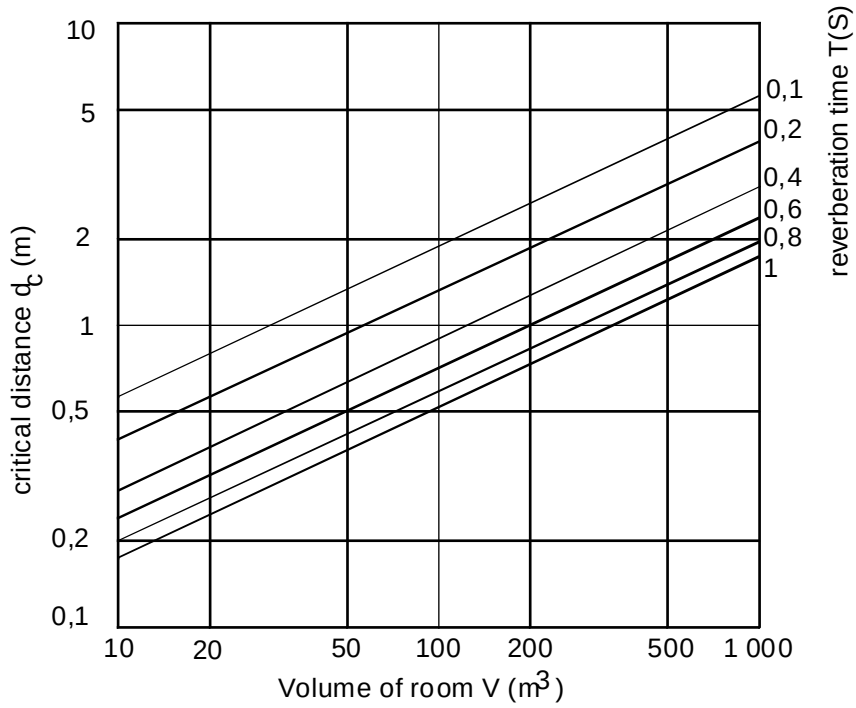


Figure 2: Influence of the room volume to the quality of sound

8.3 Far-end quality specifications for the audio system

8.3.1 Echo performance

8.3.1.1 Acoustic echo control

To get satisfactory suppression of acoustic echoes, it shall be necessary to provide the audio processor with either an echo canceller or an echo suppressor. The echo cancellation technology is recommended if highest possible speech quality performance is the objective.

The following requirements apply:

- the overall echo return loss of the audio system shall be as described in subclause 8.3.1.2;
- the echo canceller shall permit double-talk with negligible speech quality degradation.

8.3.1.2 Overall echo return loss

The overall echo return loss of the audio system shall be measured in reference point X of figure 1 with the volume control in maximum position.

When a noise source with a gaussian amplitude distribution, simulating a band limited average speech spectrum and adjusted for delivering - 20 dBm into 600 ohms, is connected to the input port, the level measured over 600 ohms at the output port shall not be higher than - 55 dBm.

8.3.2 Electric noise

The electric noise emitted by the audiographic teleconference system at the reference point X shall not be more than - 55 dBm.

The measurement shall be done with all microphones plugged in but no conferees in the conference room and without incoming signals on the reception of the equipment.

The noise emitted by the audiographic teleconference system at the reference point X when the system is transmitting shall be no more than - 50 dBm. It shall be measured by forcing the system in the emission mode as if one speaker is active in the room.

Care should be taken in order to assure that no frequency components are generated below 100 Hz and above 4 kHz at a level higher than - 40 dBm, because of noise sensitivity of the A-law codex.

8.3.3 Room noise

The room noise should be measured at the conferees positions, in the absence of conferees as shown in figure 3, element c. The background noise level should be as low as possible. It is preferred that the noise level is lower than 40 dB(A).

8.3.4 Reverberated field picked up by the microphones

The sound source, calibrated for providing 89,3 dBSPL at the MRP, shall be positioned in order that the distances between the sound source and all the microphones are greater than three times the distance between the microphone and the position defined in figure 3 for the send side alignment. It is also recommended that the source is, at least, one meter from the walls. Then the signal measured at point X is preferably not more than - 27 dBm. It is measured by forcing the system in the emission mode as if one speaker is active in the room.

The test shall be performed for each microphone in the room.

8.3.5 Electro-acoustical specifications for the send side

8.3.5.1 Microphones

The electro-acoustical characteristics of the microphones should conform to IEC 581-5 [16].

8.3.5.2 Frequency response

The frequency responses of the sending electrical channel should be flat (within ± 1 dB) in the frequency range 100 Hz - 7 000 Hz. It shall be measured for an output signal of 0 dBm.

8.3.5.3 Distortion

The harmonic distortion of the sending electrical channel should not exceed 1 % in the frequency range 200 Hz - 3 500 Hz. It shall be measured for an output signal of 0 dBm.

8.3.6 Double talk performances

In case echo suppression is performed, it should not perceivably impair the speech quality, also under double talk conditions. In particular, the following dynamic characteristics are to be met:

- both transmission and reception channel openings shall be guaranteed within 10 ms from the beginning of the speech activity in the relevant direction;

- both transmission and reception channel openings shall be kept for at least 200 ms after the end of the speech activity in the relevant direction;

- in case of double talk, both transmit and receive channels shall be opened within the specified time but, in order to reduce the perceptible echo to an acceptable amount, an extra 6 dB attenuation shall be left on the reception channel. In this way the residual echo under double talk conditions is masked by the outgoing speech.

8.3.7 Practical installation guide-lines

It is recommended that the acoustic treatment of audiographic teleconference rooms be carefully designed in order to achieve best overall electro-acoustic performances.

Whilst audiographic teleconferencing may still be possible in rooms not meeting the following recommendations, the overall system performance is likely to be degraded. In particular, it is recommended that barrel effects and background noises be prevented and a suitable sound proof insulation of the room is applied.

The main parameters to be taken into account when installing audiographic teleconference systems are:

- room reverberation;
- background noise;
- sound insulation (privacy).

While the former two parameters independently affect the maximum talker-to-microphone allowable distance, the latter ensures privacy between the conference participants.

8.3.7.1 Maximum talker to microphone distance arising from background noise level

The following maximum talker to microphone distance "dmax" should be maintained, in order to achieve a signal to noise ratio of at least 30 dB for speech level of average talkers:

$$dmax = 50{,}10^{-(L + 10 \log n) / 20} \text{ m} \quad .....(1)$$

where L is the long-term average background noise level in dB(A), and n is the number of simultaneously open microphones.

In the case where cardioide microphones are used, the calculated distance dmax may be increased by 50 %.

8.3.7.2 Maximum talker to microphone distance arising from reverberation

To avoid barrel effects it is preferred that the microphones are placed in such a way that the direct sound field of associated talkers is high enough compared to the reverberation field. This is achieved, if the maximum talker-to-microphone distance "dmax", is restricted to half the critical distance dc of the room:

$$dmax \approx (1/8) \sqrt{(0{,}161.V/(\pi.T))} \text{ m} \quad .....(2)$$

V : room volume m^3
T : reverberation time s

Extremely directional microphones should not be used. When directional microphones (cardioide) are utilised, the distance may be increased by 50 %. The reverberation time of the room can be measured, alternatively the reverberation time of geometrically simple rooms can be calculated from room absorption characteristics of walls and furniture and from the room dimensions. Realistic talker-to-microphone distances for microphones placed at the conference table are normally attained if the reverberation time is less than 0,4 s in the frequency range 100 Hz - 7 000 Hz (see figure 2). With a longer reverberation time than this figure, it is recommended to take particular care in the placing of microphones and loudspeakers and regarding the echo control performance. The relationship between room volume, reverberation and critical distance is shown in graphical form in figure 2.

8.3.7.3 Preferred maximum talker to microphone distance

The preferred maximum talker to microphone distance is given by the least of the values obtained from formulas (1) and (2). In the case of directional microphones, this distance may be increased by 50 %.

8.3.7.4 Octave band measurements for far-end quality specifications

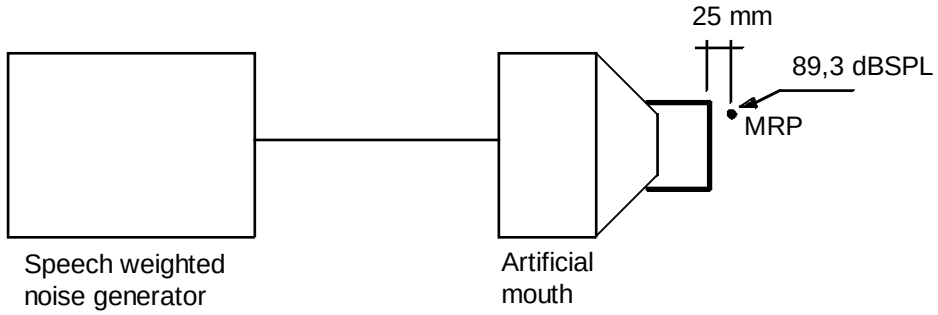
Attention should be paid to the relevant Clauses concerning audio quality. In the event of customer complaints or of particular problems, in-site measurement of the overall transmission frequency response characteristics are recommended. It is defined as the difference between the octave spectra of the electric signal at the X-interface and the acoustic excitation of the MRP. In order to prevent excessive fluctuations of the frequency response of the system, and since the measurements are performed on site, octave band measurements are recommended in the range 125 Hz to 4 kHz. It is recommended that the sum of the absolute differences between the measured values and their average should not exceed 8 dB.

8.3.7.5 Octave band measurements for near-end quality specifications

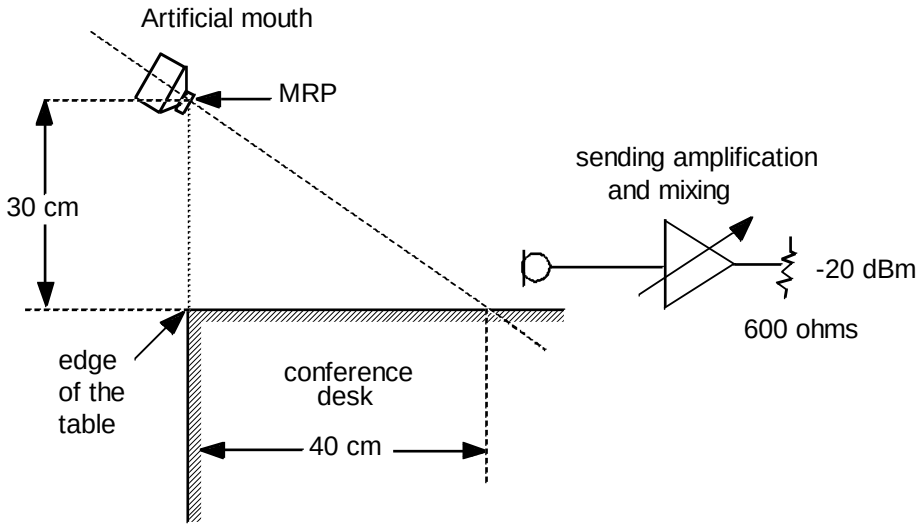
Attention should be paid to the relevant Clauses concerning audio quality. In the event of customer complaints, or of particular problems, in-site measurement of the overall reception frequency response characteristics is recommended. It is defined as the difference between the octave spectra of the acoustic signal delivered by the loudspeaker(s) at the listening positions and the input electric signal at the X-interface.

For the six octave bands, from 125 Hz to 4 kHz, it is recommended that the sum of the absolute difference between the measured values and their average does not exceed 12 dB.

a) Sound source



b) Send side alignment



c) Receive side alignment and acoustic coupling

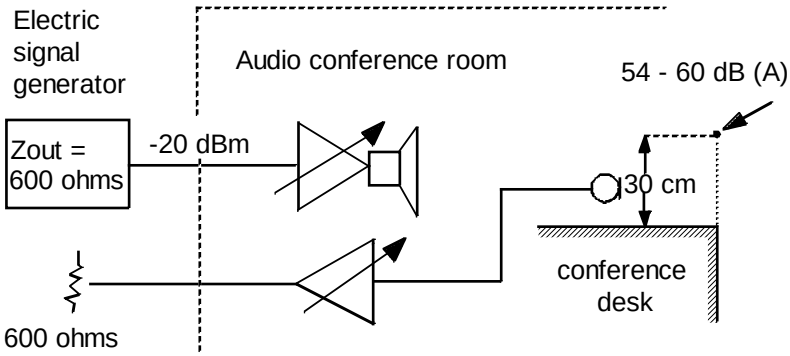


Figure 3: Audio alignment

8.4 Near-end quality specifications for the audio system

8.4.1 Electro acoustical specifications for the receive side

8.4.1.1 Loudspeakers

The electro acoustical characteristics of the loudspeakers should conform to IEC 581-7 [17].

8.4.1.2 Frequency response

The frequency response of the receiving electrical channel should be flat (within ± 1 dB), in the frequency range 100 Hz - 7 000 Hz. It shall be measured for an input signal of - 20 dBm at the X-interface.

8.4.1.3 Distortion

The harmonic distortion of the receiving electrical channel should not exceed 1 % in the frequency range 200 Hz - 3 500 Hz. It shall be measured for an input signal of - 20 dBm.

8.4.2 Reception sensitivity

8.4.2.1 Volume control

The audiographic conference terminal shall be provided with a volume control. The gain at maximum position should conform to that given in subclause 8.4.2.2.

8.4.2.2 Receive side alignment

The noise source simulating a band limited average speech spectrum, adjusted for delivering - 20 dBm into 600 ohms, is connected to the input port of the system during the alignment procedure. The receiving gain shall be adjusted in order to read a sound pressure level of at least 54 dB(A) at the conferees positions, as shown in figure 3, element c. Experiences have shown that increased listening levels up to 65 dB(A) are desirable. The maximum level is determined by the terminal stability (see subclauses 8.3.1.1 and 8.2.4).

The alignment procedure shall be performed with the volume control in the maximum position. Headsets shall be aligned by coupling both earphones in turn to the IEC 318 [18] Artificial Ear and by adjusting the receiving gain in order to obtain at least 70 dB(A) from each earphone.

8.4.3 Background noise

8.4.3.1 Noise emitted by loudspeakers

The noise emitted by the loudspeaker(s) at each participant position should preferably be lower than the background noise at the same point for each octave band with centre frequencies from 63 Hz to 16 kHz.

A measurement may be done when the input of the system at the reference point X is terminated with a 600 ohms resistive load.

8.4.4 Sound insulation

In order to ensure a good privacy for the conferees the speech level transmitted to premises around the conference room should be at least 15 dB below the noise level in these premises. Assuming that the maximum talking and listening level in the reverberation field in the conference room is 70 dB(A), and the noise level in the premises is around 40 dB(A), it follows that the sound insulation between the rooms should be at least 45 dB.

8.4.5 Double talk performance

See subclause 8.3.6.

8.5 Meeting aids

Besides speech, the following meeting aids can be used in audiographic teleconferencing:

SPTV

SPTV is a method of transferring still images derived from a video source between two or more locations by electrical means.

The equipment to be used with audiographic teleconference is of the transceiver type, i.e. each unit may both transmit and receive pictures, although not necessarily simultaneously. The system may provide for indefinite retention and display of the still picture at the remote end. Associated with the SPTV equipment shall be suitable TV cameras and monitors operating to CCIR 625 line standards. For optimum performance these items should be in accordance with the requirements given in the CEPT Recommendation on International Digital Videoconference Service (CEPT Recommendation T/R 01-02 [19] subclause 6.1). Colour or monochrome equipment may be used.

The picture information obtained from the cameras shall be coded for transmission in order to provide suitable update times.

The equipment shall be provided with suitable means for control of picture capture, transmitted resolution and transmission of pictures.

Facilities shall exist to control the movement of a cursor overlaying the displayed picture.

At the physical electrical level a single CCITT Recommendation X.21 [21] interface shall be used to interconnect with the audiographic teleconference unit. Both picture information and SPTV control information shall be sent through this interface. This subject is under study in CCITT Study Group VIII and ISO. Further details are given in Annex E to this I-ETS.

facsimile

Group 3 facsimile shall be used. Further details are given in Annex D to this I-ETS.

telewriter

The telewriter enables the exchange of handwritten information such as text, drawings and diagrams. The input device may consist of a writing tablet, a writing pen and some softkeys to perform functions such as erasure and marker. The telewriting function has its own marker or cursor, to be controlled by the writing pen. This marker can be superimposed on the telewriting image. In a multipoint environment, the telewriting image is displayed at all locations at the same time. All locations may contribute to the same image, one after another. Every location is able to erase the image. Every location may activate the telewriting marker. Since the marker only remains visible as long as it is activated, only one marker at a time can be present in an image.

To use the telewriter meeting aid, the user shall press the writing pen. In the absence of an incoming signal from another telewriter in the conference, the information written and displayed locally shall be transmitted to other connected telewriters. If another telewriter is currently in use, the local writing pen shall be inhibited. Further details are given in Annex F to this I-ETS.

keyboard and display unit

The keyboard and display unit is planned to be used to transfer messages via the message channel to an other audiographic teleconference terminal or to an MCU.

controls and indications between terminals

Between terminals the following signals are planned to be conveyed via the message channel:

- floor request;
- grant floor request;
- speaker identification;
- control of speakers microphone (by conductor);
- room identification;
- terminal parameters (available equipment, etc.);
- signals for control of data channels and meeting aids.

8.5.1 Interfaces and protocols for meeting aids

The basic terminal, depicted in figure 1, has a number of input ports connected to Interface and Protocol Adaptors (IPA). These IPA are provided only as necessary. Depending on the meeting aid, the function of the IPA may involve modifying the existing protocol of the meeting aid and substituting a new protocol internal to the audiographic teleconference system.

9 Multipoint audiographic teleconference

A general description of the functions of the MCU are given in this Clause. In addition, this Clause details the procedures to be adopted by an MCU for the handling of multipoint protocols within an audioconference and, in particular, those required for facsimile, telewriter and SPTV.

9.1 Functional description of an MCU

9.1.1 General

An MCU is a piece of equipment located at a node of a teleconferencing digital network (terrestrial or satellite) connected to several 64 kbit/s channels via network access ports. Each access port is connected to a corresponding audioconference terminal or to another MCU. The purpose of the MCU is to permit the transmission of audio signals and supplementary information between a number of separated audioconference terminals.

Although particular attention shall be paid to network topology in the case of satellite transmission, the basic functions of the MCU for a terrestrial or a satellite network are similar. Reference is made to figure 4.

The tasks to be performed by an MCU are:

- network access and interface;
- management of framing structure - multiplexing and demultiplexing;
- mixing of audio signals;
- processing of the subchannels;
- analysis of control messages;
- routing of signals to audioconference terminals and other MCUs;
- handling of encrypted signals;
- terminal interconnection;
- office automation facility;
- operator's console.

A reservation facility could be part of the MCU or located elsewhere. It is presumed that reservation is performed through a "Reservation Centre".

9.1.2 Network access

When the links to the terminals are set up, the MCU receives and transmits 64 kbit/s streams through interface equipments.

The network interface units provide bit and byte timing derived from incoming bit streams and provide for each port a single duplex 64 kbit/s transmit and receive path to the network.

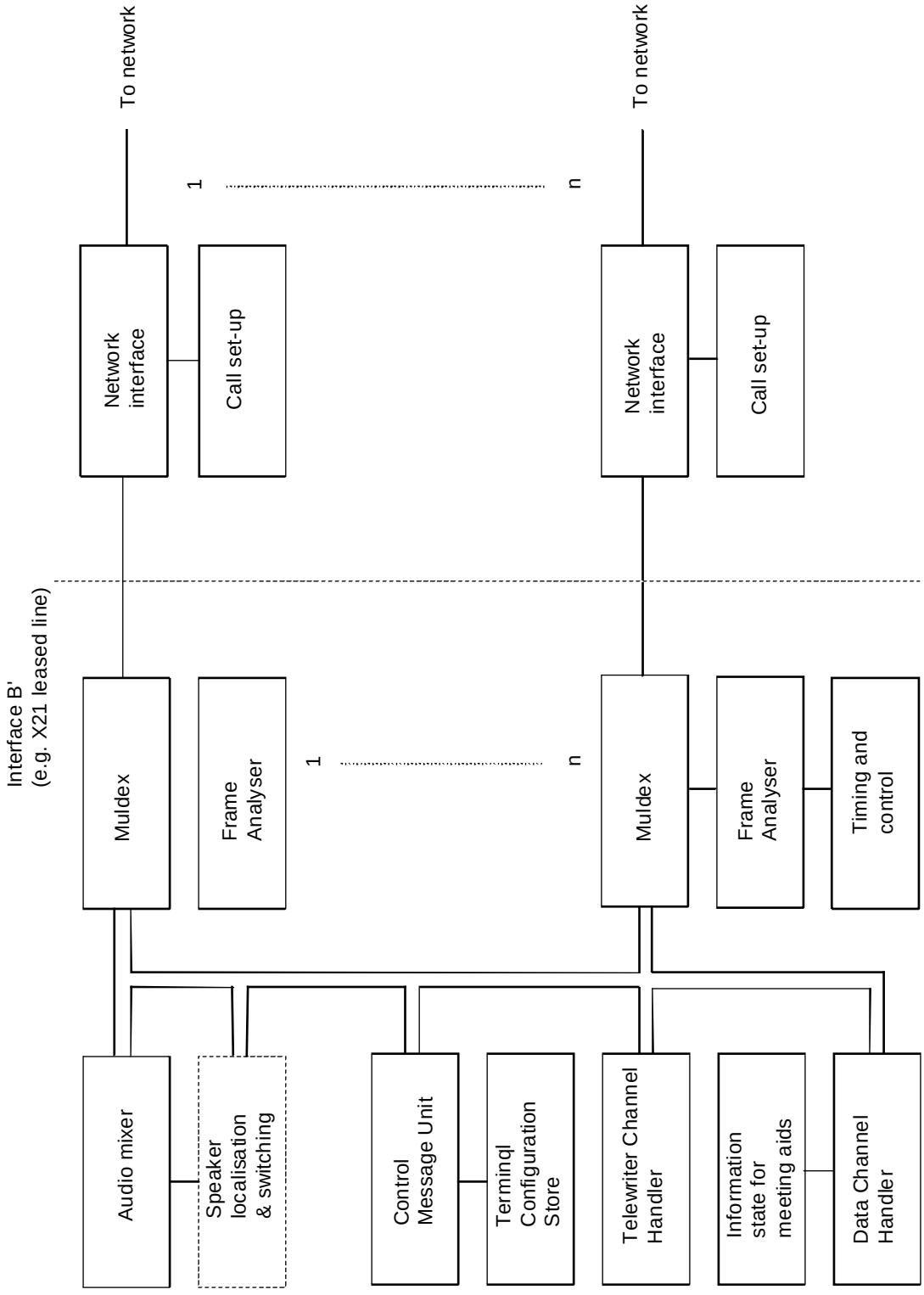


Figure 4

9.1.3 Management of framing structure

receive side:

a) for every port of the MCU, frame alignment as well as multiframe alignment shall be achieved from the incoming signal. A loss of frame alignment should be detected and an indication about frame loss should be sent to the transmitting terminal as specified in Annex C.

b) a mode-switching procedure as described in prI-ETS 300 143 [26] shall be performed;

c) signals from each port are demultiplexed into the audio components and the service channel. When applicable, the service channel is further split to recover the message channel, telewriter channel and other information. The appropriate audio coding mode is selected, and when applicable, the 8 kbit/s supplementary data channel is recovered.

These tasks shall be carried out by the muldex and frame analyser.

send side:

The send side performs the reverse function to the receive side.

9.1.4 Mixing of the audio signals

The audio mixer receives encoded speech from each muldex in the MCU. By means of an additive or other algorithm, audio signals from various sources shall be mixed, and/or switched, and routed as appropriate to other directions. The general principle of voice mixing is that each extremity should receive the audio from all other extremities except his own.

Echo control is fully implemented in the terminals, so no further control shall be performed by the audio mixer in order to avoid the build-up of channel activation/deactivation delays.

To avoid disturbances by summation of background noises from different rooms, it shall be required that the figures in subclause 8.3.2 be adhered to.

No particular means have to be provided for avoiding the saturation of the audio mixer, because the headroom associated to the dynamic range of the coder is suitable for dealing with ordinary conference conditions.

9.1.5 Protocols for handling the data channel

The message channel is used to mediate between requests for the data channel by the various meeting aids (facsimile, SPTV, etc.) at different locations. Users are permitted to operate the meeting aids on a first use basis, thus it is necessary to support the token function.

The signals from the transducers are processed in the following way as given in subclauses 9.1.5.1 to 9.1.5.6 (further details are given in the relevant Annexes).

9.1.5.1 Telewriter

The telewriter signals from the terminals are broadcast to the other terminals through the MCU. A procedure to avoid collisions between telewriter messages is provided.

Further details are given in Annex F to this I-ETS.

9.1.5.2 Facsimile

Group 3 facsimile is designed to work on a "point-to-point" basis. The protocol for multipoint operation is described in Annex D to this I-ETS.

9.1.5.3 SPTV

The SPTV signals from the terminals are broadcast to the other terminals through the MCU. This is described in Annex E of this I-ETS.

9.1.5.4 Marker

The marker function is provided by the telewriter facility.

9.1.5.5 Speaker identification signal

The name codes of active talkers are transmitted via the message channel from the terminals to MCU which in turn forwards this information to other terminals and MCUs.

9.1.5.6 Data channel handler

One of two approaches can be adopted towards the protocols to be used for meeting aids in a multipoint environment. The first approach is to permit each meeting aid to have direct access to the 8 kbit/s data channel, and allow the unadapted signals to flow from one audioconference terminal to another. Whilst this approach is feasible for point-to-point operation, it means that the MCU shall contain special facilities for each type of meeting aid. In particular, this approach would make it difficult to add extra facilities since any new meeting aid would require a specific data channel handler within the MCU.

The second approach, which has been adopted within this I-ETS, is to interpose an IPA between every meeting aid and its access to the data channel. The IPA converts the particular data format from the meeting aid into the basic format used within the teleconference system which shall allow the MCU to broadcast the data transparently to each terminal. Thus, from each audioconference terminal, a point-to-point data link is established with the MCU. Within the MCU, data received from one audioconference terminal is broadcast by the data channel handler to all other audioconference terminals. If any information needs to be sent back to the transmitter from a receiving meeting aid, then this and any negotiation required is performed over the message channel.

Using this approach, the same design of MCU may be used with any type of meeting aid provided the audioconference terminals involved in the conference have compatible IPAs.

Telewriter signals are handled by a service specific telewriter channel handler within the MCU.

9.1.6 Analysis and routing of messages

The messages transmitted through the message channel can be divided into various basic transactions (see Annex B):

a) message between participants (e.g. request for the floor);
b) message between terminal equipments and/or MCUs (e.g. request to transmit SPTV picture).

The MCU is capable of correctly routing messages according to the information contained within the message structure.

9.1.7 Routing of signals to audioconference terminals and other MCUs

Signals from meeting aids have to be routed to other terminals, possibly through other MCUs. This is achieved by means of a routing table which is brought into each MCU during the initialisation procedure. In general, information from meeting aids is sent in a broadcast mode to all other terminals. If selective distribution is required then the exact destinations are negotiated using the message channel.

9.1.8 Handling of encrypted signal

This item is still under study in CEPT and is not a part of this I-ETS.

9.1.9 Initialisation and terminal interconnection

Consideration shall be given to the correct initialisation of the MCU at the beginning of a conference. Particular items to note are:

a) network topology;
b) routing information between terminals and MCUs;
c) types of meeting aid available at conference;
d) type of conference required.

Routing information shall be transmitted via the message channel. In considering the type of conference available the following options are available:

1) Automatic - where each terminal has peer status and all are connected to an open audio system. This is sometimes known as an unconducted meeting;

2) Chairman Control - where a chairman may manually switch conferences in response to request for floor messages. This is sometimes known as a conducted meeting.

9.2 Interfaces

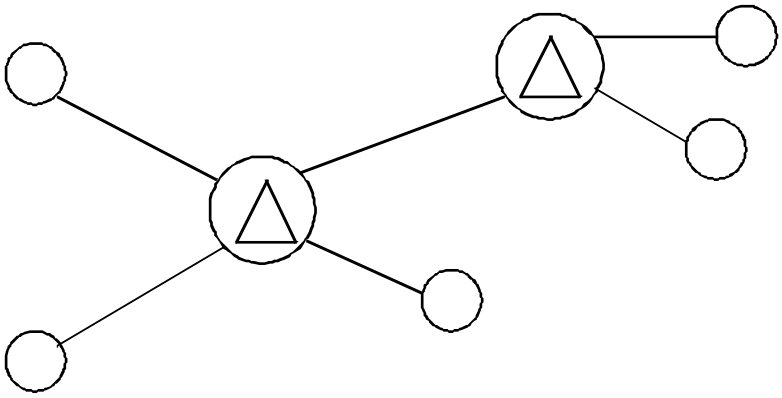
The interface(s) to the network(s) should be according to National Standards in the case of non-ISDN networks. The MCU can be interfaced to the external network environment according to the ISDN Standards or, when another network is used, according to National Standards.

9.3 Network requirements

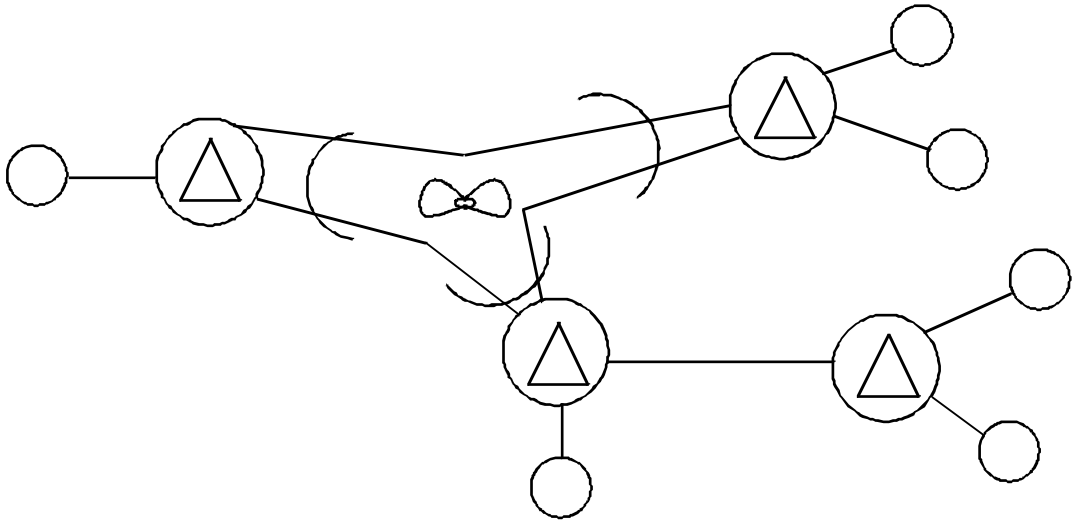
The following two basic network configurations are likely for multipoint conferencing (see figure 5). The configuration of figure 5, element a, is generally not suitable for a satellite connection as it requires a MCU in a node in the network. Satellite links could be employed instead of terrestrial links. Care should be taken not to involve more than one satellite link in unconducted meetings because of the introduced transmission delay. In conducted meetings and remote lecturing applications more satellite hops are allowed. The configuration of figure 5, element b, is suitable for satellite connections but less attractive for terrestrial connections.

Formation of meshes within this satellite network can lead to problems of addressing and stability. To avoid this problem the rule for MCUs within this configuration is that no MCU should retransmit signals back to the same satellite from which they were received.

As the employed error correction procedures of the message channel are not intended for broadcasting the satellite network has to be built up from point-to-point connections.



a) terrestrial links



b) mixed satellite and terrestrial links

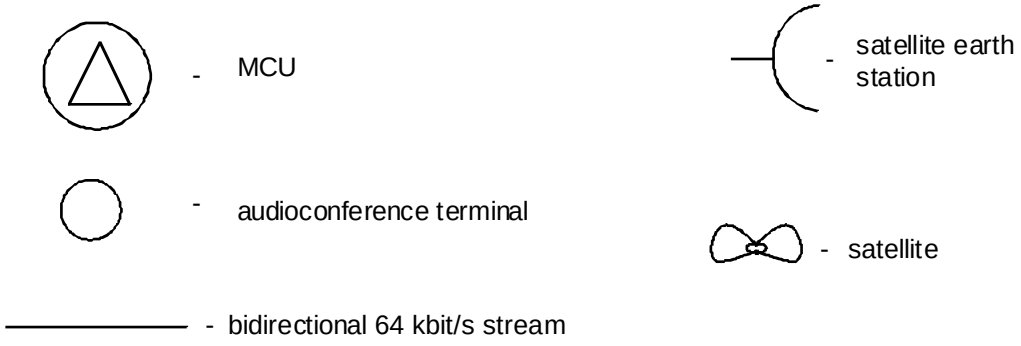


Figure 5: Multipoint network configuration

10 Interworking

The following interworking possibilities with other services may be envisaged:

Table 4

	Interworking between:	level of interworking
Direct interworking (terminal-terminal) possible (NOTE)	Audiographic teleconference and digital telephony A - law - G.711[7]	A - law speech only
	Audiographic teleconference and digital telephony-wideband coded in 64 kbit/s - G.722 [6]	wideband speech
	Audiographic teleconference and videotelephone 2 x 64 kbit/s	wideband speech and compatible meetings aids

NOTE: Via the initialisation procedure described in subclause 6.4, the audio-conference terminal adapts to the other side of the line.

Annex A (normative): List of definitions and abbreviations

A.1 Definitions

A.1.1 Teleconferencing

The following definitions for a teleconference service are given in CCITT Recommendation F.710 [27].

The Teleconference Service (TCS): provides the necessary arrangements for real time conferencing among single individuals or groups of individuals at two or more locations, by means of telecommunications networks

The concept of conferencing implies that the exchange of speech signals is always provided for as a basic facility. The use of supplementary facilities, for the exchange of other signals than speech, is to be determined by the conference participants.

For the interconnection of terminal equipment at three or more locations, a specific interconnection facility is required namely the MCU, to which all locations are connected individually.

The MCU provides proper distribution of the various signals among the connected locations and takes part in maintaining the proper procedures among the connected terminals.

TCS is a real-time service which can be divided according to the following categories:

a) **Audiographic Conference Service:** a type of TCS in which audiosignals are exchanged together with non-voice information except moving video (data, text, graphic, etc.). It may use existing protocols for non-voice informations or an integrated protocol.

b) **Videoconference Service:** a type of TCS in which both audio and full motion video information can be exchanged together with optional non-moving visual information, telematic information and signalling (speaker identification, floor request, etc.).

NOTE: A telephone multipoint conference may be considered as a simple form of audiographic teleconference.

Other forms of audiographic teleconference may imply loudspeaking terminals working full duplex or half duplex mode providing a considerably better sound quality than normal telephone (they may even contain wideband speech coding). Supporting signalling such as request for floor, grant request for floor and speaker identification may also be present.

A.1.2 Other definitions

Audiographic Teleconference Terminal: all equipment and accommodation to be connected to the network-interface (see figure 1 of the main text) which enables the user to conduct an audiographic teleconference.

Basic Audiographic Teleconference Terminal: the minimum equipment-configuration which can be characterised as an "audiographic teleconference terminal". The basic audiographic teleconference terminal (or basic terminal) configuration is indicated in Clause 8 and, in particular, in figure 1 of the main text.

Chairman: one who is chosen to preside over the audiographic teleconference in the management of the business of the meeting.

Conductor: one who leads or guides the technical management of the audiographic teleconference.

Convener: one who summons participants to a meeting and makes all necessary prior arrangements.

Facsimile: a means of transmitting and receiving fixed graphic material, photo, map, document, etc. by means of a scanning process, the received image being reproduced on paper.

Local conductor: one who is responsible for operating the keyboard and display during the conferencing.

Meeting aid: a telematic equipment used during the audiographic teleconference.

Message channel: a channel within the 64 kbit/s stream through which control and indication information is conveyed. This is further described in Annex B.

Multipoint Control Unit (MCU): a device which enables the interconnection of terminal equipment at three or more locations. All locations are connected individually to the MCU.

Reservation centre: a national administrative centre where reservation for connections and, if applicable, MCU(s) and other equipment are made.

Still Picture Television (SPTV): a means of transmitting and receiving non-moving images derived from a television camera, the received image being displayed on a television screen.

Telewriter: a system used for hand written text in which writing movement at the transmitting end causes corresponding movement of a writing device at the receiving end.

A.2 Abbreviations

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

ACT	Audiographic Teleconference Terminal
AMN	Acknowledgement of MCU Number
BAS	Bit rate Allocation Signal
CAP	Communication of Act Parameters
CAR	Communication of Act Relationship
CIU	Control and Indication Unit
CMN	Communication of MCU Number
CRE	Conductorship Relinquished
ESP	End of Speaker Identification
EVE	European Videoconference Experiment
FAX	Facsimile
GSTN	General Switched Telephone Network
HDLC	High-Level Data Link Control
IDN	Integrated Digital Network
IMCR	Inter-MCU Connection Restored
IPA	Interface and Protocol Adaptor
ISDN	Integrated services Digital Network

LAPB	Link Access Protocol Balanced
LC	Leaving Conference
MCU	Multipoint Control Unit
MRP	Mouth Reference Point
Muldex	Multiplexer/Demultiplexer
OSI	Open Systems Interconnection reference model
PAL	Participant's ACT Lost
PCM	Pulse Code Modulation
PD	Protocol Discriminator
PIS	Procedure Interrupt Signal
RAR	Request for ACT relationship
RC	Reservation Centre
RFC	Request for Conductorship
RPOA	Registered Private Operating Agency
SCM	Set Conducted Mode
SPI	Speaker Identification
SPTV	Still Picture Television

Annex B (normative): Message channel specification

B.1 Introduction

This annex details the facilities and use of the message channel for audioconferencing. The philosophy of the description of the layer 7 facilities is given, together with a number of facilities which have been identified as necessary for the control and enhancement of the audioconference.

B.2 General philosophy

The following format is used to specify the layer 7 facilities:

1 Facility title.
2 Concept of the facility - what the participant sees and does, in words.
3 Audiographic Conference Terminal (ACT) function - what the ACT has to do - in point-to-point connection - verbal description.
4 MCU function - what the MCU has to do - verbal description.
5 Details of the messages necessary to perform the facility.
6 Flow chart of action at the ACT.
7 Flow chart of action at the MCU.

B.3 Facilities list

The following facilities are necessary for the setting up and management of an audio conference.

1 Set-up of message channel
2 Reservation of the mcu
3 Set-up of act
4 Allocation of mcu numbers
5 Transmission of status information to operator console
6 Termination of conference session
7 Indication of loss of conductor's act
8 Indication of loss of participant's act
9 Indication of loss of inter-mcu connection
10 Request for update of conference status
11 Present speaker identification
12 Signalling of conductorship
13 Relinquishing of conductorship
14 Selection of conference mode
15 Control of speaker's microphone
16 Request to reserve the floor
17 Signalling of a local consultation
18 Transmission of meeting aid information
19 Transmission of text messages
20 Addition of an act to the conference

The documentation of the layer 7 facilities as described in Clause B.2 is given in Clause B.7.

B.4 Message list

To implement the facilities listed in Clause B.3 the following messages have been specified.

ERROR
SPEAKER IDENTIFICATION
REQUEST FOR CONDUCTORSHIP
REQUEST FOR CONDUCTORSHIP ACKNOWLEDGE OK
REQUEST FOR CONDUCTORSHIP ACKNOWLEDGE NOT OK
CONDUCTORSHIP RELINQUISHED
SELECT CONDUCTED MODE
SELECT HALF-CONDUCTED MODE
SELECT NON-CONDUCTED MODE
FLOOR GRANTED
REQUEST TO RESERVE THE FLOOR
CANCEL FLOOR REQUEST
FLOOR REQUEST GRANTED
FLOOR REQUEST REFUSED
FLOOR REQUEST ACKNOWLEDGE
LOCAL CONSULTATION
LOCAL CONSULTATION ENDED
TEXT MESSAGE
REQUEST FOR ACT PARAMETERS
COMMUNICATION OF ACT PARAMETERS
REQUEST FOR ACT RELATIONSHIPS
COMMUNICATION OF ACT RELATIONSHIPS
CONDUCTOR'S ACT LOST
PARTICIPANT'S ACT LOST
INTER-MCU CONNECTION LOST
INTER-MCU CONNECTION RESTORED
END OF SPEAKER IDENTIFICATION
FLOOR GRANTING CANCELLED
COMMUNICATION OF MCU NUMBER
ACKNOWLEDGEMENT OF MCU NUMBER
CONFIRMATION OF PORT NUMBER
COMMUNICATION OF NEW ACT RELATIONSHIPS
NEW ACT CONNECTED
LEAVING CONFERENCE
REQUEST XXX
REQUEST XXX ACKNOWLEDGE OK
REQUEST XXX ACKNOWLEDGE NOT OK
CONNECT XXX TO DATA CHANNEL
XXX CONNECTED TO DATA CHANNEL
XXX MEETING AID HANDSHAKE
DISCONNECT XXX FROM DATA CHANNEL
XXX DISCONNECTED FROM DATA CHANNEL

NOTE: XXX refers to a specific meeting aid, e.g. FAX, SPTV, DATA terminal.

B.5 Coding of messages (layer 6)

An explanation of the method of layer 6 coding is given in Clause B.10. A full coding of the required messages is given in Clause B.8.

B.6 Message sequence charts

Message sequence charts are taken from the facility descriptionslisted in Clause B.3 and reproduced in Clause B.9.

B.7 Layer 7 facilities

Clause B.7: Layer 7 facilities

Clause B.8.: Message definitions

Clause B.9.: Message sequence charts

Clause B.10.: Message structure layers 1-6

B.7.1 System facilities

This Clause describes the system facilities in the format proposed in this annex. As a convention within this Clause, the messages used to perform the facility are written in block capitals.

In the following subclauses the system facilities have been arranged into the two main phases of the audioconferencing process, namely conference set-up and clear-down, and the conference session.

If for some reason, when a facility is used, the return messages are not received, then after a time out period of 5 seconds (default value) a local indication of failure of the facility should be given.

B.7.2 Definitions

The following terminology is used to describe the activity of individual microphones:

Enabled microphones: those microphones which have been granted the floor. In non-conducted mode, all microphones are enabled. In conducted mode, the conductor's microphone is always enabled.

Open (or Active) microphones: those enabled microphones whose talkers are actually speaking. In conducted mode, the conductor's microphone is normally closed unless the conductor is actually speaking.

B.7.3 Set-up facilities

Facility 1: set-up of message channel

Concept

When the ACT is switched on and initially connected, either to another ACT or to a MCU, it is necessary for the message channel to be correctly initialised. This shall be done automatically as detailed below.

ACT action

The set-up of the message channel (layers 1-3) is defined in Clause B.10.

For point-to-point use, port numbers shall not be applicable. However, for consistency, the ACT address of zero shall be used at both ends.

MCU action

Once the message channel has been set up on a link by link basis at layer 3, then in multipoint use, confirmation of the port numbers can begin (see facility 3: set-up of ACT).

Facility 2: reservation of the MCU

Concept

Eventually the message channel may be used for reservation of the MCU. In the initial stages, reservation shall be performed by manual action at the MCU.

Facility 3: set-up of ACT

Concept

When the ACT is switched on and initially connected, a number of initialisation activities are necessary. The name of the ACT, the names of the participants and microphone numbers shall be input locally via the Control and Indications Unit.

Following this action and during the message channel set-up, as in facility 1, the ACT shall be allocated a port number by the MCU. For confirmation purposes, this port number information shall then be transmitted to the ACT in a layer 7 message.

All the ACT status information shall be sent to the already connected ACTs, and this ACT shall receive the status of the other ACTs.

ACT action

When the ACT has initialised it shall expect a CONFIRMATION OF PORT NUMBER message from the MCU. If no message is received, it shall assume a point-to-point operation and assume Port Number 00. On receipt of the CONFIRMATION OF PORT NUMBER messages the ACT responds with COMMUNICATION OF NEW ACT RELATIONSHIPS. It expects, in reply from the other ACTs, a COMMUNICATION OF ACT RELATIONSHIPS message. To end the sequence after a manual action by a participant at the new ACT, the ACT sends the NEW ACT CONNECTED message to show that the new ACT has now joined the conference. From that instant the new ACT shall become part of the conference.

The status of a particular ACT may change after the above facility has been used. Information concerning changes of participants shall be signalled by means of the changed ACT broadcasting an updated COMMUNICATION OF ACT RELATIONSHIPS message.

MCU action

Following initialisation, when the MCU detects the presence of an ACT connected to a particular port it shall send the CONFIRMATION OF PORT NUMBER message to the ACT. Contained within the information field shall be the Port Number of the ACT. This number is obtained from the physical configuration of the MCU. The ACT should acknowledge this message by returning COMMUNICATION OF NEW ACT RELATIONSHIPS to the MCU. The MCU shall broadcast this message to all other ACTs for their information. Thus each receiving ACT will now has a knowledge of the new ACT. Each existing ACT shall respond with a COMMUNICATION OF ACT RELATIONSHIPS message destined for the new ACT.

Thus all ACTs are now aware of the present configurations of all other ACTs.

The ACT should then send under manual control, the NEW ACT CONNECTED message broadcast to all other ACTs for status information.

Details of messages needed:

CONFIRMATION OF PORT NUMBER
COMMUNICATION OF NEW ACT RELATIONSHIPS
COMMUNICATION OF ACT RELATIONSHIPS
NEW ACT CONNECTED

Facility 4: allocation of MCU numbers

Concept

For a set up of a multipoint conference involving more than one MCU, it is necessary to allocate a number to each MCU for message routeing purposes. Initially this allocation of numbers could be done manually during reservation, but eventually an automatic procedure is to be devised. Information concerning MCU numbers may be transferred using the COMMUNICATION OF MCU NUMBER message.

NOTE: For certain applications, for example half-conducted mode, it is necessary for one MCU to become the master. This should be taken into account by the numbering scheme.

Details of messages needed:

COMMUNICATION OF MCU NUMBER
ACKNOWLEDGEMENT OF MCU NUMBER

Facility 5: transmission of status information to operator's console

Concept

The purpose of the operator's console is to enable the correct setting up of the MCU and the conference.

The exact method of implementation depends on national requirements.

It would be possible to make use of facility 10. For example, all messages which concern conference status and which flow through the MCU could also be routed to the operator's console.

Facility 6: termination of conference session (clearing down)

Concept

Experience of audioconference has shown that an orderly method of ending the conference session is desirable. An ACT wishing to leave the conference would send a LEAVING CONFERENCE message which would result in his own ACT being disabled and suitable information broadcast to all other ACTs.

This facility could apply equally to just one ACT leaving the conference, or the final termination by all ACTs.

ACT action

Having sent the LEAVING CONFERENCE message, the ACT would be disabled from sending any further information or speech. The receiving part of the ACT would also be muted to avoid disturbing noises during call release. Following transmission of this message, the ACT's 64 kbit/s connection can be terminated.

MCU action

When the MCU receives a LEAVING CONFERENCE message, it broadcasts this message to all other ACTs. At the same time it could disable the port to which the leaving ACT is connected.

Details of message needed:

LEAVING CONFERENCE

B.7.4 Conference session facilities

Facility 7: indication of loss of conductor's ACT

Concept

When in a conducted mode conference, permission to speak is granted by the conductor. If the conductor's ACT is disconnected from the conference then the system assumes the non-conducted mode.

ACT action

This facility is not applicable in point-to-point working since, in a conducted point-to-point conference, a loss of connection results in a total loss of communication with the distant ACT.

Each ACT should receive a CONDUCTOR'S ACT LOST message from the MCU in multipoint operation and should switch into non-conducted mode.

For the conductor's ACT, this is disconnected from the conference and should give a local indication to this effect.

MCU action

When the MCU detects the loss of the conductor's ACT, then it shall send a CONDUCTOR'S ACT LOST message to all remaining ACTs. The MCU shall keep a local knowledge of the fact that the conference is now non-conducted.

Details of message needed:

CONDUCTOR'S ACT LOST

Facility 8: indication of loss of participant's act

Concept

This facility is not applicable to point-to-point operation. In multipoint, the message PARTICIPANT'S ACT LOST message should be received. This shall be used solely for the information of the participants.

ACT action

This facility is not applicable in point-to-point working since disconnection of the other ACT results in a failure of the message channel.

In multipoint operation each ACT should receive a PARTICIPANT'S ACT LOST message from the MCU.

MCU action

When the MCU detects the loss of the participant's ACT, it shall send a PARTICIPANT'S ACT LOST message to all remaining ACTs. The MCU shall keep a local knowledge of the fact that the participant has been lost.

Details of message needed:

PARTICIPANT'S ACT LOST

Facility 9: indication of loss of inter-mcu connection

Concept

In the situation where two MCUs are connected together in the conference configuration it is important that participants be aware of any loss of this interconnection since this leads to the possibility of two separate conferences being formed.

ACT function

This facility is not appropriate to point-to-point working. In multipoint operation, the ACTs connected to each MCU shall receive the INTER-MCU CONNECTION LOST message. This shall result the conference reverting to the non-conducted mode.

For the conductor's ACT this has the effect of him relinquishing conductorship.

If the inter-MCU connection is restored, the MCU should broadcast the INTER-MCU CONNECTION RESTORED message. A procedure is then needed to appraise each "half" of the conference of the status of the other "half". Thus a COMMUNICATION OF ACT RELATIONSHIPS message shall be broadcast by each ACT to the other ACTs. If conducted mode is required this shall be established again in the usual way.

MCU function

When the MCU detects the loss of its interconnection to another MCU, it shall send the message INTER-MCU CONNECTION LOST to all ACTs.

If the inter-MCU connection is re-established then an INTER-MCU CONNECTION RESTORED message shall be sent to each ACT. Optionally, an automatic procedure could be used for checking the restored MCU link.

Details of messages needed:

INTER-MCU CONNECTION LOST
INTER-MCU CONNECTION RESTORED
COMMUNICATION OF ACT RELATIONSHIPS

Facility 10: request for update of conference status

Concept

For the better use and control of the audioconference it is convenient for each ACT to be able to obtain the present status of the conference. Status indications can be of varying importance and complexity.

Initially, the following status indications are needed.

a) Which ACTs are connected?
b) What are the participant's names and microphone numbers?
c) What is the conference mode?
d) If conducted - who is the conductor?
e) What facilities are available at each ACT?

Most of the information in a), b), c) and d) shall be transferred between ACTs using facility 3 at the start of the conference. However, there may be occasions where further confirmation of status is required during the conference session.

ACT function

For a), b) c) and d) the message REQUEST FOR ACT RELATIONSHIPS is sent. ACT replies with the message COMMUNICATION OF ACT RELATIONSHIPS.

For e) the requesting ACT sends the REQUEST FOR ACT PARAMETERS message. The receiving ACT responds with the COMMUNICATION OF ACT PARAMETERS message, the facilities available being described in the information field.

MCU function

The procedure at the MCU for all the above status enquiries are similar. The MCU shall broadcast the request message to all other ACTs. It shall then receive the responses and send them back to the requesting ACT. No further action is necessary.

Details of messages needed:

REQUEST FOR ACT RELATIONSHIPS
COMMUNICATION OF ACT RELATIONSHIPS
REQUEST FOR ACT PARAMETERS
COMMUNICATION OF ACT PARAMETERS

Facility 11: present speaker identification

Concept

Voice detectors connected to each microphone shall be used at each ACT to establish who is the active speaker. When a participant speaks then after a suitable delay, a SPEAKER IDENTIFICATION message shall be sent. This shall be displayed at all receiving ACTs. When a participant ends his speech then, after a suitable delay, an END OF SPEAKER IDENTIFICATION message shall be sent. This shall be used to remove the previously displayed speaker identification indication at all receiving ACTs.

ACT function

The ACT shall generate the SPEAKER IDENTIFICATION or END OF SPEAKER IDENTIFICATION message as above. The name of the speaker shall be given in the information field of the message.

On reception, the ACT shall display this information.

In conducted mode the SPEAKER IDENTIFICATION and END OF SPEAKER IDENTIFICATION message shall still be needed, since more than one microphone can be enabled at any time.

MCU function

The MCU shall broadcast any SPEAKER IDENTIFICATION or END OF SPEAKER IDENTIFICATION message which it receives. No other action shall be taken.

Details of messages needed:

SPEAKER IDENTIFICATION
END OF SPEAKER IDENTIFICATION

Facility 12: signalling of conductorship

Concept

All conferences shall start in non-conducted mode. By a mutual agreement one ACT may become the conductor. Once a conductor's ACT has been chosen, no other ACT may be conductor until the present conductor has relinquished control.

ACT function

During a non-conducted conference, the requesting ACT shall send the REQUEST FOR CONDUCTORSHIP message to all other ACTs. Each ACT shall automatically respond with the REQUEST FOR CONDUCTORSHIP ACKNOWLEDGE OK. The requesting ACT may then become the conductor. The message sequence for selection of conference mode shall then commence (see facility 14).

If the conference is already conducted, then the REQUEST FOR CONDUCTORSHIP ACKNOWLEDGE NOT OK message shall be automatically returned from the conductor's ACT and the sequence shall end. Local displays shall be given of the request and its outcome. It would be possible to provide this facility without the need for acknowledgement messages. However, to avoid contention and to be consistent with other facilities they have been included.

MCU function

The MCU shall broadcast the REQUEST FOR CONDUCTORSHIP messages to all ACTs. It shall also send back to the requesting ACT the REQUEST FOR CONDUCTORSHIP ACKNOWLEDGE OK/NOT OK.

Details of messages needed:

REQUEST FOR CONDUCTORSHIP
REQUEST FOR CONDUCTORSHIP ACKNOWLEDGE OK
REQUEST FOR CONDUCTORSHIP ACKNOWLEDGE NOT OK

Facility 13: relinquishing of conductorship

Concept

When a conductor has already been chosen, then before conductorship can be transferred to a new participant it is necessary to relinquish conductorship. Once this has been done, then a new conductor can be chosen.

ACT function

On the request of the conductor the CONDUCTORSHIP RELINQUISHED message is sent from the conductor's ACT. When this is received by other ACTs, the conference becomes non-conducted.

The choice of a new conductor can then be signalled using the signalling of conductorship facility.

MCU function

The MCU shall broadcast the CONDUCTORSHIP RELINQUISHED message to all other ACTs. The conference shall become non-conducted.

Details of messages needed:

CONDUCTORSHIP RELINQUISHED

Facility 14: selection of conference mode

Concept

Only the conductor can change the conference mode. Following the choice of a conductor as in the facility 13 above, the conducted mode shall be chosen.

ACT function

When the conductor's ACT has received the REQUEST FOR CONDUCTORSHIP ACKNOWLEDGE OK from all connected ACTs, then it shall broadcast the message SELECT CONDUCTED MODE. It shall then assume the status of a conductor's ACT. Each ACT on reception of this message shall store the information locally and send silence from its audio coder.

Only the conductor's ACT is permitted to issue the SELECT CONDUCTED MODE message. By software control within the ACT, each ACT which is not a conductor shall not be permitted to send any SELECT XXX MODE message. As a further security check against false signalling of such messages, each receiving ACT should check that the source of such messages is the conductor's ACT.

If it is subsequently desired to go to non-conducted mode then the conductor's ACT may issue the SELECT NON-CONDUCTED MODE message.

MCU function

The MCU shall receive the SELECT CONDUCTED MODE message which inherently indicates that it has been sent from a conductor's ACT and broadcast this to all other ACTs.

For the SELECT NON-CONDUCTED MODE message, again this shall be broadcast to all other ACTs.

Similar procedures may be used to select half conducted mode using the SELECT HALF-CONDUCTED MODE message.

Details of messages needed:

SELECT CONDUCTED MODE
SELECT NON-CONDUCTED MODE
SELECT HALF-CONDUCTED MODE

Facility 15: control of speaker's microphones

Concept

In conducted mode the normal method of speech control is by participants using the "Request to reserve the Floor" (facility 16) under the overall control of the conductor. There may be occasions where the conductor wishes to enable a particular ACT for speech without the need for the participant to make a specific request. Under these circumstances, this facility is provided to enable the conductor to directly control the audio coming from a particular ACT. Following the enabling of any microphone, the conductor shall also be able to disable that microphone as required.

ACT function

To enable a speaker's microphone, the conductor's ACT shall issue a FLOOR GRANTED message. This shall be broadcast to all ACTs for information but shall only enable audio at the specific ACT and microphone whose address appears in the information field.

To disable a speaker's microphone, the conductor's ACT shall issue a FLOOR GRANTING CANCELLED message with the participant's ACT and microphone number within its information field.

MCU function

The MCU shall broadcast the FLOOR GRANTED and FLOOR GRANTING CANCELLED message to all ACTs.

Details of messages needed:

FLOOR GRANTED
FLOOR GRANTING CANCELLED

Facility 16: request to reserve the floor

Concept

In any mode of conference every participant shall be able to issue a request to reserve the floor. This facility is intended to draw the attention of participants to the fact that one participant at his corresponding ACT, wishes to make a contribution to the conference. In half-conducted and conducted mode, this facility shall be used in order to speak in the conference.

- Non-conducted mode

In the case of a non-conducted conference, this facility shall be used solely for the information and guidance of participants. A participant can issue a FLOOR REQUEST and this shall be shown as a message at each ACT giving details of the requester. When the participant has finished speaking it shall be his responsibility to cancel the request by sending a CANCEL FLOOR REQUEST, or alternatively this may be cancelled by any subsequent FLOOR REQUEST from other participants.

Since all ACTs shall display the same names, the participant is obliged only to send the message CANCEL FLOOR REQUEST if his name is still on the display at the moment when he finishes his speech.

- Half-conducted mode

In the case of half-conducted mode, the participant can join the conversation under the control of the MCU.

In operation the participant generates a FLOOR REQUEST and receives back either a FLOOR REQUEST GRANTED or a FLOOR REQUEST REFUSED.

If a FLOOR REQUEST REFUSED indication is received then this means that there are presently the maximum number of concurrent speakers. Under these circumstances, a message is sent to the present speakers to tell them that another party wishes to speak. In this case it is up to a present speaker to relinquish the floor by sending a CANCEL FLOOR REQUEST message.

- Conducted mode

In the case of a conducted conference, the participant shall have to wait until his request is granted by the conductor before his voice can be heard. This is achieved by the conductor issuing a FLOOR REQUEST GRANTED message.

The control and indications unit shall provide this human interface.

ACT action

Resulting from an action of the participant, a FLOOR REQUEST message is sent to the other ACT. In a non-conducted conference, it would be usual for the other participants to acknowledge such a request by sending, also for information, either a FLOOR REQUEST GRANTED or a FLOOR REQUEST REFUSED message.

This would result in some indication at the ACT.

In half-conducted or conducted mode, a response is given either by the MCU or the conductor.

MCU function

- Non-conducted mode

When a FLOOR REQUEST message is received from an ACT then this message is broadcast to all other ACTs within the conference. This message shall contain the address of the originating participant.

If a CANCEL FLOOR REQUEST message is received from an ACT then this shall also be broadcast to all other ACTs.

If another FLOOR REQUEST message is issued by an ACT before the previous FLOOR REQUEST message has been cancelled then this again shall be broadcast by the MCU. All ACTs shall either display a list of requests or alternatively display only the last received.

- Half-conducted mode

When the MCU receives a FLOOR REQUEST message from an ACT it broadcasts the message and then checks the number of present concurrent speakers.

If the number is less than three (default value) then it returns the message FLOOR REQUEST GRANTED to both the originating ACT and the other ACTs. The effect of the FLOOR REQUEST GRANTED message upon the requesting ACT is to enable the transmission of coded audio from it to the MCU. Thus the audio from the originating ACT is mixed with that from the other concurrent speakers.

At the other ACTs, this message is used for information.

If the number of present concurrent speakers is three or more then the MCU shall return the message FLOOR REQUEST REFUSED to the originating ACT. At the same time the message FLOOR REQUEST REFUSED shall be sent to the other ACTs for information.

A current speaker may cancel their participation in the conversation by sending the message CANCEL FLOOR REQUEST. When received by the MCU this indicates that the audio from this participant has been silenced and the message CANCEL FLOOR REQUEST with an appropriate address is to be sent to the other ACTs.

- Conducted mode

When the MCU receives a FLOOR REQUEST message from an ACT it broadcasts the message to all the other ACTs. Only the conductor may decide if the request can be granted. If the request is granted then the message FLOOR REQUEST GRANTED is received from the conductor's ACT.

This message, which carries in its information field the number of the ACT and participant that has been given permission, is broadcast to all ACTs.

At the new speaker's ACT, reception of this message is used to enable the transmission of audio information from the indicated microphone.

At the ACT of the previous speaker, the reception of this message is indicated by a local indication; his microphone is still enabled.

If the conductor wishes to disable the previous speaker then the conductor shall send the FLOOR GRANTING CANCELLED message, with its information field containing the ACT and microphone number of the disabled microphone.

If for some reason the conductor does not wish to give the floor to the requester then the conductor may send from his ACT the FLOOR REQUEST REFUSED message. This shall be broadcast by the MCU to all participating ACTs. No further action is taken.

Alternatively, the conductor may wish to offer the floor at a later stage (using facility 15) in which case he would send the FLOOR REQUEST ACKNOWLEDGED message, which is intended merely as information. The MCU would take no further action in this case.

Details of messages needed:

FLOOR REQUEST
CANCEL FLOOR REQUEST
FLOOR REQUEST GRANTED
FLOOR REQUEST REFUSED
FLOOR REQUEST ACKNOWLEDGED
FLOOR GRANTED
FLOOR GRANTING CANCELLED

Facility 17: signalling of a local consultation

Concept

Participants at a particular ACT may wish to hold a local discussion without other people at other ACTs being able to hear them. At the local ACT the participant may press a button on his Control and Indications Unit to disable the microphones at his ACT. A local indication of this status is shown and each other ACT within the conference is also informed. The microphones may be restored to normal operation by a local operation. Although the command (FLOOR GRANTED) may be sent from the chairmans ACT at any time during a conducted conference, for secrecy purposes, the local consultation shall have higher priority. Under these circumstances, the microphones shall not become active until the ACT has ended the local consultation.

ACT action

When a participant uses this facility, the ACT concerned shall transmit the speech codes equivalent to silence. At the same time the message LOCAL CONSULTATION shall be transmitted for information purposes, no acknowledgement shall be expected. On reception of this message an ACT shall give a local display of this status.

When the consultation has come to an end, the ACT sends the message LOCAL CONSULTATION ENDED. In a non-conducted conference, the audio transmission from the ACT shall be enabled.

For the convenience of the participants in a non-conducted conference, a local "ON LINE" indication should be given at the ACT which has just held the local consultation.

In a multipoint half-conducted or conducted conference, the ACT shall only enable the audio transmission if a previous FLOOR REQUEST GRANTED message has been received.

Again, on reception of the LOCAL CONSULTATION ENDED message, an ACT shall give a local display of this status.

MCU action

In all modes, the MCU shall simply broadcast the LOCAL CONSULTATION and LOCAL CONSULTATION ENDED messages to the other ACTs.

Details of messages needed:

LOCAL CONSULTATION
LOCAL CONSULTATION ENDED
FLOOR GRANTED

Facility 18: transmission of meeting aid information (using 8 Kbit/s channel)

Concept

The ACT user who wishes to send some information from one meeting aid to similar meeting aids at other ACTs operates some control which indicates that he wishes to use this facility.

The exact method of indication shall be specified in the ACT documentation.

The participant then waits until he is given a suitable indication (e.g. on the screen of the control and indications unit) telling him whether his request for the facility has been granted. If it is not granted for any reason then he shall wait and request the facility again.

For simplicity, during the use of this facility all connected ACTs and MCUs shall use a common speech coding rate of 48 kbit/s, even if particular ACTs do not support the specific meeting aid.

If the facility is granted then after a further negotiation phase another indication is given indicating that the data transmission from the meeting aid has started. When the transmission has ended the system shall automatically revert to its normal state.

NOTE: It is proposed that the same message structure be used for all types of meeting aid within the 8 kbit/s data channel. In the following description the following convention is used whereby the general message REQUEST XXX is implemented in practice by the specific form REQUEST SPTV or REQUEST FACSIMILE and so on.

ACT function

Consider two ACTs - ACT 1 wishes to send from a meeting aid to ACT 2 in point-to-point connection.

ACT 1 sends the REQUEST XXX, ACT 2 responds with the message REQUEST XXX ACKNOWLEDGE OK or REQUEST XXX ACKNOWLEDGE NOT OK.

In the case of the REQUEST XXX ACKNOWLEDGE NOT OK, a reason shall be given in the information field of the message. Either no XXX meeting aid exists at ACT 2 or there has been a simultaneous request for the facility from each ACT and a situation of contention exists. In this case the message sequence shall terminate at this point.

Assuming that the REQUEST XXX ACKNOWLEDGE OK has been received at ACT1 then this ACT shall change its attributes in the Bit rate Allocation Sequence (BAS) word and open an 8 kbit/s data channel.

When this change of attributes is received at ACT 2, then this shall also change its attributes in the opposite direction. This change shall be detected at ACT 1. A two-way data path has now been established.

At ACT 1, the XXX meeting aid and its IPA is connected to the data channel and the message CONNECT XXX TO DATA CHANNEL is sent to ACT 2. On receipt ACT 2 connects its XXX meeting aid to the data channel and returns the XXX CONNECTED TO DATA CHANNEL message.

The data path is now established and both meeting aids are in a position to transfer information.

Depending on the type of meeting aid, further negotiation may be required over the Message Channel, or this be contained with the 8 kbit/s stream. The exact protocol to be used by each meeting aid shall be specified in the ACT Documentation.

For communication between the meeting aid IPAs the XXX MEETING AID HANDSHAKE message may be used. This message shall permit control information to be sent from the ACT 1 IPA to the equivalent IPA of ACT 2. In the reverse direction, this message permits control information to be returned from ACT 2 IPA to ACT 1 IPA. The information content of the message shall vary according to the IPA.

When the XXX meeting aid transmission has ended, a further message sequence is used to release the facility.

ACT 1 disconnects its XXX meeting aid and its IPA from the data channel and sends the DISCONNECT XXX FROM DATA CHANNEL message.

ACT 2 receives this message and in turn disconnected its XXX meeting aid and IPA returning the message XXX DISCONNECTED FROM DATA CHANNEL.

A further phase of exchanging attributes for the 0 kbit/s data channel occurs.

The ACTs are then ready to start a new message sequence.

MCU function

In this description ACT 1 requests the use of the XXX meeting aid. The MCU shall receive the REQUEST XXX message (source ACT 1; broadcast destination MCU and ACTs) from ACT 1.

The MCU shall take this REQUEST XXX message and broadcast it to all other ACTs.

Each receiving ACT shall respond with either the REQUEST XXX ACKNOWLEDGE OK or REQUEST ACKNOWLEDGE NOT OK.

At the MCU these response messages shall be forwarded to the requesting ACT 1; the MCU does not combine the individual messages into one composite message. ACT 1 shall wait for a suitable amount of time for all response messages to be received.

Assuming that at least one REQUEST ACKNOWLEDGE OK message has been returned to ACT 1 and no other ACT returned a REQUEST ACKNOWLEDGE NOT OK indicating contention then, as in the point-to-point case, an exchange of attributes and an allocation of the 8 kbit/s channel shall take place.

When the MCU receives the change of attributes from ACT 1 it sends a change of attributes to all connected ACTs. When all ACTs have responded with their change of attributes, then the MCU shall interconnect all the data channels in the MCU. Following this, attributes are changed in the MCU - ACT 1 direction.

When the CONNECT XXX TO DATA CHANNEL broadcast message from the requesting ACT 1 is received by the MCU, it shall send the CONNECT XXX TO DATA CHANNEL message to all ACTs irrespective of whether they have the XXX facility.

Each ACT with the named facility shall respond with the XXX CONNECTED TO DATA CHANNEL message. The MCU shall transmit these messages to ACT 1.

The transmitting meeting aid XXX shall now be connected to all the receiving XXX meeting aids.

Initialisation, transmission and acknowledgement of meeting aid information shall now be carried out. Any messages needed for this purpose will be defined in the ACT documentation. When necessary, any handshaking between the transmitting IPA and the receiving IPAs shall be carried out using the XXX MEETING AID HANDSHAKE message as detailed above. In the forward direction this shall be a broadcast message. In the reverse direction, it shall be possible to send control information selectively from any IPA back to the transmitting IPA.

When the meeting aid has completed its transmission, the data path shall be cleared. This shall follow the following sequence:

ACT 1 sends a DISCONNECT XXX FROM DATA CHANNEL message to the MCU. The MCU disconnects the data MCU and broadcasts the DISCONNECT XXX FROM THE DATA CHANNEL messages to the other ACTs. Those ACTs with the meeting aid shall in turn disconnect their XXX meeting aid and return the message XXX DISCONNECTED FROM DATA CHANNEL.

The MCU shall transmit these messages to ACT 1.

Next an exchange of attributes takes place and when this is complete the sequence shall end.

Details of messages needed:

REQUEST XXX
REQUEST XXX ACKNOWLEDGE OK
REQUEST XXX ACKNOWLEDGE NOT OK
CONNECT XXX TO DATA CHANNEL
XXX CONNECTED TO DATA CHANNEL
XXX MEETING AID HANDSHAKE
DISCONNECT XXX FROM DATA CHANNEL
XXX DISCONNECTED FROM DATA CHANNEL

Facility 19: transmission of text messages

Concept

For the enhancement of the audio conference it shall be possible to transmit textual messages either from the Control and Indications Unit (CIU) of the ACT or from the operator's console of the MCU.

A TEXT MESSAGE originated by an ACT shall be entered into the CIU unit using the keyboard or shall be alternatively selected from a simple menu. The content shall be of an informative nature, such as "Leaving the room briefly to obtain refreshment". These messages can be broadcast either to all the ACTs or to all ACTs plus MCU(s). This distinction is necessary in order to preserve, eventually, the privacy of certain messages since the operator of the MCU is not a participant of the conference.

A text message originated by the operator's console shall be used by the local operator to send information that concerns the maintenance of the conference either to other MCUs or to the ACTs plus MCUs.

ACT function

When requested, the ACT sends the TEXT MESSAGE message. The text of the participant's message shall be contained in the information field. The CIU unit shall eventually provide editing facilities for selecting the desired destination address. If a TEXT MESSAGE is received, then it shall be displayed on the screen of the CIU unit.

MCU function

The MCU shall route, according to the destination address, the TEXT MESSAGE received from an ACT or MCU. The MCU shall send the TEXT MESSAGE messages generated by its operator's console to the other MCU or ACTs.

If a received TEXT MESSAGE is addressed to its own MCU, then this message shall be displayed on the screen of the operator's console.

Details of messages needed:

TEXT MESSAGE

Facility 20: addition of an act to the conference

Concept

For convenience, it shall be possible for an ACT to join the conference after the conference session has started. Although some means of security of access shall be provided at an MCU to avoid unauthorised connection to a conference; in the demonstrator such restrictions shall be given by manual observation of the MCU.

The difference between this facility and facility 3 is that when an ACT joins a conference which has already started it shall be necessary for the ACT to establish the mode of the conference. If the conference is conducted then the ACT shall switch into the conducted mode.

ACT action

When the ACT is connected to the MCU, it shall make use of facilities 1 and 3 to set up the message channel and establish its port number. It shall also use facility 3 to establish the conference status, in particular whether the conference is conducted or not. Once the status is known the ACT shall configure itself to the conference.

MCU action

The MCU shall handle facilities 1 and 3, as previously described and keep the knowledge of the connection for possible future use in facility 8.

Details of messages needed:

AS FOR FACILITY 3

B.7.5 List of messages needed

From the above facilities, a number of messages have been identified. In addition, a method of dealing with error conditions is required. For this purpose, an ERROR message is needed and this is included in the list below. The format of this message is given in Clause B.8. The conditions under which this message is generated, and the response of the receiving ACTs and/or MCU is the responsibility of the equipment designer.

A list of the messages identified above, is given below:

ERROR
SPEAKER IDENTIFICATION
REQUEST FOR CONDUCTORSHIP
REQUEST FOR CONDUCTORSHIP ACKNOWLEDGE OK
REQUEST FOR CONDUCTORSHIP ACKNOWLEDGE NOT OK
CONDUCTORSHIP RELINQUISHED
SELECT CONDUCTED MODE
SELECT HALF-CONDUCTED MODE
SELECT NON-CONDUCTED MODE
FLOOR GRANTED
REQUEST TO RESERVE THE FLOOR
CANCEL FLOOR REQUEST
FLOOR REQUEST GRANTED
FLOOR REQUEST REFUSED
FLOOR REQUEST ACKNOWLEDGE
LOCAL CONSULTATION
LOCAL CONSULTATION ENDED
TEXT MESSAGE
REQUEST FOR ACT PARAMETERS
COMMUNICATION OF ACT PARAMETERS
REQUEST FOR ACT RELATIONSHIPS
COMMUNICATION OF ACT RELATIONSHIPS
CONDUCTOR'S ACT LOST
PARTICIPANT'S ACT LOST
INTER-MCU CONNECTION LOST
INTER-MCU CONNECTION RESTORED
END OF SPEAKER IDENTIFICATION
FLOOR GRANTING CANCELLED
COMMUNICATION OF MCU NUMBER
ACKNOWLEDGEMENT OF MCU NUMBER
CONFIRMATION OF PORT NUMBER
COMMUNICATION OF NEW ACT RELATIONSHIPS
NEW ACT CONNECTED
LEAVING CONFERENCE
REQUEST XXX
REQUEST XXX ACKNOWLEDGE OK
REQUEST XXX ACKNOWLEDGE NOT OK
CONNECT XXX TO DATA CHANNEL
XXX CONNECTED TO DATA CHANNEL
XXX MEETING AID HANDSHAKE
DISCONNECT XXX FROM DATA CHANNEL
XXX DISCONNECTED FROM DATA CHANNEL

B.8 Message definitions

Message format employing CCITT Recommendation X.209 [23] coding

Message definitions

The following pages give the message definitions for the audioconference facilities.

The following format is recommended

1 Message title.

2 Concept: what the message does and is used for, in words.

3 Function: the coding to be placed in the function field.

4 Destination of the message: where the message is destined.

5 Source of the message: where the message is generated.

6 Data: the data which is placed in the information field.

7 Formal description (according to CCITT Recommendation X.209 [23]).

8 Message coding.

NOTE: The messages are described for broadcast applications. Selective addressing can be added as required.

The definitions are written for multipoint operation; in point-to-point operation, the appropriate messages shall have 00 in the place of the MCU and ACT address numbers.

ERROR MESSAGE (ERR)

Concept:

This message is sent when an ACT receives an unexpected message or when another error occurs.

Message content:

Function code:	00
Destination:	<MCU>, <ACT>, 00
Source:	<MCU>, <ACT>, 00
Data:	<INTEGER> (Values terminal dependant)

Formal description:

MESSAGE 00 ::= [APPLICATION 00] ERR

```
ERR ::=     IMPLICIT SEQUENCE

                {
                Destination   [0] IMPLICIT Octet String
                Source        [1] IMPLICIT Octet String
                Data          [2] IMPLICIT Error_Code
                }

                Error_Code ::= (Values terminal dependant)
```

Encoding:

ERR	L	
60	0D	
Destination	L	C
80	03	<MCU> <ACT> 00
Source	L	C
81	03	<MCU> <ACT> 00
Error_Code	L	C
82	01	(Integer)

SPEAKER IDENTIFICATION (SPI)

Concept:

This message is generated automatically by an ACT whenever an active speaker is detected (criteria determined by system designer).

Message content:

Function code:	01
Destination:	FF,--,00 (Broadcast to all ACTs)
Source:	<MCU>, <ACT>, <PAR> (Participant Address)
Data:	Name of Active Speaker written in IA5 text

Formal description:

MESSAGE 01 ::= [APPLICATION 01] SPI

```
SPI ::=     IMPLICIT SEQUENCE
            {
            Destination   [0] IMPLICIT Octet String
            Source        [1] IMPLICIT Octet String
            Data          [2] IMPLICIT Speaker_Ident
            }
            Speaker_Ident ::= IA5 String
```

Encoding:

SPI	L		
61	XX + OC		
	Destination	L	C
	80	03	FF 00 00
	Source	L	C
	81	03	<MCU> <ACT> <PAR>
	Speaker_Ident	L	C
	82	XX	(Speaker Name IA5 text)

REQUEST FOR CONDUCTORSHIP (RFC)

Concept:

A participant wishing to become the conductor would generate this message from his ACT.

Message content:

Function code:	02
Destination:	FF,--,00 (Broadcast to all ACTs)
Source:	<MCU>, <ACT>, <PAR>
Data:	None

Formal description:

MESSAGE 02 ::= [APPLICATION 02] RFC

```
RFC ::=     IMPLICIT SEQUENCE
                {
                Destination   [0] IMPLICIT Octet String
                Source        [1] IMPLICIT Octet String
                }
```

Encoding:

RFC	L		
62	0A		
	Destination	L	C
	80	03	FF 00 00
	Source	L	C
	81	03	<MCU> <ACT> <PAR>

REQUEST FOR CONDUCTORSHIP ACKNOWLEDGE OK (COK)

Concept:

An ACT would automatically generate this message after receiving the REQUEST FOR CONDUCTORSHIP message if the ACT is not conductor.

Message content:

Function code: 03
Destination: <MCU>, <ACT>, 00 (ACT requesting conductorship)
Source: <MCU>, <ACT>, 00 (ACT Address)
Data: None

Formal description:

MESSAGE 03 ::= [APPLICATION 03] COK

```
COK ::=     IMPLICIT SEQUENCE
                {
                Destination   [0] IMPLICIT Octet String
                Source        [1] IMPLICIT Octet String
                }
```

Encoding:

COK	L		
63	0A		
	Destination	L	C
	80	03	<MCU> <ACT> 00
	Source	L	C
	81	03	<MCU> <ACT> 00

REQUEST FOR CONDUCTORSHIP ACKNOWLEDGE NOT OK (CNK)

Concept:

An ACT would automatically generate this message after receiving the REQUEST FOR CONDUCTORSHIP message if the ACT is conductor.

Message content:

Function code:	04
Destination:	<MCU>, <ACT>, 00 (ACT requesting conductorship)
Source:	<MCU>, <ACT>, 00 (ACT Address)
Data:	None

Formal description:

MESSAGE 04 ::= [APPLICATION 04] CNK

```
CNK ::=     IMPLICIT SEQUENCE
                {
                Destination   [0] IMPLICIT Octet String
                Source        [1] IMPLICIT Octet String
                }
```

Encoding:

CNK	L		
64	0A		
	Destination	L	C
	80	03	<MCU> <ACT> 00
	Source	L	C
	81	03	<MCU> <ACT> 00

CONDUCTORSHIP RELINQUISHED (CRE)

Concept:

In a conducted mode, when the conductor wishes to give up the conductorship he shall generate this message from his ACT. The conference shall then become non-conducted.

Message content:

Function code:	05
Destination:	FE,--,00 (Broadcast to all ACTs and MCUs)
Source:	<MCU>, <ACT>, <PAR> (Conductor's ACT)
Data:	None

Formal description:

MESSAGE 05 ::= [APPLICATION 05] CRE

```
CRE ::=     IMPLICIT SEQUENCE
                {
                Destination   [0] IMPLICIT Octet String
                Source        [1] IMPLICIT Octet String
                }
```

Encoding:

CRE	L			
65	0A			
		Destination	L	C
		80	03	FE 00 00
		Source	L	C
		81	03	<MCU> <ACT> <PAR>

SELECT CONDUCTED MODE (SCM)

Concept:

This message is only allowed from the conductor's ACT and is generated in response to the conductor. On reception it is used to set each ACT to the conducted state.

It is also used to signal the name of the conductor, following the choice of conductor in facility 12.

Message content:

Function code:	06
Destination:	FE,--,00 (Broadcast to all ACTs and MCUs)
Source:	<MCU>, <ACT>, <PAR> (conductor's ACT)
Data:	Name of conductor in IA5 text

Formal description:

MESSAGE 06 ::= [APPLICATION 06] SCM

```
SCM ::=     IMPLICIT SEQUENCE
                {
                Destination     [0] IMPLICIT Octet String
                Source          [1] IMPLICIT Octet String
                Data            [2] IMPLICIT Conductor's_Name
                }
                Conductor's_Name ::= IA5 String
```

Encoding:

SCM	L		
66	XX +0C		
	Destination	L	C
	80	03	FE OO 00
	Source	L	C
	81	03	<MCU> <ACT> <PAR>
	Conductor's_Name	L	C
	82	XX	(Name in IA5 text)

SELECT HALF CONDUCTED MODE (SHM)

Concept:

This message is only allowed from the conductor's ACT and is generated in response to the conductor. On reception it is used by the MCUs and ACTs to set up half-conducted mode.

Message content:

Function code:	07
Destination:	FE,--,00 (Broadcast to all ACTs and MCUs)
Source:	<MCU>, <ACT>, <PAR> (conductor's ACT)
Data:	None

Formal description:

MESSAGE 07 ::= [APPLICATION 07] SHM

```
SHM ::=     IMPLICIT SEQUENCE
                {
                Destination   [0] IMPLICIT Octet String
                Source        [1] IMPLICIT Octet String
                }
```

Encoding:

SHM	L		
67	0A		
	Destination	L	C
	80	03	FE 00 00
	Source	L	C
	81	03	<MCU> <ACT> <PAR>

SELECT NON CONDUCTED MODE (SNM)

Concept:

Usually, this message comes from the conductor's ACT and is generated in response to the conductor. On reception it is used by the MCUs and ACTs to set up non-conducted mode.

Message content:

Function code:	08
Destination:	FE,--,00 (Broadcast to all ACTs and MCUs)
Source:	<MCU>, <ACT>, <PAR> (conductor's ACT)
Data:	None

Formal description:

MESSAGE 08 ::= [APPLICATION 08] SNM

```
SNM ::=     IMPLICIT SEQUENCE
                {
                Destination   [0] IMPLICIT Octet String
                Source        [1] IMPLICIT Octet String
                }
```

Encoding:

SNM	L			
68	0A			
		Destination	L	C
		80	03	FE 00 00
		Source	L	C
		81	03	<MCU> <ACT> <PAR>

FLOOR GRANTED (FGR)

Concept:

This message is generated by the conductor's ACT in response to the conductor. It is used at the permitted ACT to enable the transmission of audio from that participant at the specific ACT. At other ACTs it is used for information.

Message content:

Function code:	Code for FGR
Destination:	FF,--,00 (All ACTs)
Source:	<MCU>, <ACT>, 00 (conductor's ACT)
Data:	MCU & Port Number of permitted ACT and microphone number of participant.

Formal description:

MESSAGE 09 ::= [APPLICATION 09] FGR

```
FGR ::=     IMPLICIT SEQUENCE
                {
                Destination         [0] IMPLICIT Octet String
                Source              [1] IMPLICIT Octet String
                Data                [2] IMPLICIT Floor_Granted
                }
                Floor_Granted ::= Octet String
```

Encoding:

FGR	L		
69	0F		
	Destination	L	C
	80	03	FF 00 00
	Source	L	C
	81	03	<MCU> <ACT> 00
	Floor_Granted	L	C
	82	03	<MCU> <ACT> <PAR>

FLOOR REQUEST (RFL)

Concept:

This message is used:

a) in non-conducted mode - for information that a participant wishes to have the floor;
b) in half-conducted mode - to ask the MCU for permission to speak;
c) in conducted mode - to ask the conductor for permission to speak.

It is generated in response to a participant's request.

Message content:

Function code:	10
Destination:	FF,--,00 (Broadcast to ACTs)
	FE,00,00 (ACTs plus MCUs in half-conducted mode)
Source:	<MCU>, <ACT>, <PAR> (Originating ACT)
Data:	Name of the requesting participant in IA5 text

Formal description:

MESSAGE 10 ::= [APPLICATION 10] RFL

```
RFL ::=          IMPLICIT SEQUENCE
                 {
                 Destination        [0] IMPLICIT Octet String
                 Source             [1] IMPLICIT Octet String
                 Data               [2] IMPLICIT Floor_Request
                 }
                 Floor_Request ::= IA5 String
```

Encoding:

RFL	L			
6A	XX +OC			
	Destination	L	C	
	80	03	FF 00 00	
	Source	L	C	
	81	03	<MCU> <ACT> <PAR>	
	Floor_Request	L	C	
	82	XX	(Participant's Name IA5 text)	

CANCEL FLOOR REQUEST (CFR)

Concept:

When a FLOOR REQUEST message has been generated and sent as above, the request may be cancelled as follows:

a) in non-conducted mode, the participant who originated the floor request may send this message for information;
b) in half-conducted mode, this message may be generated by one of the present speakers in order to relinquish the floor;
c) in conducted mode, the participant who originated the floor request may send this message in order to delete his earlier request.

Message content:

Function code:	11
Destination:	FF,--,00 (Broadcast to all ACTs)
	FE,00,00 (ACTs and MCUs in half-conducted mode)
Source:	<MCU>, <ACT>, <PAR> (Cancelling ACT)
Data:	Name of cancelling participant in IA5 text

Formal description:

MESSAGE 11 ::= [APPLICATION 11] CFR

```
CFR ::=     IMPLICIT SEQUENCE
                {
                Destination         [1] IMPLICIT Octet String
                Source              [2] IMPLICIT Octet String
                Data                [3] IMPLICIT Cancel_Floor_Request
                }
                Cancel_Floor_Request ::= IA5 String
```

Encoding:

CFR	L		
6B	XX + 0C		
	Destination	L	C
	80	03	FF 00 00
	Source	L	C
	81	03	<MCU> <ACT> <PAR>
	Cancel_Floor_Request	L	C
	82	XX	(Participant's name in IA5 text)

FLOOR REQUEST GRANTED (FLG)

Concept:

This message is used only in half-conducted or conducted mode. In half-conducted mode, it is generated by an MCU automatically. In conducted mode, it is generated in response to the action of the conductor at his ACT.

In both cases, it shall enable the audio transmission from the requesting participant at the specific ACT.

At other ACTs it is used for information.

Message content:

Function code:	12
Destination:	FF,--,00 (Broadcast to all ACTs)
Source:	<MCU>, <ACT>, <PAR> (Conductor's ACT) <MCU>, 00, 00 (or the MCU in half-conducted mode)
Data:	One octet for MCU number of granted ACT followed by one octet for ACT number followed by 1 octet for participant number.

Formal description:

MESSAGE 12 ::= [APPLICATION 12] FLG

```
FLG ::=     IMPLICIT SEQUENCE
                {
                Destination   [0] IMPLICIT Octet String
                Source        [1] IMPLICIT Octet String
                Data          [3] IMPLICIT Floor_Request_Granted
                }
                Floor_Request_Granted ::= Octet String
```

Encoding:

FLG	L			
6C	0F			
		Destination	L	C
		80	03	FF 00 00
		Source	L	C
		81	03	<MCU> <ACT> <PAR>
		Floor_Request_Granted	L	C
		82	03	<MCU> <ACT> <PAR>

FLOOR REQUEST REFUSED (FRR)

Concept:

This message is used only in half-conducted or conducted mode. In half conducted mode, it is generated by an MCU automatically. In conducted mode, it is generated in response to the action of the conductor at his ACT.

In both cases, the receiving ACT shall take no action other than removing any "floor request" indications.

Message content:

Function code:	13
Destination:	FF,--,00 (Broadcast to all ACTs)
Source:	<MCU>, <ACT>, <PAR> (conductor's ACT) <MCU>, 00, 00 (or the MCU in half-conducted mode)
Data:	One octet for MCU Number of refused ACT followed by one octet for ACT number followed by one octet for participant number.

Formal description:

MESSAGE 13 ::= [APPLICATION 13] FRR

```
FRR ::=     IMPLICIT SEQUENCE
                {
                Destination             [1] IMPLICIT Octet String
                Source                  [2] IMPLICIT Octet String
                Data                    [3] IMPLICIT Floor_Request_Refused
                }
                Floor_Request_Refused ::= Octet String
```

Encoding:

FRR	L			
6D	0F			
		Destination	L	C
		80	03	FF 00 00
		Source	L	C
		81	03	<MCU> <ACT> <PAR>
		Floor_Request_Refused	L	C
		82	03	<MCU> <ACT> <PAR>

FLOOR REQUEST ACKNOWLEDGED (FRA)

Concept:

This message is generated by the conductor's ACT in response to the conductor after the reception of a FLOOR REQUEST message.

At the receiving ACT no action is taken other than removing any "floor request" indications.

Message content:

Function code:	14
Destination:	FF,--,00 (All ACTs)
Source:	<MCU>, <ACT>, <PAR> (conductor's ACT)
Data:	One octet for MCU number of acknowledged ACT followed by one octet for ACT number followed by participant number.

Formal description:

MESSAGE 14 ::= [APPLICATION 14] FRA

```
FRA ::=     IMPLICIT SEQUENCE
                {
                Destination   [0] IMPLICIT Octet String
                Source        [1] IMPLICIT Octet String
                Data          [2] IMPLICIT Floor_Request_Ack
                }
                Floor_Request_Ack ::= Octet String
```

Encoding:

FRA	L			
6E	0F			
		Destination	L	C
		80	03	FF 00 00
		Source	L	C
		81	03	<MCU> <ACT> <PAR>
		Floor_Request_Ack	L	C
		82	03	<MCU> <ACT> <PAR>

LOCAL CONSULTATION (LOC)

Concept:

This message is generated following an action by a participant at an ACT. It is used for information at a receiving ACT and indicates that the originating ACT is unable to transmit audio.

Message content:

Function code:	15
Destination:	FF,--,00 (All ACTs)
Source:	<MCU>, <ACT>, 00 (Originating ACT)
Data:	Name of originating ACT in IA5 text

Formal description:

MESSAGE 15 ::= [APPLICATION 15] LOC

```
LOC ::=     IMPLICIT SEQUENCE
                {
                Destination   [0] IMPLICIT Octet String
                Source        [1] IMPLICIT Octet String
                Data          [2] IMPLICIT Local_Consultation
                }
                Local_Consultation ::= IA5 String
```

Encoding:

LOC	L		
6F	XX + OC		
	Destination	L	C
	80	03	FF 00 00
	Source	L	C
	81	03	<MCU> <ACT> 00
	Local_Consultation	L	C
	82	XX	(ACT name in IA5 text)

LOCAL CONSULTATION ENDED (LCE)

Concept:

This message is generated following an action by a participant at an ACT. It is used for information at a receiving ACT and indicates in non-conducted mode that the originating ACT is able to transmit audio.

Message content:

Function code:	16
Destination:	FF,--,00 (All ACTs)
Source:	<MCU>, <ACT>, 00 (Originating ACT)
Data:	Name of originating ACT in IA5 text.

Formal description:

MESSAGE 16 ::= [APPLICATION 16] LCE

```
LCE ::=          IMPLICIT SEQUENCE
                 {
                 Destination        [0] IMPLICIT Octet String
                 Source             [1] IMPLICIT Octet String
                 Data               [2] IMPLICIT Consultation_Ended
                 }
                 Consultation_Ended ::= IA5 String
```

Encoding:

LCE	L			
70	XX + OC			
		Destination	L	C
		80	03	FF 00 00
		Source	L	C
		81	03	<MCU> <ACT> 00
		Consultation_Ended	L	C
		82	XX	(ACT name in IA5 text)

TEXT MESSAGE (MES)

Concept:

This message is used to transmit information intended to be read as text either by the participants or by the MCU operators. Messages generated by participants shall be broadcast either to all ACTs or to ACTs plus MCUs. Messages generated by operators shall be broadcast either to all MCUs or to MCUs and ACTs.

Message content:

Function code:	17
Destination:	FF,--,00 (Broadcast to all ACTs)
	FE,--,00 (Broadcast to ACTs plus MCUs)
	FD,--,00 (Broadcast to MCUs)
Source:	<MCU>, <ACT>, <PAR> Generated by a participant
	<MCU>, 00, 00 Generated by an operator IA5 text data

Formal description:

Message 17 ::= [APPLICATION 17] MES

```
MES ::=     IMPLICIT SEQUENCE
                {
                Destination   [0] IMPLICIT Octet String
                Source        [1] IMPLICIT Octet String
                Data          [2] IMPLICIT Text_Message
                }
                Text_Message ::= IA5 String
```

Encoding:

MES	L			
71	XX + OC			
		Destination	L	C
		80	03	FF 00 00
		Source	L	C
		81	03	<MCU> <ACT> <PAR>
		Text_Message	L	C
		82	XX	(Message in IA5 text)

REQUEST FOR ACT PARAMETERS (RAP)

Concept:

This message is sent by an ACT wishing to obtain the present status of the conference (parameters defining the facilities available at each ACT). The message is broadcast to all ACTs: these shall respond with the Communication of Act Parameters (CAP) message.

Message content:

Function code:	18
Destination:	FF,--,00
Source:	<MCU>, <ACT>, 00
Data:	None

Formal description:

MESSAGE 18 ::= [APPLICATION 18] RAP

```
RAP ::=     IMPLICIT SEQUENCE
                {
                Destination   [0] IMPLICIT Octet String
                Source        [1] IMPLICIT Octet String
                }
```

Encoding:

RAP	L			
72	0A			
		Destination	L	C
		80	03	FF 00 00
		Source	L	C
		81	03	<MCU> <ACT> 00

COMMUNICATION OF ACT PARAMETERS (CAP)

Concept:

This message is sent in response to the RAP message. The data field contains the identity of available meeting aids at the sending ACT (FAX, SPTV, data terminal, telewriter).

Message content:

Function code:	19	
Destination:	<MCU>, <ACT>, 00	
Source:	<MCU>, <ACT>, 00	
Data:	One octet = status of meeting aids:	1 = available 2 = unavailable

Octet coding: bit 8 = Group 3 FAX
bit 7 = SPTV
bit 6 = Data terminal
bit 5 = Telewriter
bits 4, 3, 2, 1 = 0

Formal description:

MESSAGE 19 ::= [APPLICATION 19] CAP

```
CAP ::=     IMPLICIT SEQUENCE
                {
                Destination   [0] IMPLICIT Octet String
                Source        [1] IMPLICIT Octet String
                Data          [2] IMPLICIT Act_Parameters
                }
                Act_Parameters ::= Octet string
```

Encoding:

CAP	L		
73	0D		
	Destination	L	C
	80	03	<MCU> <ACT> 00
	Source	L	C
	81	03	<MCU> <ACT> 00
	Act_Parameters	L	C
	82	01	(Octet String)

REQUEST FOR ACT RELATIONSHIP (RAR)

Concept:

This message is sent by an ACT wishing to obtain the present status of the conference (names of ACTs and their participants). The message is broadcast to all ACT's and they shall respond with the Communication of Act Relationship (CAR) message.

Message content:

Function code:	20
Destination:	FF,--,00
Source:	<MCU>, <ACT>, 00
Data:	None

Formal description:

MESSAGE 20 ::= [APPLICATION 20] RAR

```
RAR ::=     IMPLICIT SEQUENCE
                {
                Destination   [0] IMPLICIT Octet String
                Source        [1] IMPLICIT Octet String
                }
```

Encoding:

RAR	L			
74	0A			
		Destination	L	C
		80	03	FF 00 00
		Source	L	C
		81	03	<MCU> <ACT> 00

COMMUNICATION OF ACT RELATIONSHIP (CAR)

Concept:

This message is sent by an ACT in response to either a Communication of New Act Relationship (CNAR) message or to a RAR message. The message is addressed to the requesting ACT only and it provides the relationship between the sending ACTs name and logical port number; also between each participant at the ACT and his microphone number.

Additionally, in the case of reception of an Inter-MCU Connection Restored (IMCR) message, then the ACT shall broadcast this message to all connected ACTs and MCUs.

Message content:

Function code: 21
Destination: <MCU>, <ACT>, 00 (Requesting ACT) FE,00,00 (or broadcast)
Source: <MCU>, <ACT>, 00 (Sending ACT)
Data: Octet string = (bit 8 = conductor at ACT, bit 7 = conducted)
(Bit 6 = half-conducted, bit 1-5=0)
Default value zero

Integer = microphone number (extensible to six
IA5 String = participant name microphone number/
Integer = microphone number participant name
IA5 String = participant name pairings)

IA5 String = ACT Name,

Conductor's name first if bit 8 above set.

Formal description:

MESSAGE 21 ::= [APPLICATION 21] CAR

```
CAR ::=        IMPLICIT SEQUENCE
                    {
                    Destination   [0] IMPLICIT Octet String
                    Source        [1] IMPLICIT Octet String
                    Data          [2] IMPLICIT Act_Relationships
                    }
Act_Relationships ::= SET
                    {
                    Mode          [0] IMPLICIT Octet String
                    Parname_1     [1] IMPLICIT IA5 String OPTIONAL
                    Parname_2     [2] IMPLICIT IA5 String OPTIONAL
                    Parname_3     [3] IMPLICIT IA5 String OPTIONAL
                    Parname_4     [4] IMPLICIT IA5 String OPTIONAL
                    Parname_5     [5] IMPLICIT IA5 String OPTIONAL
                    Parname_6     [6] IMPLICIT IA5 String OPTIONAL
                    ACTname       [7] IMPLICIT IA5 String
                    }
```

Encoding:
Example

```
CAR   L
75    13H +XX +YY
            Destination          L      C
            80                   03     <MCU> <ACT> 00
            Source               L      C
            81                   03     <MCU> <ACT> 00
            Act_Relationships    L
            A2                   07 +   XX +YY
                                        Mode         L     C
                                        80           01    (Octet)
                                        Parname_1    L     C
                                        81           XX    (IA5 text)
                                        ACTname      L     C
                                        87           YY    (IA5 text)
```

CONDUCTORS ACT LOST (CAL)

Concept:

This message is generated by the MCU hosting the conductor's ACT when the communication between it and the conductor's ACT is interrupted. The message is broadcast to all other ACT's who shall record a change of conference mode to non-conducted mode.

Message content:

Function code:	22
Destination:	FE,--,00
Source:	<MCU>, 00, 00
Data:	2 octets - MCU Number and ACT Number.

Formal description:

MESSAGE 22 ::= [APPLICATION 22] CAL

```
CAL ::=          IMPLICIT SEQUENCE
                 {
                 Destination   [0] IMPLICIT Octet String
                 Source        [1] IMPLICIT Octet String
                 Data          [2] IMPLICIT Conductor's_Act
                 }
                 Conductor's_Act ::= Octet String
```

Encoding:

```
CAL   L
76    0E
            Destination          L      C
            80                   03     FE 00 00
            Source               L      C
            81                   03     <MCU> 00 00
            Conductor's_Act      L      C
            82                   02     <MCU> <ACT>
```

PARTICIPANTS ACT LOST (PAL)

Concept:

This message is generated when an MCU detects that it has lost communication with an ACT connected to it (not the conductor's ACT). The message is broadcast to all other ACTs who shall record the change in status of the lost ACT.

Message content:

Function code:	23
Destination:	FE,--,00
Source:	<MCU>, 00, 00
Data:	2 octets = MCU Number and ACT Number

Formal description:

MESSAGE 23 ::= [APPLICATION 23] PAL

```
PAL ::=          IMPLICIT SEQUENCE
                 {
                 Destination   [0] IMPLICIT Octet String
                 Source        [1] IMPLICIT Octet String
                 Data          [2] IMPLICIT Participant's_Act
                 }
                 Participant's_Act ::= Octet String
```

Encoding:

PAL	L			
77	0E			
		Destination	L	C
		80	03	FE 00 00
		Source	L	C
		81	03	<MCU> 00 00
		Participant's_Act	L	C
		82	02	<MCU> <ACT>

INTER-MCU CONNECTION LOST (IMCL)

Concept:

This message is generated by an MCU when it detects that it has lost communication with the other MCU in a conference. The message is sent to all ACT's on the MCU, each of which records a change of conference status to non-conducted mode (if not already in that mode).

Message content:

Function code:	24
Destination:	FC,--,00
Source:	<MCU>, 00, 00
Data:	None

Formal description:

MESSAGE 24 ::= [APPLICATION 24] IMCL

```
IMCL ::=    IMPLICIT SEQUENCE
                {
                Destination   [0] IMPLICIT Octet String
                Source        [1] IMPLICIT Octet String
                }
```

Encoding:

IMCL	L			
78	0A			
		Destination	L	C
		80	03	FC 00 00
		Source	L	C
		81	03	<MCU> 00 00

INTER-MCU CONNECTION RESTORED (IMCR)

Concept:

This message is generated by an MCU when it detects that the inter-MCU communication is restored (message is triggered either by operator action or by recipient of communication of MCU Number (CMN) or Acknowledgement of MCU Number (AMN). The message is sent to all ACTs associated with the MCU).

Message content:

Function code:	25
Destination:	FC,--,00
Source:	<MCU>, 00, 00
Data:	None

Formal description:

MESSAGE 25 ::= [APPLICATION 25] IMCR

```
IMCR ::=    IMPLICIT SEQUENCE
                {
                Destination   [0] IMPLICIT Octet String
                Source        [1] IMPLICIT Octet String
                }
```

Encoding:

IMCR	L		
79	0A		
	Destination	L	C
	80	03	FC 00 00
	Source	L	C
	81	03	<MCU> 00 00

END OF SPEAKER IDENTIFICATION (ESP)

Concept:

This message is generated automatically by an ACT whenever the termination of speech from an active speaker is detected (criteria determined by equipment designer).

Message content:

Function code:	26
Destination:	FF,--,00 (Broadcast to all ACTs)
Source:	<MCU>, <ACT>, <PAR> (Participant Address)
Data:	Name of active speaker written in IA5 text

Formal description:

```
MESSAGE 26 ::= [APPLICATION 26] ESP

ESP ::=      IMPLICIT SEQUENCE
                  {
                  Destination   [0] IMPLICIT Octet String
                  Source        [1] IMPLICIT Octet String
                  Data          [2] IMPLICIT End_of_Speaker_Ident
                  }
                  End_of_Speaker_Ident ::= IA5 String
```

Encoding:

ESP	L		
7A	XX + OC		
		Destination	L C
		80	03 FF 00 00
		Source	L C
		81	03 <MCU> <ACT> <PAR>
		End_of_Speaker_Ident	L C
		82	XX(Speaker Name IA5 text)

FLOOR GRANTING CANCELLED (FGC)

Concept:

When a FLOOR GRANTED message has been generated and sent by the conductor, the enabled microphone may subsequently be cancelled by the conductor sending the FLOOR GRANTING CANCELLED message.

Message content:

Function code:	27
Destination:	FF,--,00 (Broadcast to all ACTs)
Source:	<MCU>, <ACT>, <PAR> (CONDUCTOR'S ACT)
Data:	MCU & Port number of ACT and microphone number of participant to be cancelled

Formal description:

MESSAGE 27 ::= [APPLICATION 27] FGC

```
FGC ::=     IMPLICIT SEQUENCE
                {
                Destination   [1] IMPLICIT Octet String
                Source        [2] IMPLICIT Octet String
                Data          [3] IMPLICIT Floor_Granting_Cancelled
                }
                Floor_Granting_Cancelled ::= Octet String
```

Encoding:

FGC	L			
7B	XX + 0C			
		Destination	L	C
		80	03	FF 00 00
		Source	L	C
		81	03	<MCU> <ACT> <PAR>
		Floor_Granting_Cancelled	L	C
		82	03	<MCU> <ACT> <PAR>

COMMUNICATION OF MCU NUMBER (CMN)

Concept:

This message is used during a reserved conference in the initial establishment or re-establishment of a link between two MCU's. It is initiated by an operator, or by automatic means by one nominee of the connected MCUs and its purpose is to trigger the process of conference-(re)-establishment in the distant MCU.

Message content:

Function code:	32
Destination:	FD,--,00
Source:	<MCU>, 00, 00
Data:	None

Formal description:

MESSAGE 32 ::= [APPLICATION 32] CMN

```
CMN ::=     IMPLICIT SEQUENCE
                {
                Description   [0] IMPLICIT Octet String
                Source        [1] IMPLICIT Octet String
                }
```

Encoding:

CMN L
7F 20 0A

Destination	L	C
80	03	FD 00 00
Source	L	C
81	03	<MCU> 00 00

ACKNOWLEDGEMENT OF MCU NUMBER (AMN)

Concept:

This message is sent by an MCU in response to the CMN message from the other MCU. Its purpose is to trigger the process of conference-(re)-establishment in the recipient MCU>.

Message content:

Function code:	33
Destination:	FD,--,00
Source:	<MCU>, 00, 00
Data:	None

Formal description:

MESSAGE 33 ::= [APPLICATION 33] AMN

```
AMN ::=     IMPLICIT SEQUENCE
                {
                Destination   [0] IMPLICIT Octet String
                Source        [1] IMPLICIT Octet String
                }
```

Encoding:

AMN L
7F 21 0A

Destination	L	C
80	03	FD 00 00
Source	L	C
81	03	<MCU> 00 00

CONFIRMATION OF PORT NUMBER (CPN)

Concept:

This message is sent by the MCU following initialisation, and when it has detected an ACT connected to a particular port. The destination address field contains the port number and MCU number and provides the ACT with the confirmation of ACT identity/Port number/MCU number binding required for all future transactions.

Message content:

Function code:	34
Destination:	<MCU>, <ACT>, 00 (own MCU, own port)
Source:	<MCU>, 00, 00 (own MUC)
Data:	None

Formal description:

MESSAGE 34 ::= [APPLICATION 34] CPN

```
CPN ::=     IMPLICIT SEQUENCE
                {
                Destination   [0] IMPLICIT Octet String
                Source        [1] IMPLICIT Octet String
                }
```

Encoding:

CPN	L		
7F 22	0A		
	Destination	L	C
	80	03	<MCU> <ACT> 00
	Source	L	C
	81	03	<MCU> 00 00

COMMUNICATION OF NEW ACT RELATIONSHIP (CNAR)

Concept:

This message is sent by an ACT in response to the CPN message and is broadcast to all other ACTs and MCUs. For the sending ACT, it provides the relationships between ACT name and logical port number and between each participant at the ACT and his microphone number.

Message content:

Function code:	35		
Destination:	FE,s--,00 (Broadcast to all ACTs and MCUs)		
Source:	<MCU>, <ACT>, 00		
Data:	IA5 String = ACT Name		
	Integer = microphone number	)	(extensible to
	IA5 String = participant name	)	six microphone
	Integer = microphone number	)	number/
	A5 String = participant name	)	participant
		)	name pairing)
	ACT Name		

Formal description:

MESSAGE 35 ::= [APPLICATION 35] CNAR

```
CNAR ::=    IMPLICIT SEQUENCE
                {
                Destination   [0] IMPLICIT Octet String
                Source        [1] IMPLICIT Octet String
                Data          [2] IMPLICIT New_Act_Relationships
                }

New_Act_Relationships ::= SET
                {
                Parname_1  [1] IMPLICIT IA5 String OPTIONAL
                Parname_2  [2] IMPLICIT IA5 String OPTIONAL
                Parname_3  [3] IMPLICIT IA5 String OPTIONAL
                Parname_4  [4] IMPLICIT IA5 String OPTIONAL
                Parname_5  [5] IMPLICIT IA5 String OPTIONAL
                Parname_6  [6] IMPLICIT IA5 String OPTIONAL
                ACTname    [7] IMPLICIT IA5 String
                }
```

Encoding:
Example

```
CNAR        L
7F 23 0C +XX +YY
                    Destination              L     C
                    80                       03    FE 00
                    Source                   L     C
                    81                       03    <MCU> <ACT> 00
                    New_Act_Relationships    L
                    A2                       04          +XX +YY
                                                         Parname_1        L     C
                                                         81               XX    IA5 text)

                                                         ACTname          L
                                                         87               YY    (IA5 text)
```

NEW ACT CONNECTED (NAC)

Concept:

This message is sent by an ACT which has just completed its acquisition of current status information on the conference and is ready to participate.

Message content:

Function code: 36
Destination: FE,--,00 (Broadcast to all ACTs and MCUs)
Source: <MCU>, <ACT>, 00
Data: None

Formal description:

MESSAGE 36 ::= [APPLICATION 36] NAC

```
NAC ::=     IMPLICIT SEQUENCE
                {
                Destination   [0] IMPLICIT Octet String
                Source        [1] IMPLICIT Octet String
                }
```

Encoding:

```
NAC   L
7F 24 0A
            Destination     L     C
            80              03    FE 00 00
            Source          L     C
            81              03    <MCU> <ACT> 00
```

LEAVING CONFERENCE (LC)

Concept:

Leaving conference message is sent by an ACT wishing to leave the conference and is broadcast to all other ACTs and MCUs. It results in the record of relationships relating to the leaving ACT being deleted at all the recipient ACTs and MCUs.

Message content:

Function code:	37
Destination:	FE,--,00
Source:	<MCU>, <ACT>, 00
Data:	None

Formal description:

MESSAGE 37 ::= [APPLICATION 37] LC

```
LC ::= IMPLICIT SEQUENCE
       {
       Destination   [0] IMPLICIT Octet String
       Source        [1] IMPLICIT Octet String
       }
```

Encoding:

LC	L		
7F 25	0A		
	Destination	L	C
	80	03	FE 00 00
	Source	L	C
	81	03	<MCU> <ACT> 00

REQUEST FAX (RFAX)

Concept:

This message is sent by an ACT, one of whose users wishes to send information from a type FAX meeting aid to similar meeting aids at other ACTs. The message is broadcast by the MCU to all ACTs.

Message content:

Function code:	38
Destination:	FE,--,00
Source:	<MCU>, <ACT>, 00
Data:	None

Formal description:

Message 38 ::= [APPLICATION 38] RFAX

```
RFAX ::=    IMPLICIT SEQUENCE
                {
                Destination   [0] IMPLICIT Octet String
                Source        [1] IMPLICIT Octet String
                }
```

Encoding:

RFAX L
7F 26 0A

Destination	L	C
80	03	FE 00 00
Source	L	C
81	03	<MCU> <ACT> 00

REQUEST FAX ACKNOWLEDGE OK (RFAXAOK)

Concept:

This message is sent by an ACT who has a FAX meeting aid, in response to a RFAX message. Provided that the recipients ACT receives one message of this type, establishment of the meeting aid connection can proceed.

Message content:

Function code:	39
Destination:	<MCU>, <ACT>, 00
Source:	<MCU>, <ACT>, 00
Data:	None

Formal description:

MESSAGE 39 ::= [APPLICATION 39] RFAXAOK

```
RFAXAOK ::=     IMPLICIT SEQUENCE
                {
                Destination   [0] IMPLICIT Octet String
                Source        [1] IMPLICIT Octet String
                }
```

Encoding:

RFAXAOK	L			
7F 27	0A			
		Destination	L	C
		80	03	<MCU> <ACT> 00
		Source	L	C
		81	03	<MCU> <ACT> 00

REQUEST FAX ACKNOWLEDGE NOT OK (RFAXANOK)

Concept:

This message is sent by an ACT who does not have a fax meeting aid, or as a result of contention, in response to a RFAX message.

Message content:

Function code:	40
Destination:	<MCU>, <ACT>, 00
Source:	<MCU>, <ACT>, 00
Data:	One octet = reason for non-availability:
	01 = Not available
	02 = Contention

Formal description:

MESSAGE 40 ::= [APPLICATION 40] RFAXANOK

```
RFAXANOK ::=        IMPLICIT SEQUENCE
                    {
                    Destination   [0] IMPLICIT Octet String
                    Source        [1] IMPLICIT Octet String
                    Data          [2] IMPLICIT Reason
                    }
              Reason ::= Octet String
```

Encoding:

RFAXANOK L
7F 28 0D

Destination	L	C
80	03	<MCU> <ACT> 00
Source	L	C
81	03	<MCU> <ACT> 00
Reason	L	C
82	01	(Octet string)

CONNECT FAX TO DATA CHANNEL (CFAXDC)

Concept:

Following the establishment of two-way data paths between ACTs and MCUs for the purpose of inter-meeting aid communication, the initiating ACT sends CFAXDC to the MCU which broadcasts the CFAXDC to the ACTs. On receipt, those ACTs with FAX connect their FAX meeting aid to the channel.

Message content:

Function code:	41
Destination:	FF,--,00
Source:	<MCU>, <ACT>, 00
Data:	None

Formal description:

Message 41 ::= [APPLICATION 41] CFAXDC

```
CFAXDC ::= IMPLICIT SEQUENCE
                {
                Destination   [0] IMPLICIT Octet String
                Source        [1] IMPLICIT Octet String
                }
```

Encoding:

CFAXDC	L			
7F 29	0A			
		Destination	L	C
		80	03	FF 00 00
		Source	L	C
		81	03	<MCU> <ACT> 00

FAX CONNECTED TO DATA CHANNEL (FAXCDC)

Concept:

This message is the response to the CFAXDC message and indicates that the sending ACT has connected its FAX meeting aid to the 8 kbit/s channel.

Message content:

Function code:	42
Destination:	<MCU>, <ACT>, 00
Source:	<MCU>, <ACT>, 00
Data:	None

Formal description:

MESSAGE 42 ::= [APPLICATION 42] FAXCDC

```
FAXCDC ::= IMPLICIT SEQUENCE
                    {
                    Destination   [0] IMPLICIT Octet String
                    Source        [1] IMPLICIT Octet String
                    }
```

Encoding:

FAXCDC	L			
7F 2A	0A			
		Destination	L	C
		80	03	<MCU> <ACT> 00
		Source	L	C
		81	03	<MCU> <ACT> 00

FAX MEETING AID HANDSHAKE (FAXMAH)

Concept:

This message is sent point-to-multipoint by sending ACTs, and point-to-point by receiving ACTs.

It is used to exchange binary coded signals to CCITT Recommendation T.30 [8] between the ACT IPAs. Multiple signals may be included in a single handshake message. Each signal in the data field is prefixed with its length and immediately follows the preceding signal. A length of zero indicates that there are no more signals contained in the handshake message.

Details of how this message can be used to adapt facsimile protocols is given in Annex D.

Message content:

Function code:	43
Destination:	FF,--,00 (Broadcast to all ACTs)
Source:	<MCU>, <ACT>, 00 (ACT Address)
Data:	N bytes supplied by meeting aid/IPA (the specific values of these bytes are defined in Annex D).

Formal description:

MESSAGE 43 ::= [APPLICATION 43] FAXMAH

```
FAXMAH ::=      IMPLICIT SEQUENCE
                {
                Destination   [0] IMPLICIT Octet String
                Source        [1] IMPLICIT Octet String
                Data          [2] IMPLICIT Fax_Handshake
                }
```

Fax_Handshake ::= Octet String

Encoding:

FAXMAH	L		
7F 2B	XX + 0C		
	Destination	L	C
	80	03	FF 00 00
	Source	L	C
	81	03	<MCU> <ACT> 00
	Fax_Handshake	L	C
	82	XX	(Octet string)

DISCONNECT FAX FROM DATA CHANNEL (DFAXDC)

Concept:

This message is sent by the initiating ACT when it has completed its use of the meeting aid. The MCU, on receipt of the message, shall disconnect its internal switch paths for the meeting aids and then forwards the DFAXDC message to the ACTs.

Message content:

Function code:	44
Destination:	FE,--,00
Source:	<MCU>, <ACT>, 00
Data:	None

Formal description:

MESSAGE 44 ::= [APPLICATION 44] DFAXDC

```
DFAXDC ::=      IMPLICIT SEQUENCE
                {
                Destination   [0] IMPLICIT Octet String
                Source        [1] IMPLICIT Octet String
                }
```

Encoding:

DFAXDC	L			
7F 2C	0A			
		Destination	L	C
		80	03	FE 00 00
		Source	L	C
		81	03	<MCU> <ACT> 00

FAX DISCONNECTED FROM DATA CHANNEL (FAXDDC)

Concept:

This message is the response to the DFAXDC message and indicates that the sending ACT has disconnected its fax meeting aid from the 8 Kbit/s channel.

Message content:

Function code:	45
Destination:	<MCU>, <ACT>, 00
Source:	<MCU>, <ACT>, 00
Data:	None

Formal description:

MESSAGE 45 ::= [APPLICATION 45] FAXDDC

```
FAXDDC ::=      IMPLICIT SEQUENCE
                {
                Destination   [0] IMPLICIT Octet String
                Source        [1] IMPLICIT Octet String
                }
```

Encoding:

FAXDDC	L			
7F 2D	0A			
		Destination	L	C
		80	03	<MCU> <ACT> 00
		Source	L	C
		81	03	<MCU> <ACT> 00

REQUEST SPTV (RSPTV)

Concept:

This message is sent by an ACT, one of whose users wishes to send information from a SPTV type meeting aid to similar meeting aids at other ACTs. The message is broadcast by the MCU to all ACTs.

Message content:

Function code:	46
Destination:	FE,--,00
Source:	<MCU>, <ACT>, 00
Data:	None

Formal description:

MESSAGE 46 ::= [APPLICATION 46] RSPTV

```
RSPTV ::=       IMPLICIT SEQUENCE
                {
                Destination   [0] IMPLICIT Octet String
                Source        [1] IMPLICIT Octet String
                }
```

Encoding:

RSPTV	L		
7F 2E 0A			
	Destination	L	C
	80	03	FE 00 00
	Source	L	C
	81	03	<MCU> <ACT> 00

REQUEST SPTV ACKNOWLEDGE OK (RSPTVAOK)

Concept:

This message is sent by an ACT who has an SPTV meeting aid, in response to a RSPTV message. Provided that the recipients ACT receives one message of this type, establishment of the meeting aid connection can proceed.

Message content:

Function code:	47
Destination:	<MCU>, <ACT>, 00
Source:	<MCU>, <ACT>, 00
Data:	None

Formal description:

MESSAGE 47 ::= [APPLICATION 47] RSPTVAOK

```
RSPTVAOK ::=    IMPLICIT SEQUENCE
                {
                Destination   [0] IMPLICIT Octet String
                Source        [1] IMPLICIT Octet String
                }
```

Encoding:

RSPTVAOK	L	
7F 2F	0A	
Destination	L	C
80	03	<MCU> <ACT> 00
Source	L	C
81	03	<MCU> <ACT> 00

REQUEST SPTV ACKNOWLEDGE NOT OK (RSPTVANOK)

Concept:

This message is sent by an ACT who does not have a type SPTV meeting aid, or as a result of contention, in response to a RSPTV message.

Message content:

Function code:	48
Destination:	<MCU>, <ACT>, 00
Source:	<MCU>, <ACT>, 00
Data:	One octet = reason for non-availability:
	01 = Not available
	02 = Contention

Formal description:

MESSAGE 48 ::= [APPLICATION 48] RSPTVANOK

```
RSPTVANOK ::=   IMPLICIT SEQUENCE
                    {
                    Destination   [0] IMPLICIT Octet String
                    Source        [1] IMPLICIT Octet String
                    Data          [2] IMPLICIT Reason
                    }
                    Reason ::= Octet string
```

Encoding:

RSPTVANOK	L		
7F 30	0D		
	Destination	L	C
	80	03	<MCU> <ACT> 00
	Source	L	C
	81	03	<MCU> <ACT> 00
	Reason	L	C
	82	01	(Octet string)

CONNECT SPTV TO DATA CHANNEL (CSPTVDC)

Concept:

Following the establishment of two-way data paths between ACTs and MCUs for the purpose of inter-meeting aid communication, the initiating ACT sends CSPTVDC to the MCU which broadcasts the CSPTVDC to the ACTs. On receipt, those ACTs with SPTV connect their SPTV meeting aid to the channel.

Message content:

Function code:	49
Destination:	FF,--,00
Source:	<MCU>, <ACT>, 00
Data:	None

Formal description:

MESSAGE 49 ::= [APPLICATION 49] CSPTVDC

```
CSPTVDC ::=     IMPLICIT SEQUENCE
                {
                Destination   [0] IMPLICIT Octet String
                Source        [1] IMPLICIT Octet String
                }
```

Encoding:

CSPTVDC	L		
7F 31	0A		
	Destination	L	C
	80	03	FF 00 00
	Source	L	C
	81	03	<MCU> <ACT> 00

SPTV CONNECTED TO DATA CHANNEL (SPTVCDC)

Concept:

This message is the response to the CSPTVDC message and indicates that the sending ACT has connected its SPTV meeting aid to the 8 kbit/s channel.

Message content:

Function code:	50
Destination:	<MCU>, <ACT>, 00
Source:	<MCU>, <ACT>, 00
Data:	None

Formal description:

MESSAGE 50 ::= [APPLICATION 50] SPTVCDC

```
SPTVCDC ::=     IMPLICIT SEQUENCE
                {
                Destination   [0] IMPLICIT Octet String
                Source        [1] IMPLICIT Octet String
                }
```

Encoding:

SPTVCDC	L			
7F 32	0A			
		Destination	L	C
		80	03	<MCU> <ACT> 00
		Source	L	C
		81	03	<MCU> <ACT> 00

SPTV MEETING AID HANDSHAKE (SPTVMAH)

Concept:

This message may be sent point-to-multipoint by sending ACTs, and point-to-point by receiving ACTs.

It is used to transfer information particular to the SPTV meeting aid being used.

Message content:

Function code:	51
Destination:	FF,--,00 (Broadcast to all ACTs)
Source:	<MCU>, <ACT>, 00 (ACT Address)
Data:	N bytes supplied by meeting aid/IPA (the values attached to these bytes are defined in Annex E).

Formal Description:

MESSAGE 51 ::= [APPLICATION 51] SPTVMAH

```
SPTVMAH ::=     IMPLICIT SEQUENCE
                {
                Destination   [0] IMPLICIT Octet String
                Source        [1] IMPLICIT Octet String
                Data          [2] IMPLICIT SPTV_Handshake
                }
```

SPTV_Handshake ::= Octet String

Encoding:

SPTVMAH	L			
7F 33	XX +0C			
	Destination	L	C	
	80	03	FF 00 00	
	Source	L	C	
	81	03	<MCU> <ACT> 00	
	SPTV_Handshake	L	C	
	82	XX	(Octet string)	

DISCONNECT SPTV FROM DATA CHANNEL (DSPTVDC)

Concept:

This message is sent by the initiating ACT when it has completed its use of the meeting aid. The MCU, on receipt of the message shall disconnect its internal switch paths for the meeting aids and shall then forward the DSPTVDC message to the ACTs.

Message content:

Function code:	52
Destination:	FE,--,00
Source:	<MCU>, <ACT>, 00
Data:	None

Formal description:

MESSAGE 52 ::= [APPLICATION 52] DSPTVDC

```
DSPTVDC ::=     IMPLICIT SEQUENCE
                {
                Destination   [0] IMPLICIT Octet String
                Source        [1] IMPLICIT Octet String
                }
```

Encoding:

DSPTVDC	L			
7F 34	0A			
		Destination	L	C
		80	03	FE 00 00
		Source	L	C
		81	03	<MCU> <ACT> 00

SPTV DISCONNECTED FROM DATA CHANNEL (SPTVDDC)

Concept:

This message is the response to the DSPTVDC message and indicates that the sending ACT has disconnected its SPTV meeting aid from the 8 kbit/s channel.

Message content:

Function code:	53
Destination:	<MCU>, <ACT>, 00
Source:	<MCU>, <ACT>, 00
Data:	None

Formal description:

MESSAGE 53 ::= [APPLICATION 53] SPTVDDC

```
SPTVDDC ::=     IMPLICIT SEQUENCE
                {
                Destination   [0] IMPLICIT Octet String
                Source        [1] IMPLICIT Octet String
                }
```

Encoding:

SPTVDDC	L			
7F 35	0A			
		Destination	L	C
		80	03	<MCU> <ACT> 00
		Source	L	C
		81	03	<MCU> <ACT> 00

REQUEST DT (RDT)

Concept:

This message is sent by an ACT, one of whose users wishes to send information from a type DATA TERMINAL (DT) meeting aid to similar meeting aids at other ACTs. The message is broadcast by the MCU to all ACTs.

Message content:

Function code:	54
Destination:	FE,--,00
Source:	<MCU>, <ACT>, 00
Data:	None

Formal description:

MESSAGE 54 ::= [APPLICATION 54] RDT

```
RDT ::=     IMPLICIT SEQUENCE
                {
                Destination   [0] IMPLICIT Octet String
                Source        [1] IMPLICIT Octet String
                }
```

Encoding:

RDT L
7F 36 0A

Destination	L	C
80	03	FE 00 00
Source	L	C
81	03	<MCU> <ACT> 00

REQUEST DT ACKNOWLEDGE OK (RDTAOK)

Concept:

This message is sent by an ACT who has a DT meeting aid, in response to a RDT message. Provided that the recipients ACT receives one message of this type, establishment of the meeting aid connection can proceed.

Message content:

Function code:	55
Destination:	<MCU>, <ACT>, 00
Source:	<MCU>, <ACT>, 00
Data:	None

Formal description:

MESSAGE 55 := [APPLICATION 55] RDTAOK

```
RDTAOK ::=      IMPLICIT SEQUENCE
                {
                Destination   [0] IMPLICIT Octet String
                Source        [1] IMPLICIT Octet String
                }
```

Encoding:

RDTAOK	L			
7F 37	0A			
		Destination	L	C
		80	03	<MCU> <ACT> 00
		Source	L	C
		81	03	<MCU> <ACT> 00

REQUEST DT ACKNOWLEDGE NOT OK (RDTANOK)

Concept:

This message is sent by an ACT who does not have a type DT meeting aid, or as a result of contention, in response to a RDT message.

Message content:

Function code:	56
Destination:	<MCU>, <ACT>, 00
Source:	<MCU>, <ACT>, 00
Data:	One octet = reason for non-availability:
	01 = Not available
	02 = Contention

Formal description:

MESSAGE 56 ::= [APPLICATION 56] RDTANOK

```
RSPTVANOK ::=       IMPLICIT SEQUENCE
                    {
                    Destination   [0] IMPLICIT Octet String
                    Source        [1] IMPLICIT Octet String
                    Data          [2] IMPLICIT Reason
                    }
                    Reason ::= Octet String
```

Encoding:

RDTANOK	L			
7F 38	0D			
		Destination	L	C
		80	03	<MCU> <ACT> 00
		Source	L	C
		81	03	<MCU> <ACT> 00
		Reason	L	C
		82	01	(Octet string)

CONNECT DT TO DATA CHANNEL (CDTDC)

Concept:

Following the establishment of two-way data paths between ACTs and MCUs for the purpose of inter-meeting aid communication, the initiating ACT sends CDTDC to the MCU which broadcasts the CDTDC to the ACTs. On receipt, those ACTs with DT connect their DT meeting aid to the channel.

Message content:

Function code:	57
Destination:	FF,--,00
Source:	<MCU>, <ACT>, 00
Data:	None

Formal description:

MESSAGE 57 ::= [APPLICATION 57] CDTDC

```
CDTDC ::=       IMPLICIT SEQUENCE
                {
                Destination   [0] IMPLICIT Octet String
                Source        [1] IMPLICIT Octet String
                }
```

Encoding:

CDTDC	L		
7F 39	0A		
	Destination	L	C
	80	03	FF 00 00
	Source	L	C
	81	03	<MCU> <ACT> 00

DT CONNECTED TO DATA CHANNEL (DTCDC)

Concept:

This message is the response to the CDTDC message and indicates that the sending ACT has connected its DT meeting aid to the 8 Kbit/s channel.

Message content:

Function code:	58
Destination:	<MCU>, <ACT>, 00
Source:	<MCU>, <ACT>, 00
Data:	None

Formal description:

MESSAGE 58 ::= [APPLICATION 58] DTCDC

```
DTCDC ::=       IMPLICIT SEQUENCE
                {
                Destination   [0] IMPLICIT Octet String
                Source        [1] IMPLICIT octet String
                }
```

Encoding:

DTCDC	L		
7F 3A	0A		
	Destination	L	C
	80	03	<MCU> <ACT> 00
	Source	L	C
	81	03	<MCU> <ACT> 00

DT MEETING AID HANDSHAKE (DTMAH)

Concept:

This message may be sent point-to-multipoint by sending ACTs, and point-to-point by receiving ACTs.

It is used to transfer information particular to the meeting aid being used.

Message content:

Function code:	59
Destination:	FF,--,00 (Broadcast to all ACTs)
Source:	<MCU>, <ACT>, 00 (ACT Address)
Data:	N bytes supplied by meeting aid/IPA (the values attached to these bytes are defined in Annex G).

Formal destination:

MESSAGE 59 ::= [APPLICATION 59] DTMAH

```
DTMAH ::=       IMPLICIT SEQUENCE
                {
                Destination   [0] IMPLICIT Octet String
                Source        [1] IMPLICIT Octet String
                Data          [2] IMPLICIT Dt_Handshake
                }
```

Dt_Handshake ::= Octet String

Encoding:

DTMAH	L		
7F 3B	XX +0C		
	Destination	L	C
	80	03	FF 00 00
	Source	L	C
	81	03	<MCU> <ACT> 00
	Dt_Handshake	L	C
	82	XX	(Octet string)

DISCONNECT DT FROM DATA CHANNEL (DDTDC)

Concept:

This message is sent by the initiating ACT when it has completed its use of the meeting aid. The MCU, on receipt of the message shall disconnect its internal switch paths for the meeting aids and then forwards the DDTDC message to the ACTs.

Message content:

Function code:	60
Destination:	FE,--,00
Source:	<MCU>, <ACT>, 00
Data:	None

Formal description:

MESSAGE 60 ::= [APPLICATION 60] DDTDC

```
DDTDC ::=       IMPLICIT SEQUENCE
                {
                Destination   [0] IMPLICIT Octet String
                Source        [1] IMPLICIT Octet String
                }
```

Encoding:

DDTDC	L		
7F 3C	0A		
	Destination	L	C
	80	03	FE 00 00
	Source	L	C
	81	03	<MCU> <ACT> 00

DT DISCONNECTED FROM DATA CHANNEL (DTDDC)

Concept:

This message is the response to the DDTDC message and indicates that the sending ACT has disconnected its DT meeting aid from the 8 Kbit/s channel.

Message content:

Function code:	61
Destination:	<MCU>, <ACT>, 00
Source:	<MCU>, <ACT>, 00
Data:	None

Formal description:

MESSAGE 61 ::= [APPLICATION 61] DTDDC

```
DTDDC ::=       IMPLICIT SEQUENCE
                {
                Destination   [0] IMPLICIT Octet String
                Source        [1] IMPLICIT Octet String
                }
```

Encoding:

DTDDC	L		
7F 3D	0A		
	Destination	L	C
	80	03	<MCU> <ACT> 00
	Source	L	C
	81	03	<MCU> <ACT> 00

The following is a list of the messages specified above:

00 ERROR
01 SPEAKER IDENTIFICATION
01 REQUEST FOR CONDUCTORSHIP
03 REQUEST FOR CONDUCTORSHIP ACKNOWLEDGE OK
04 REQUEST FOR CONDUCTORSHIP ACKNOWLEDGE NOT OK
05 CONDUCTORSHIP RELINQUISHED
06 SELECT CONDUCTED MODE
07 SELECT HALF-CONDUCTED MODE
08 SELECT NON-CONDUCTED MODE
09 FLOOR GRANTED
10 REQUEST TO RESERVE THE FLOOR
11 CANCEL FLOOR REQUEST
12 FLOOR REQUEST GRANTED
13 FLOOR REQUEST REFUSED
14 FLOOR REQUEST ACKNOWLEDGE
15 LOCAL CONSULTATION
16 LOCAL CONSULTATION ENDED
17 TEXT MESSAGE
18 REQUEST FOR ACT PARAMETERS
19 COMMUNICATION OF ACT PARAMETERS
20 REQUEST FOR ACT RELATIONSHIPS
21 COMMUNICATION OF ACT RELATIONSHIPS
22 CONDUCTOR'S ACT LOST
23 PARTICIPANT'S ACT LOST
24 INTER-MCU CONNECTION LOST
25 INTER-MCU CONNECTION RESTORED
26 END OF SPEAKER IDENTIFICATION
27 FLOOR GRANTING CANCELLED
32 COMMUNICATION OF MCU NUMBER
33 ACKNOWLEDGEMENT OF MCU NUMBER
34 CONFIRMATION OF PORT NUMBER
35 COMMUNICATION OF NEW ACT RELATIONSHIPS
36 NEW ACT CONNECTED
37 LEAVING CONFERENCE
38 REQUEST FAX
39 REQUEST FAX ACKNOWLEDGE OK
40 REQUEST FAX ACKNOWLEDGE NOT OK
41 CONNECT FAX TO DATA CHANNEL
42 FAX CONNECTED TO DATA CHANNEL
43 FAX MEETING AID HANDSHAKE
44 DISCONNECT FAX FROM DATA CHANNEL
45 FAX DISCONNECTED FROM DATA CHANNEL
46 REQUEST SPTV
47 REQUEST SPTV ACKNOWLEDGE OK
48 REQUEST SPTV ACKNOWLEDGE NOT OK
49 CONNECT SPTV TO DATA CHANNEL
50 SPTV CONNECTED TO DATA CHANNEL
51 SPTV MEETING AID HANDSHAKE
52 DISCONNECT SPTV FROM DATA CHANNEL
53 SPTV DISCONNECTED FROM DATA CHANNEL
54 REQUEST DT
55 REQUEST DT ACKNOWLEDGE OK
56 REQUEST DT ACKNOWLEDGE NOT OK
57 CONNECT DT TO DATA CHANNEL
58 DT CONNECTED TO DATA CHANNEL
59 DT MEETING AID HANDSHAKE
60 DISCONNECT DT FROM DATA CHANNEL
61 DT DISCONNECTED FROM DATA CHANNEL

B.9 Message Sequence Charts

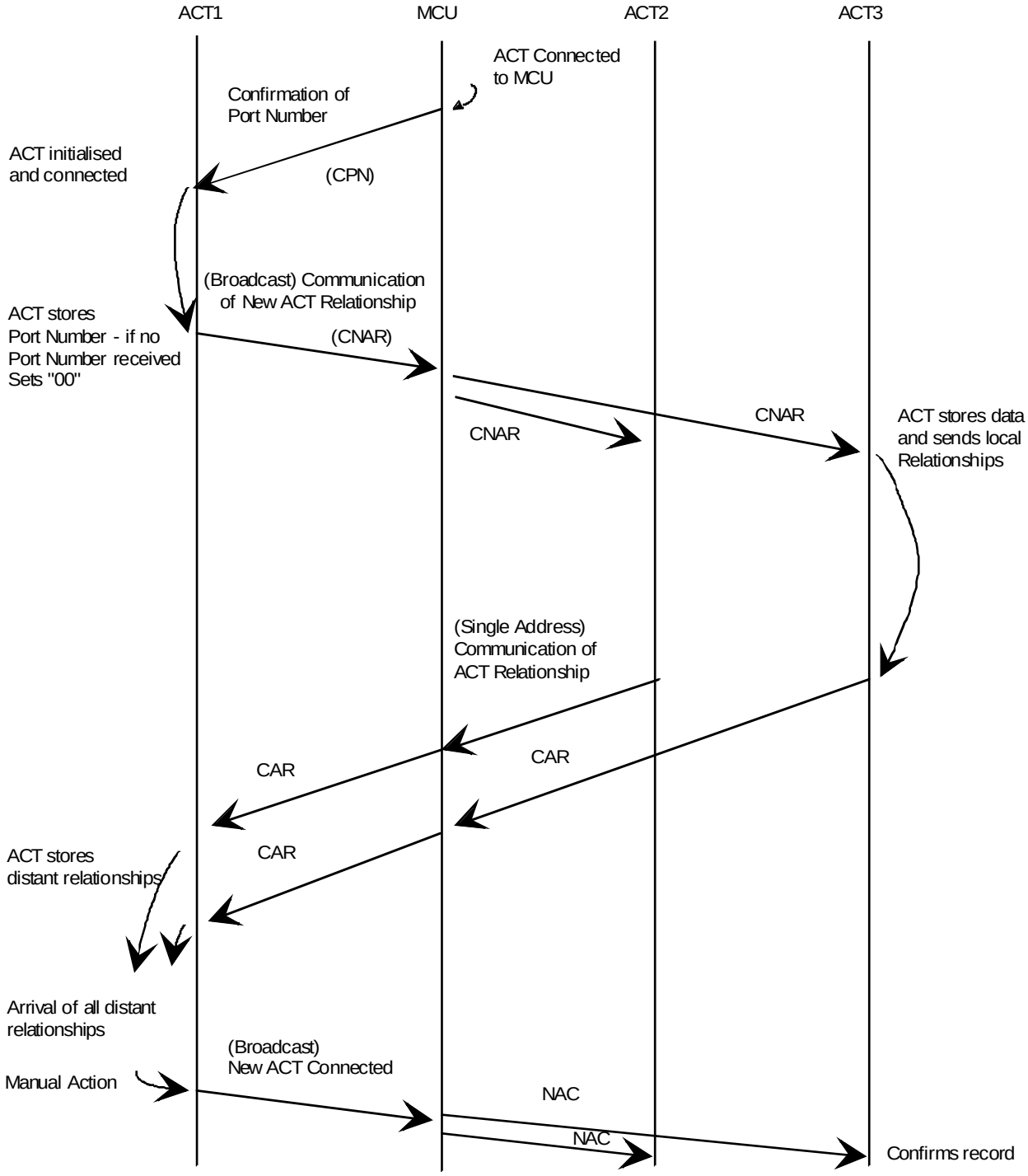


Figure B.1: Facility number 3 (facility title: Set-up of new act)

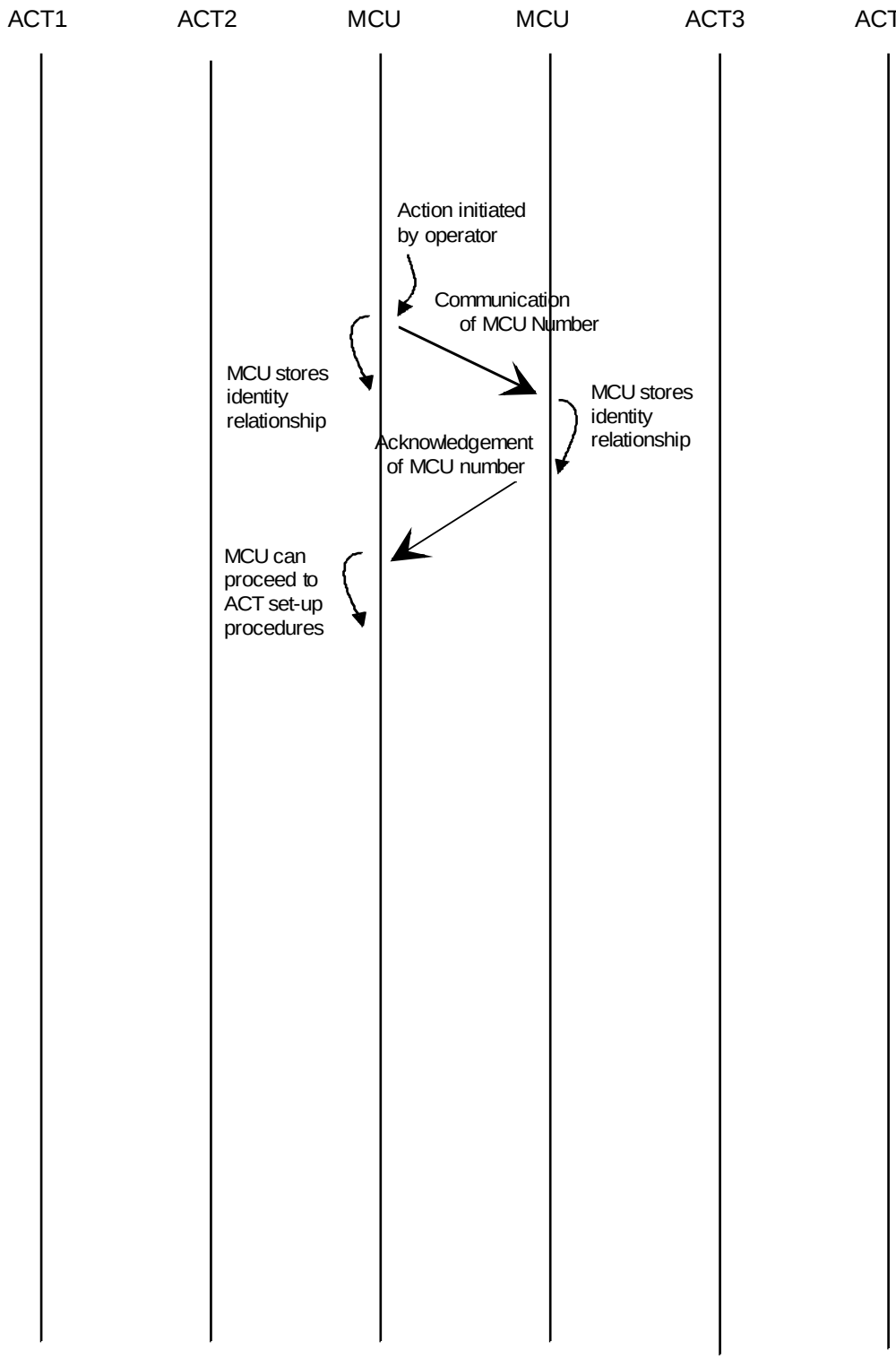


Figure B.2: Facility number 4 (facility title: Allocation of MCU numbers)

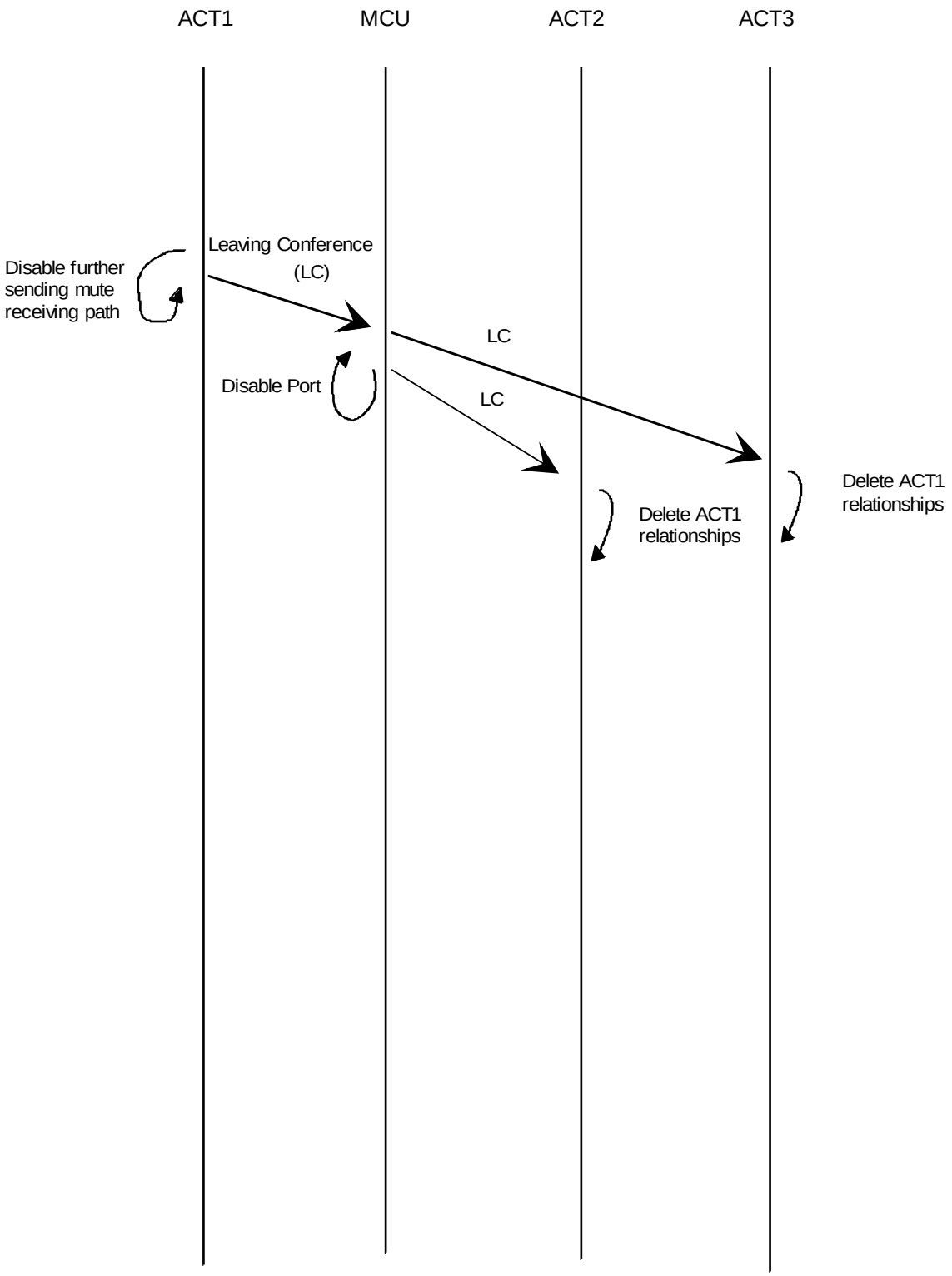


Figure B.3: Facility number 6 (facility title: Termination of conference session)

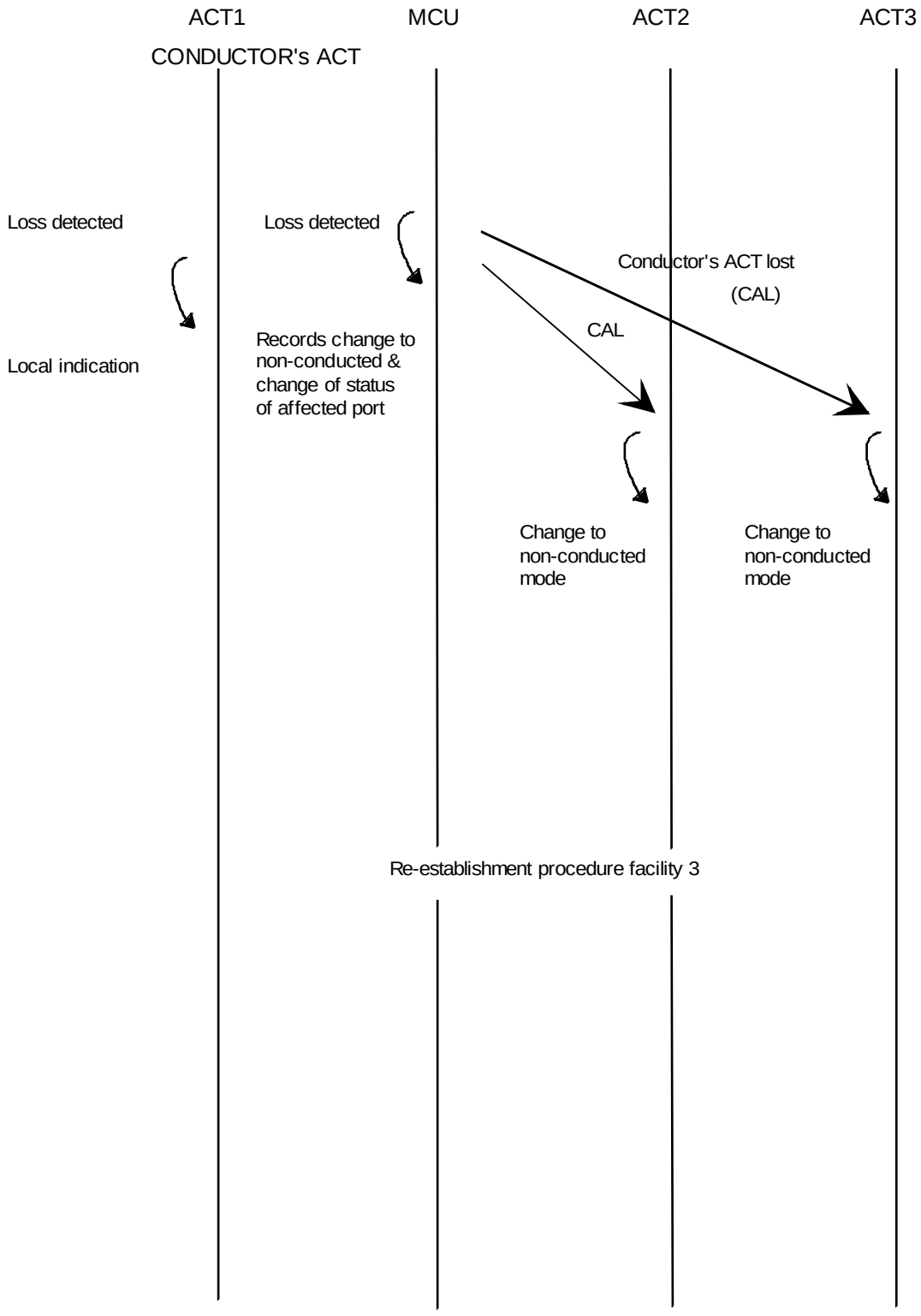


Figure B.4: Facility number 7 (facility title: Indication of loss of conductor's ACT)

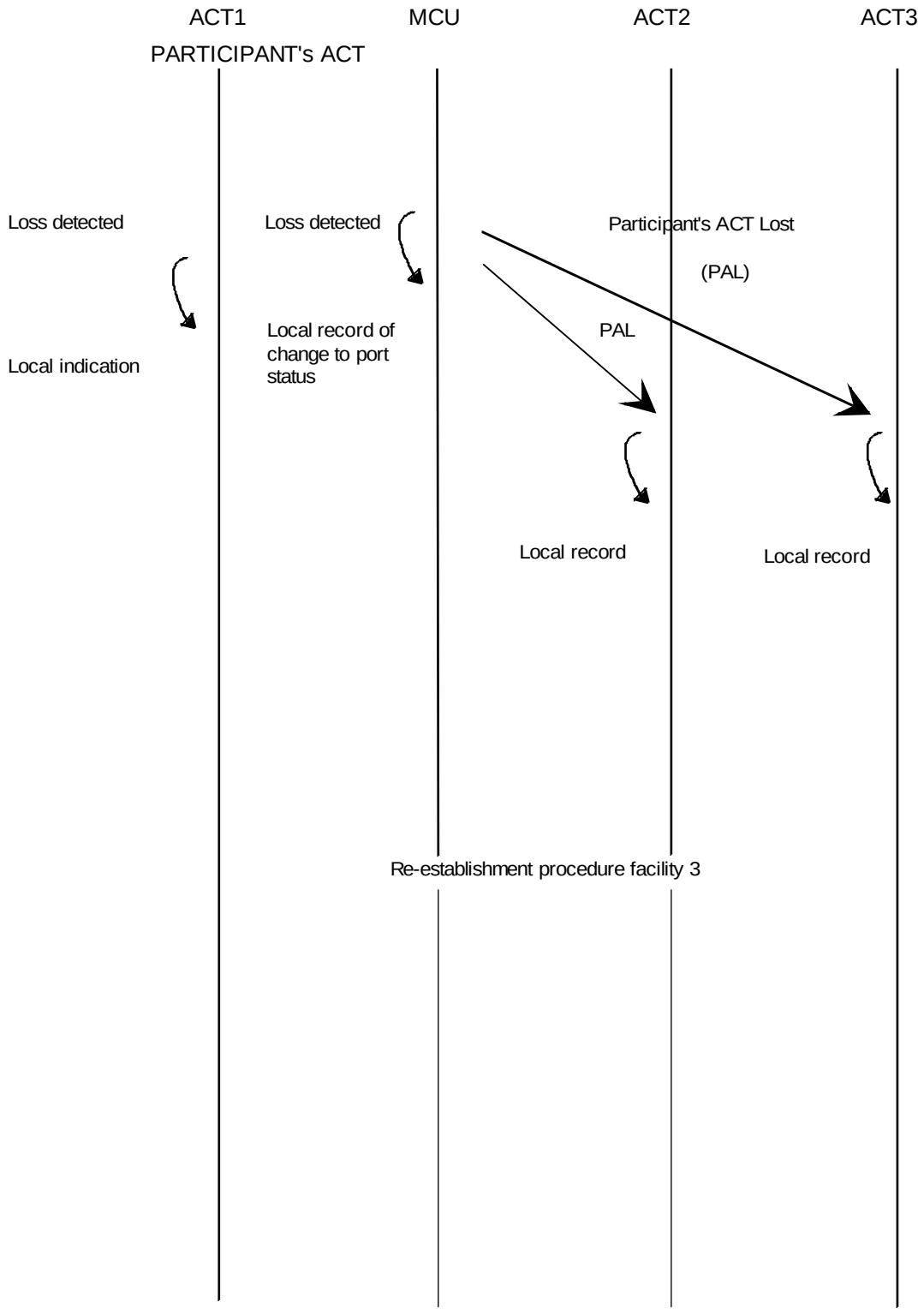


Figure B.5: Facility number 8 (facility title: Indication of loss of participant's ACT)

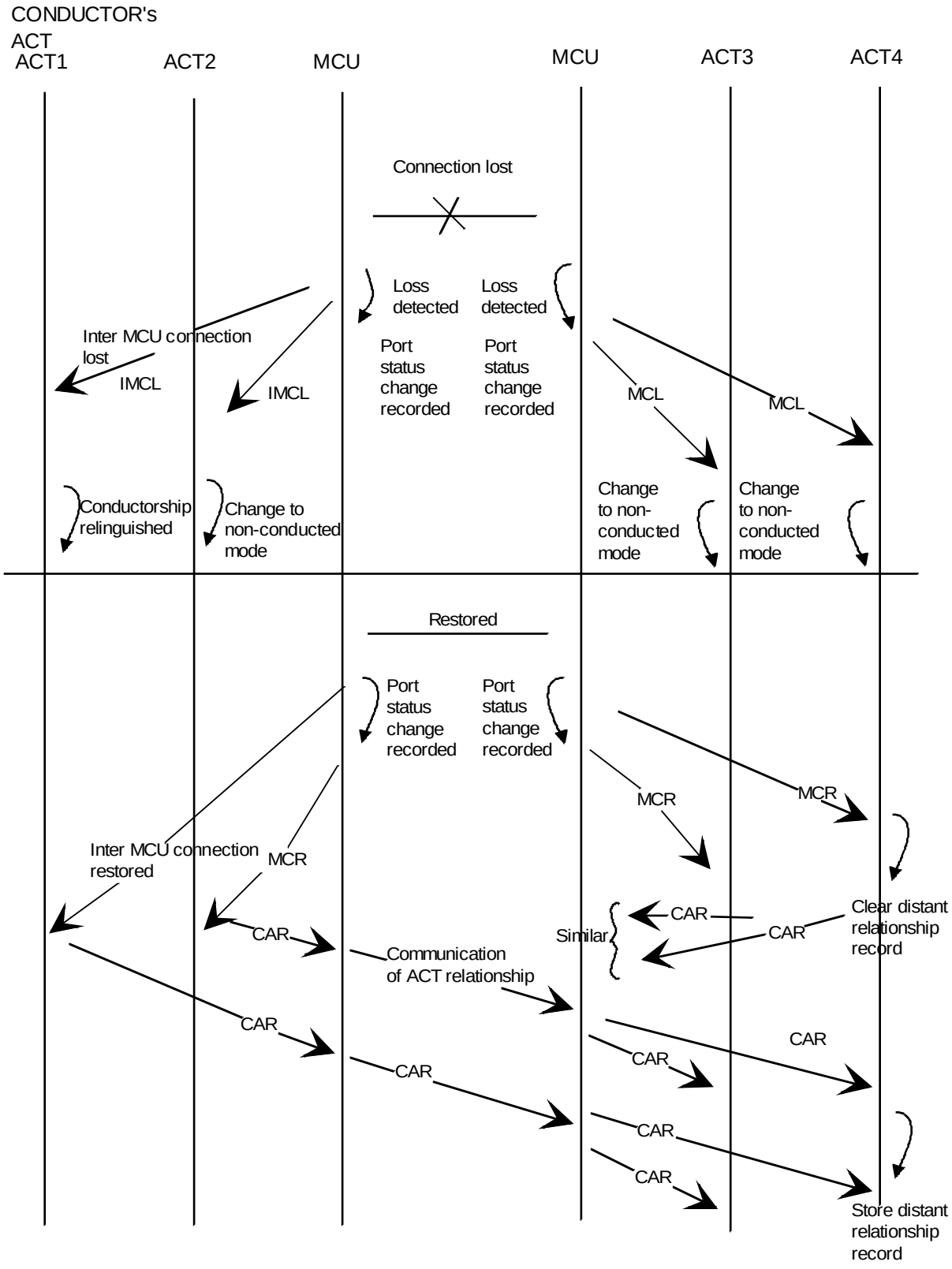


Figure B.6: Facility number 9 (facility title: Indication of loss of MCU connection (A. operator initiated recovery))

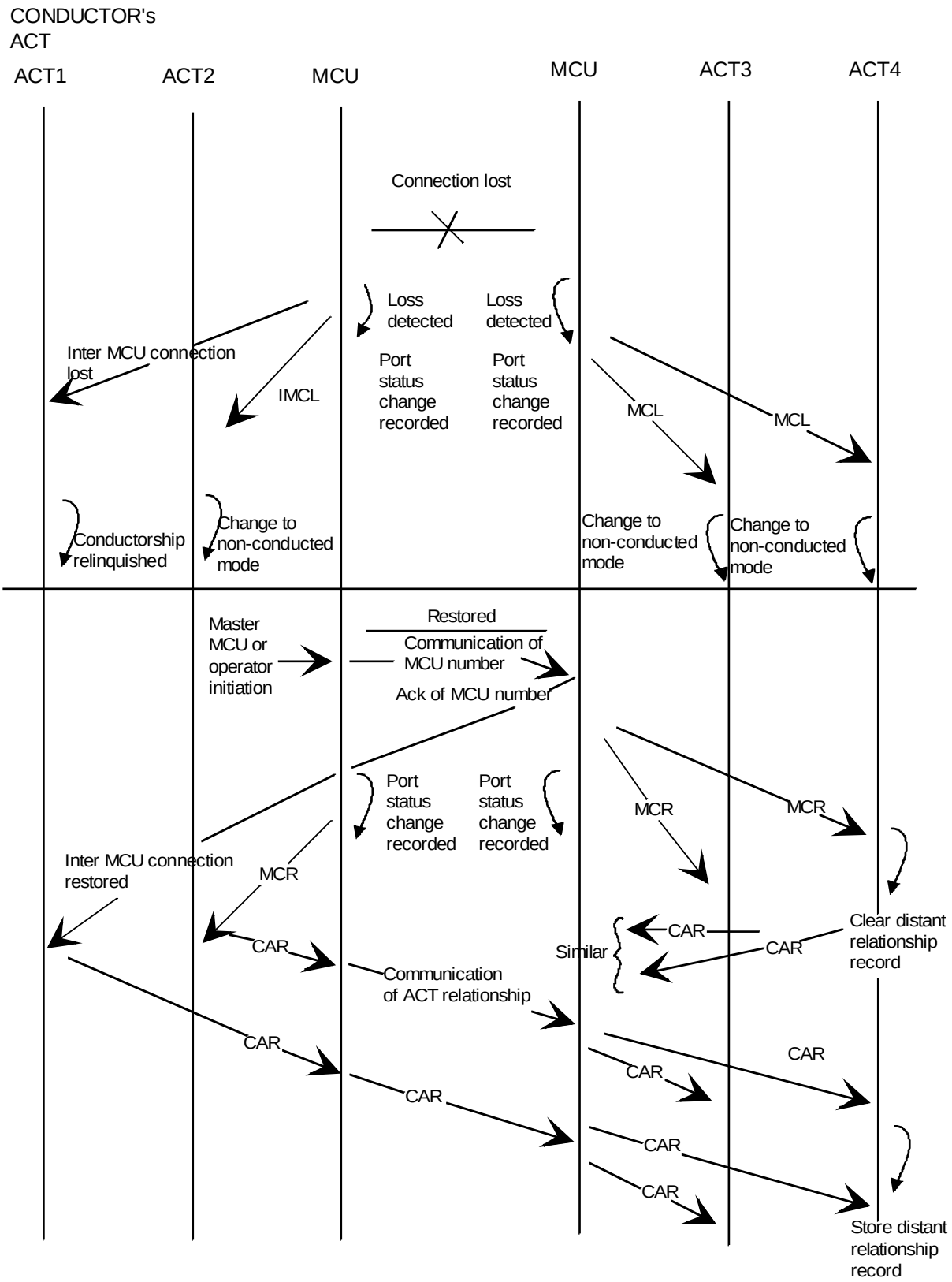


Figure B.7: Facility number 9 (facility title: Indication of loss of MCU connection (B. option for automatic initiation of recovery))

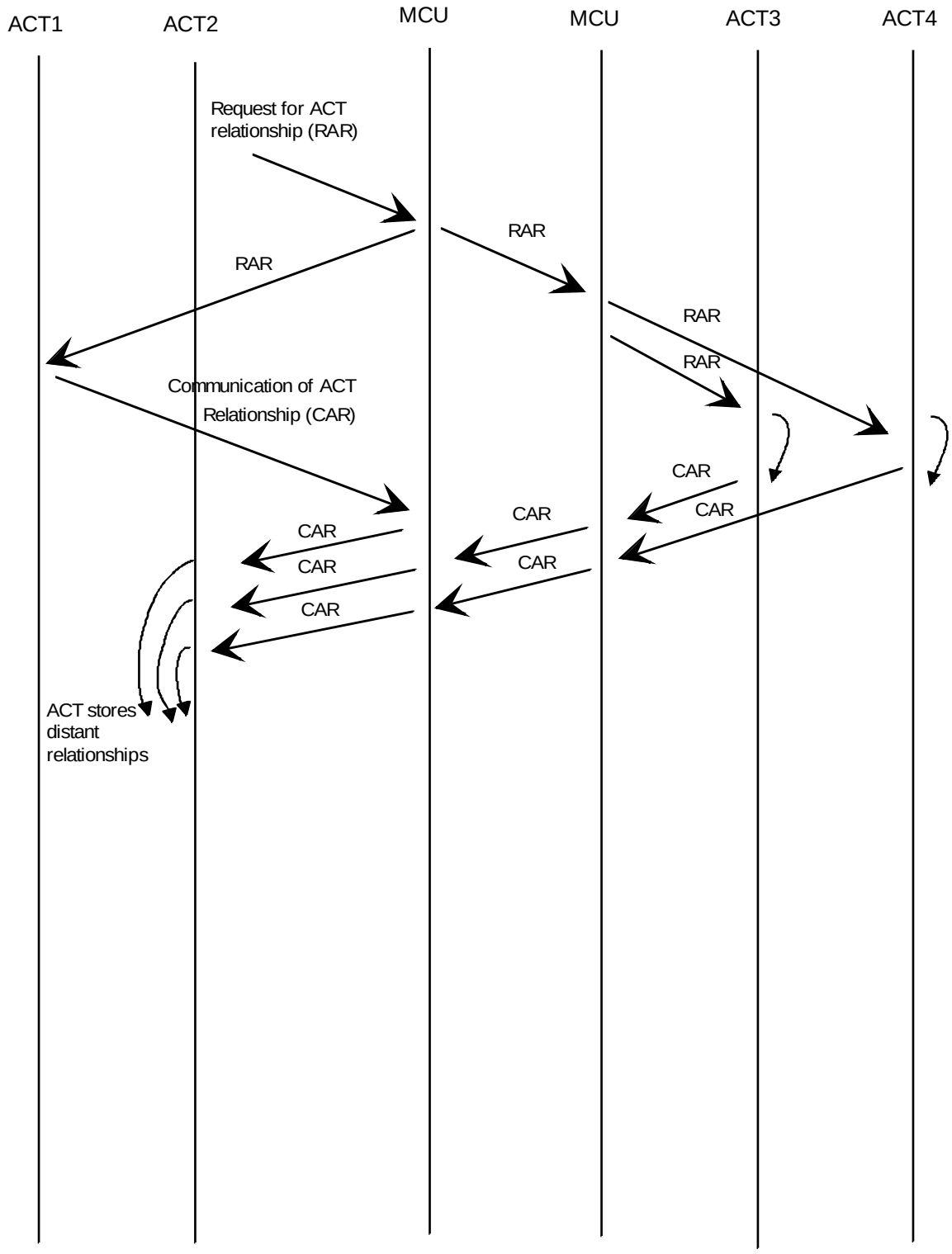


Figure B.8: Facility number 10 (facility title: Request for update of conference status (which ACTs are connected, what are the participant's names, what is the conference mode and who is conductor))

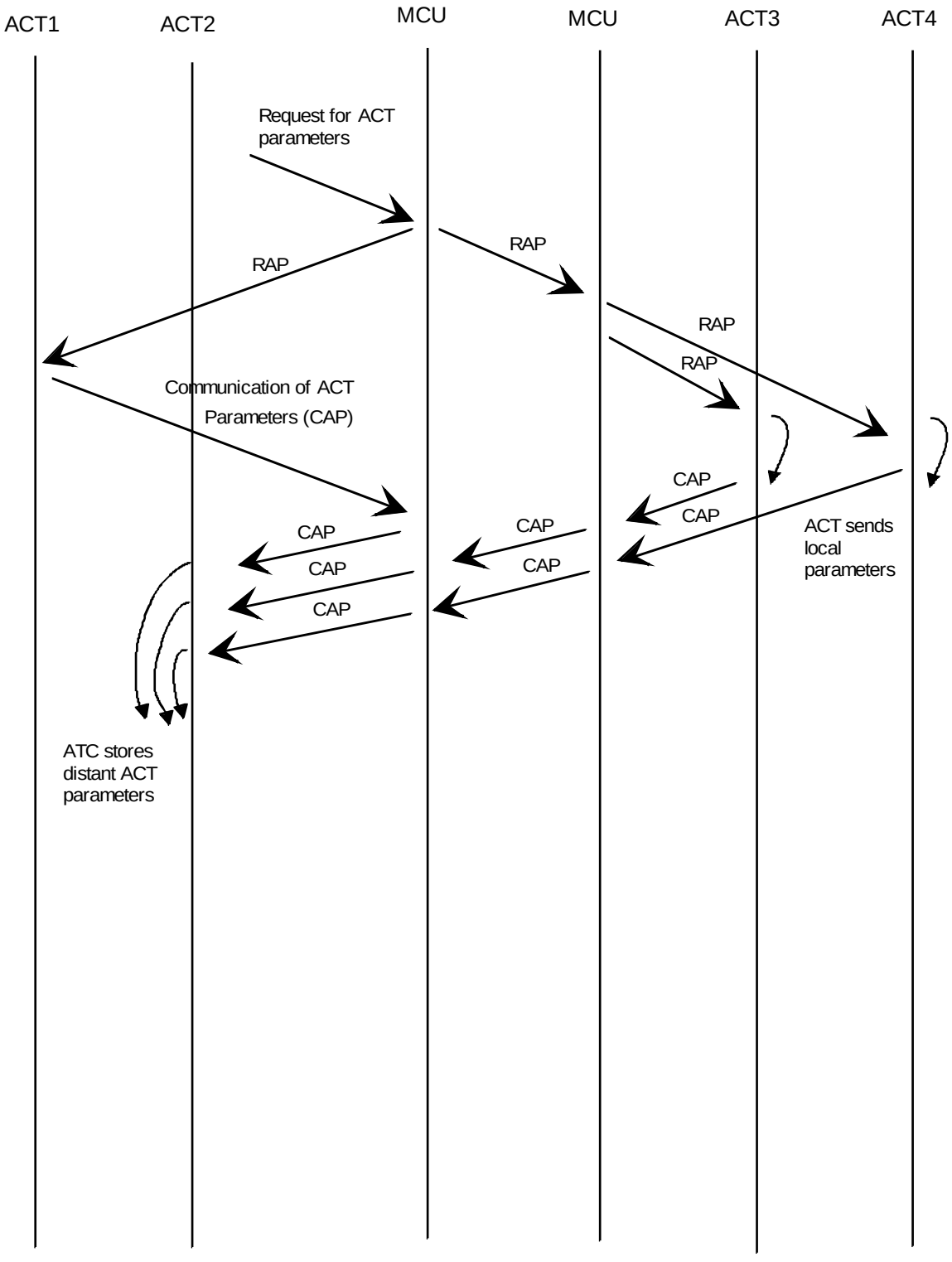


Figure B.9: Facility number 10 (facility title: Request for update of conference status (what facilities are available at each ACT?)

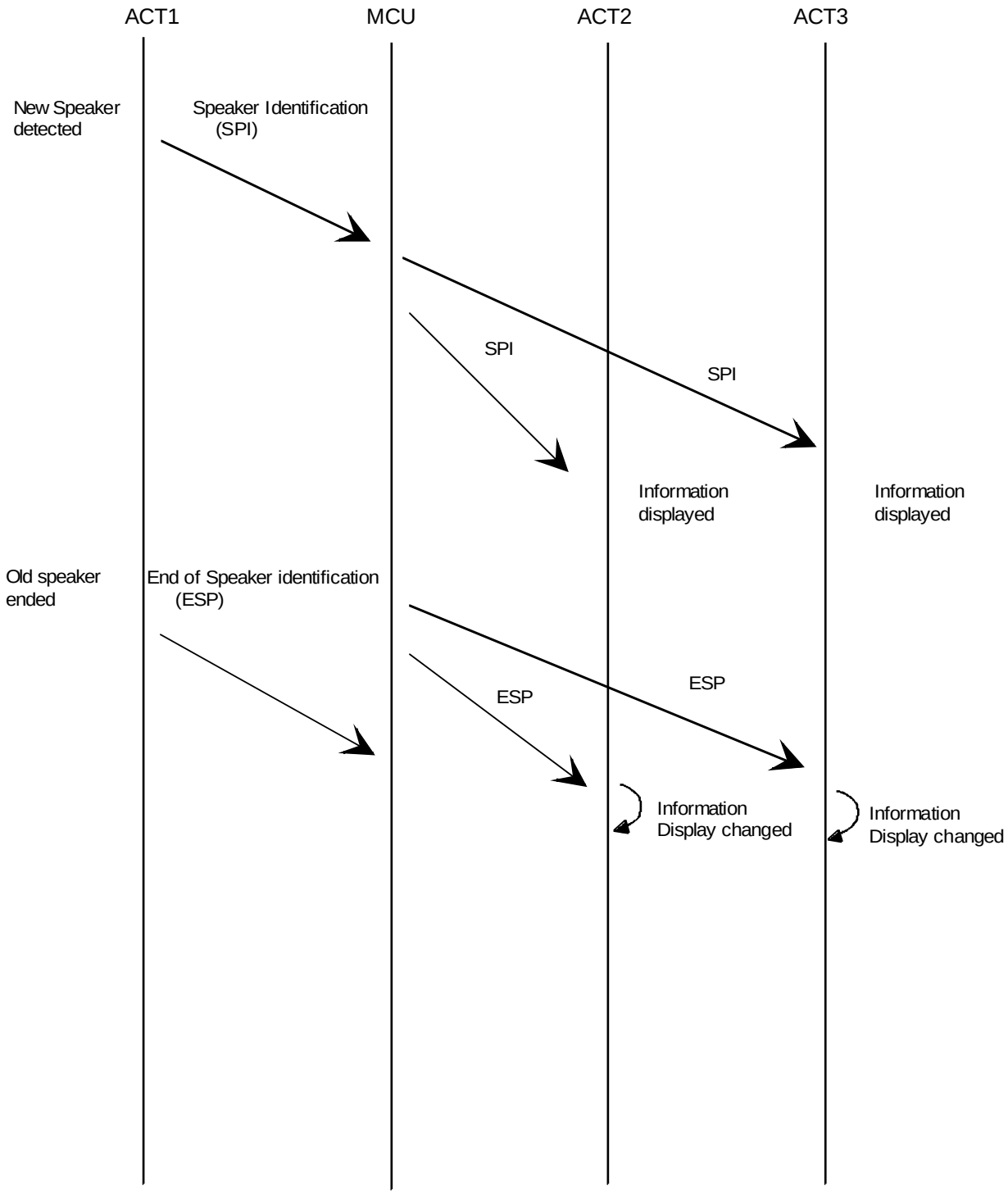


Figure B.10: Facility number 11 (facility title: Present speaker identification)

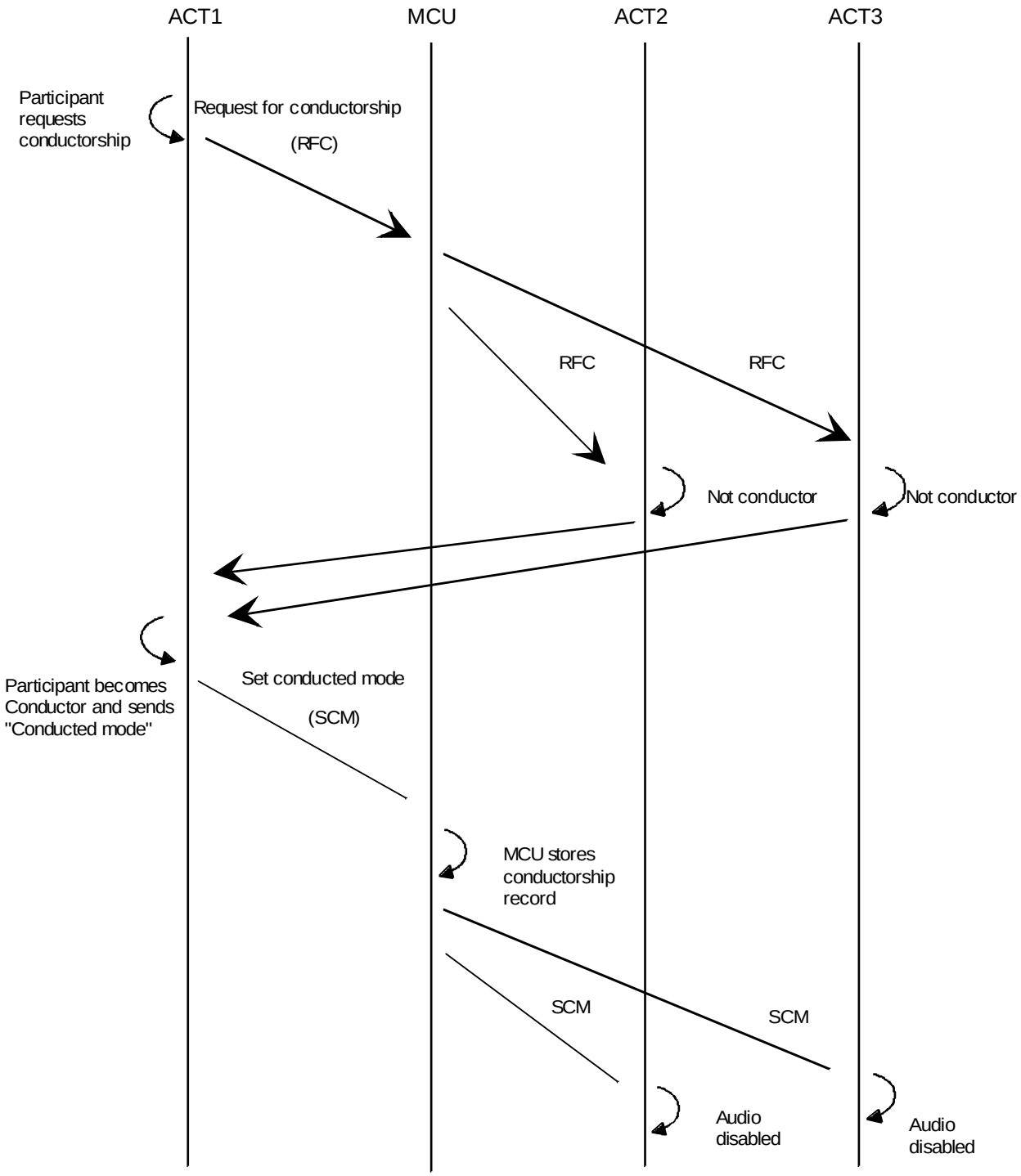


Figure B.11: Facility number: 12 (Facility title: Signalling of conductorship (conductorship granted))

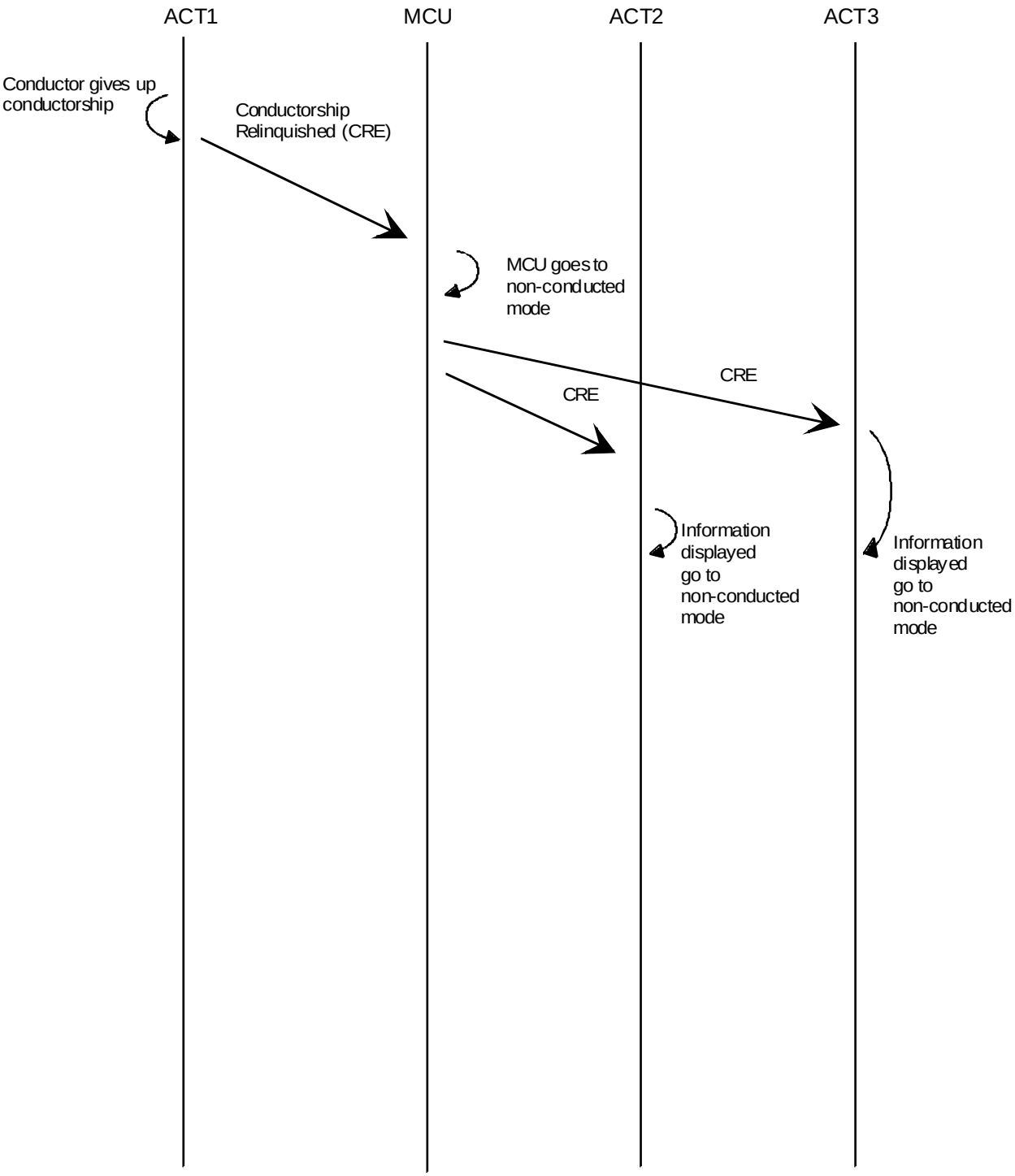


Figure B.12: Facility number 13 (facility title: Relinquishing of conductorship)

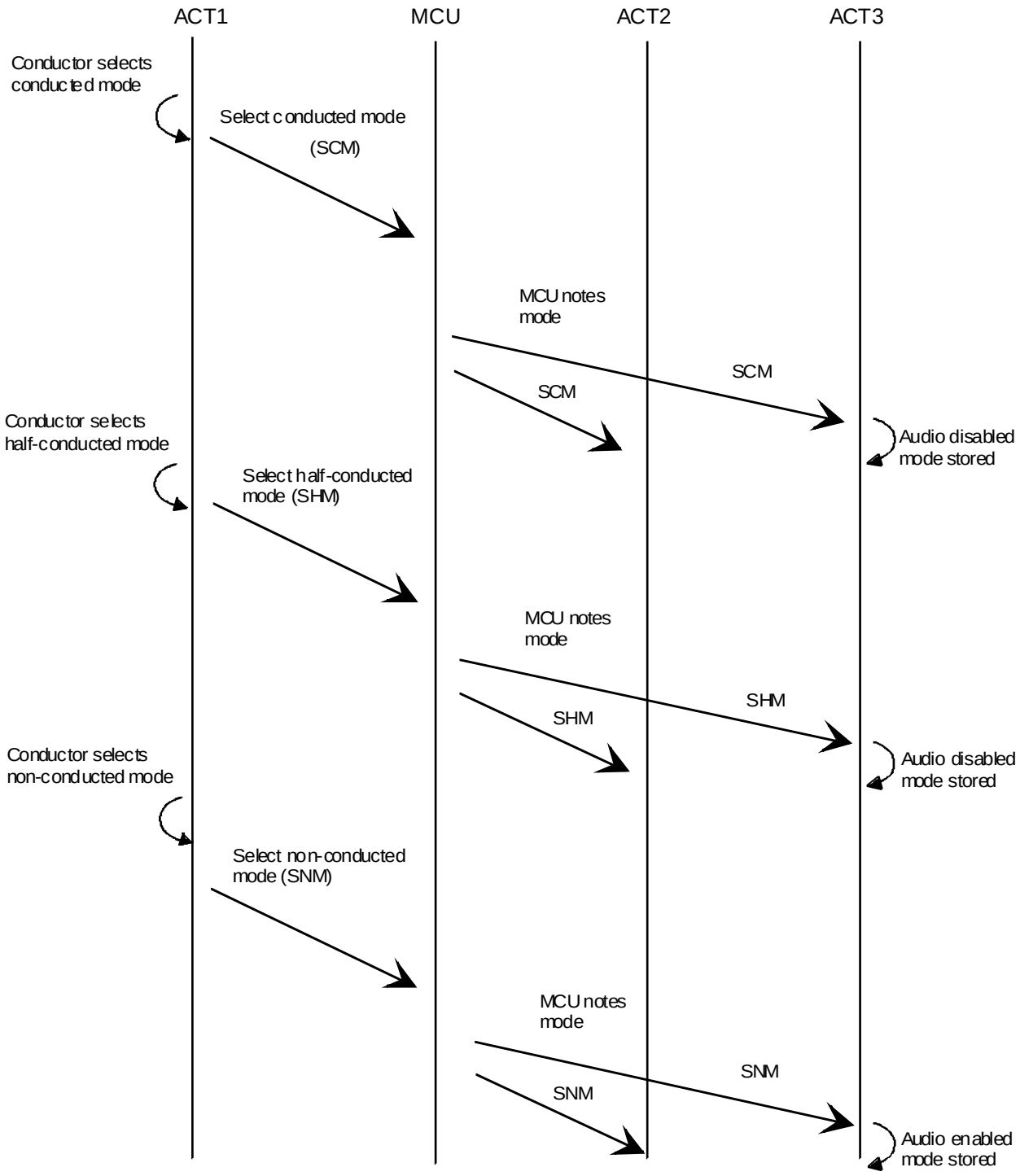


Figure B.13: Facility number 14 (facility title: Selection of conference mode)

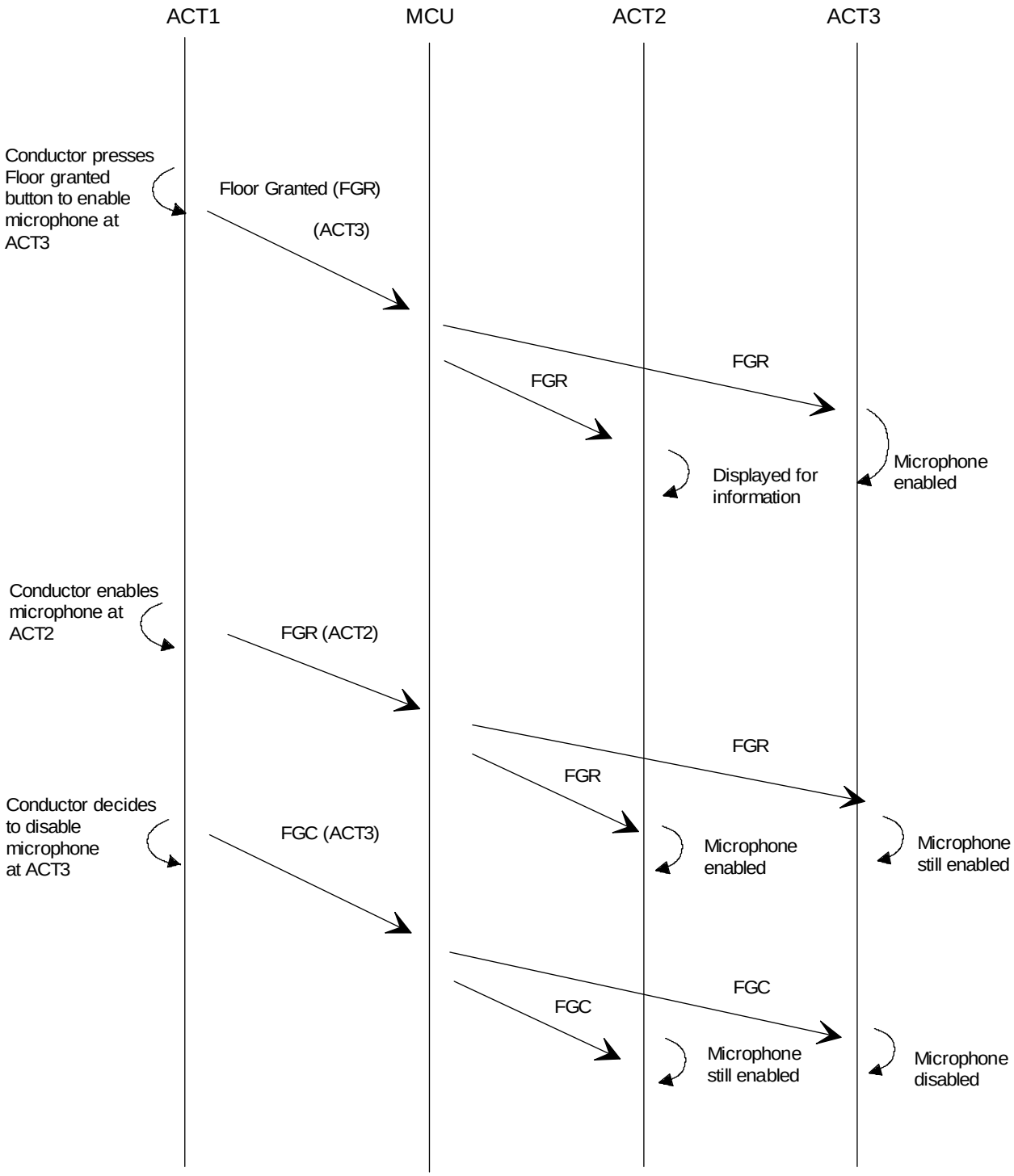


Figure B.14: Facility number 15 (facility title: Control of speaker's microphones)

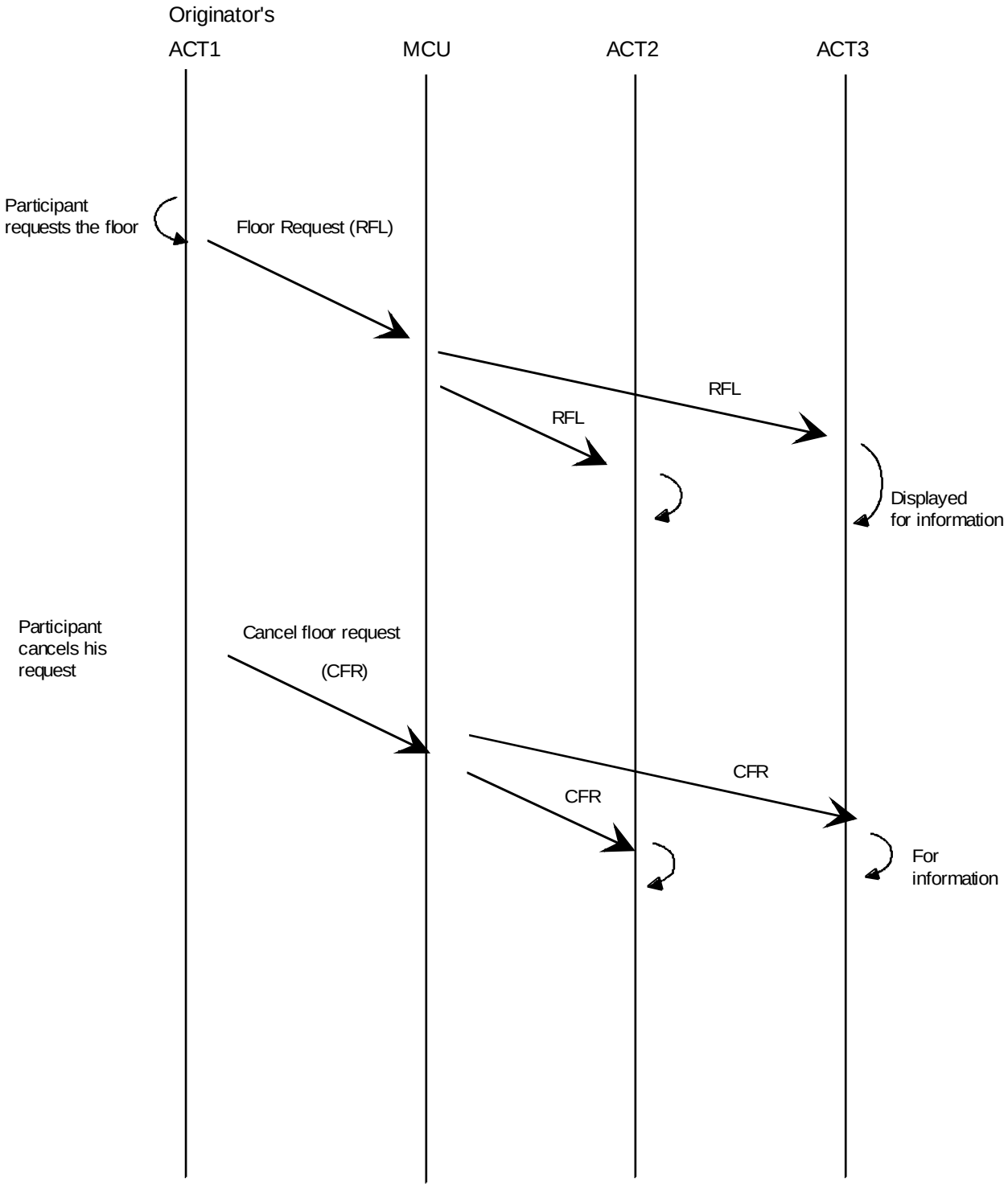


Figure B.15: Facility number 16 (facility title: Request to reserve the floor (non-conducted mode))

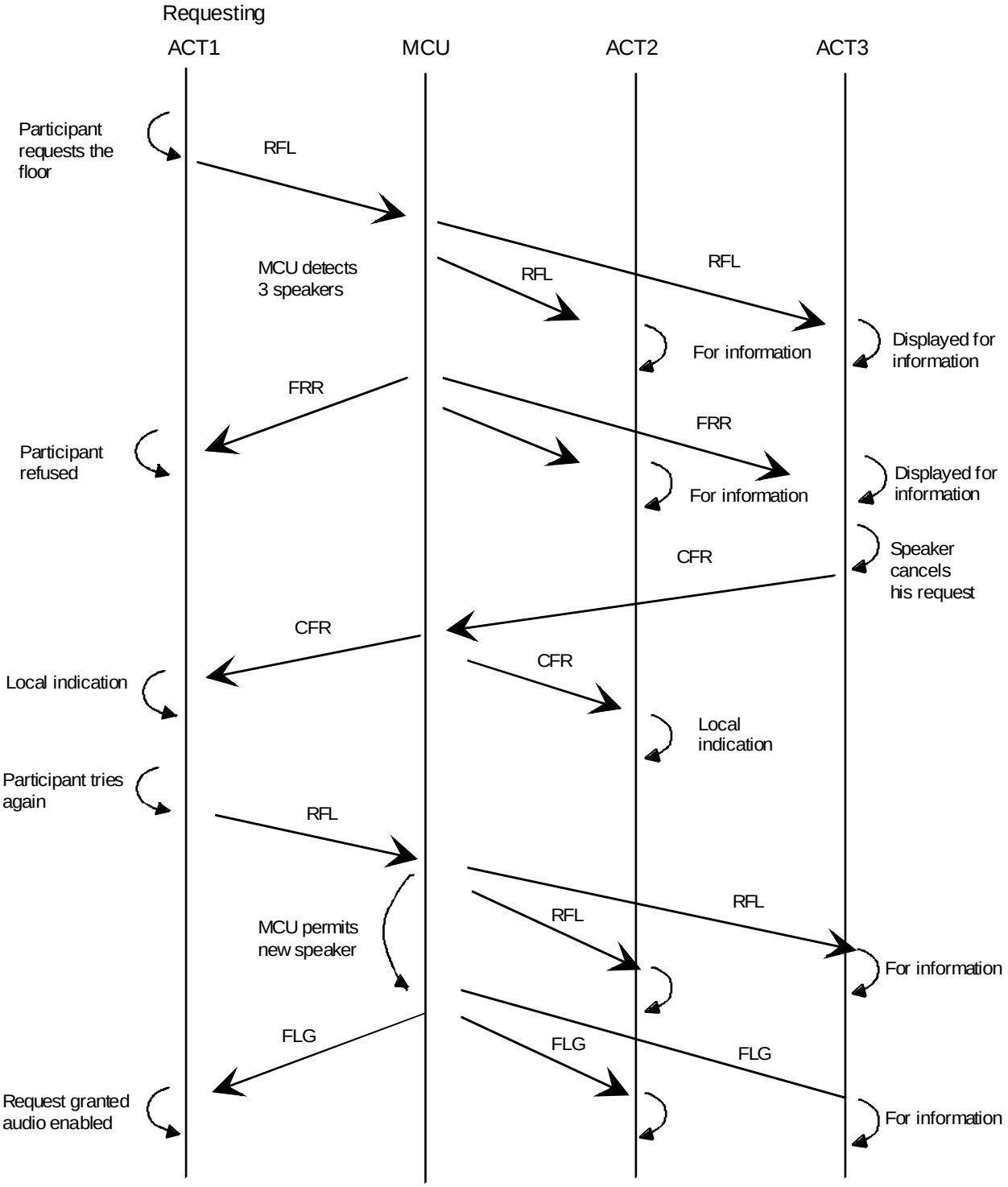


Figure B.16: Facility number 16 (facility title: Request to reserve the floor (half-conducted mode))

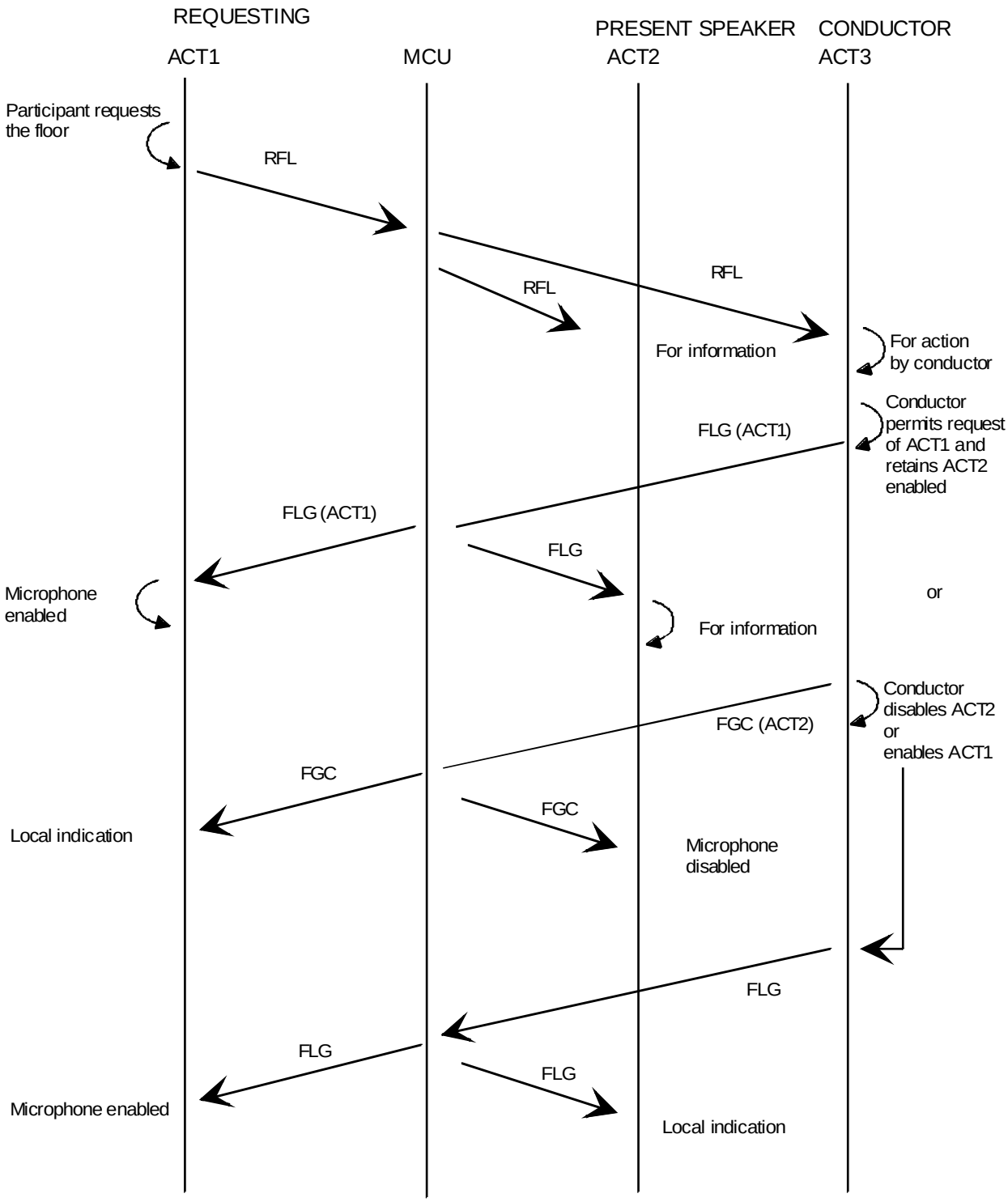


Figure B.17a: Facility number 16 (facility title: Request to reserve the floor (conducted mode))

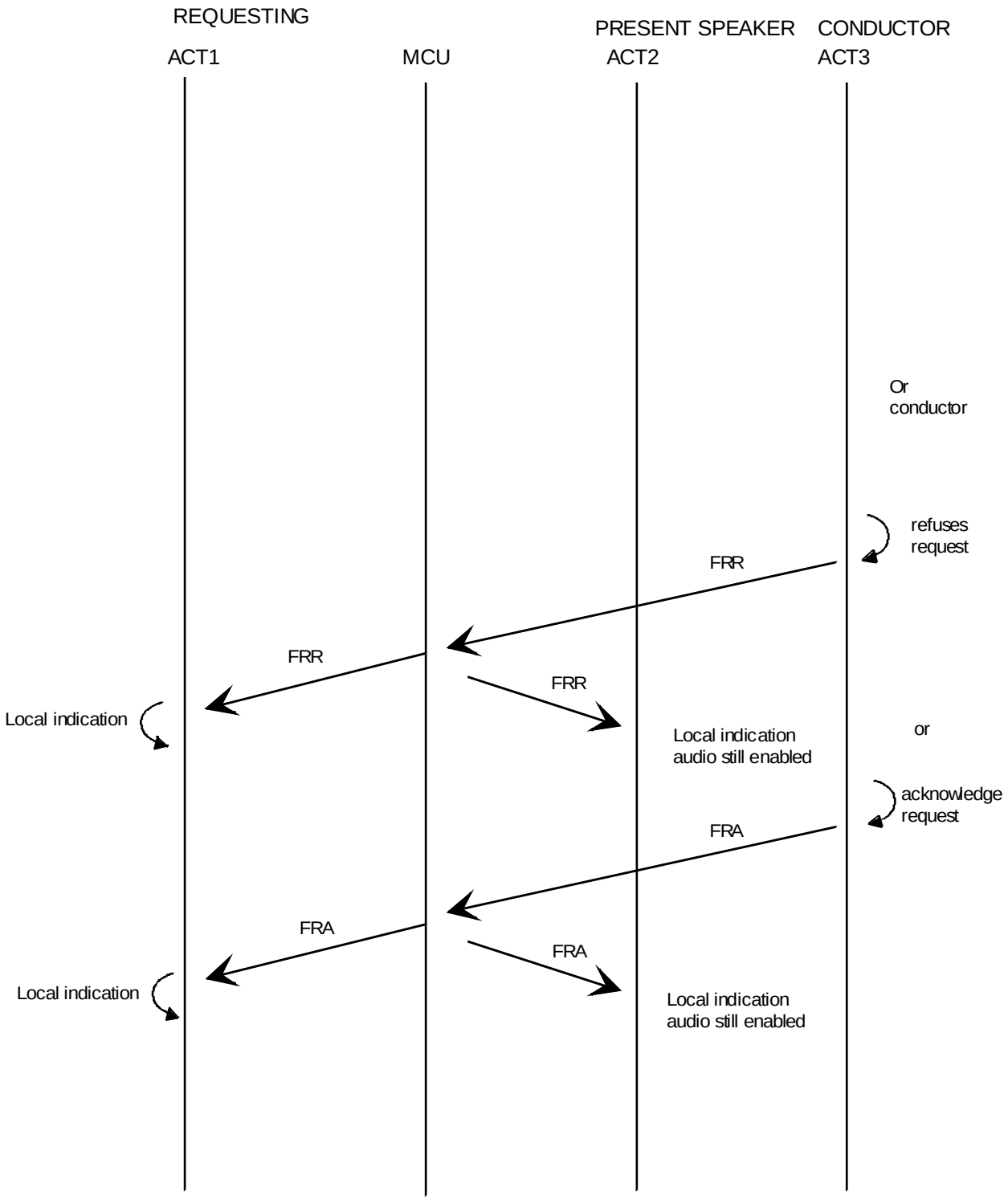


Figure B.17b: Facility number 16 (facility title: Request to reserve the floor (concluded mode))

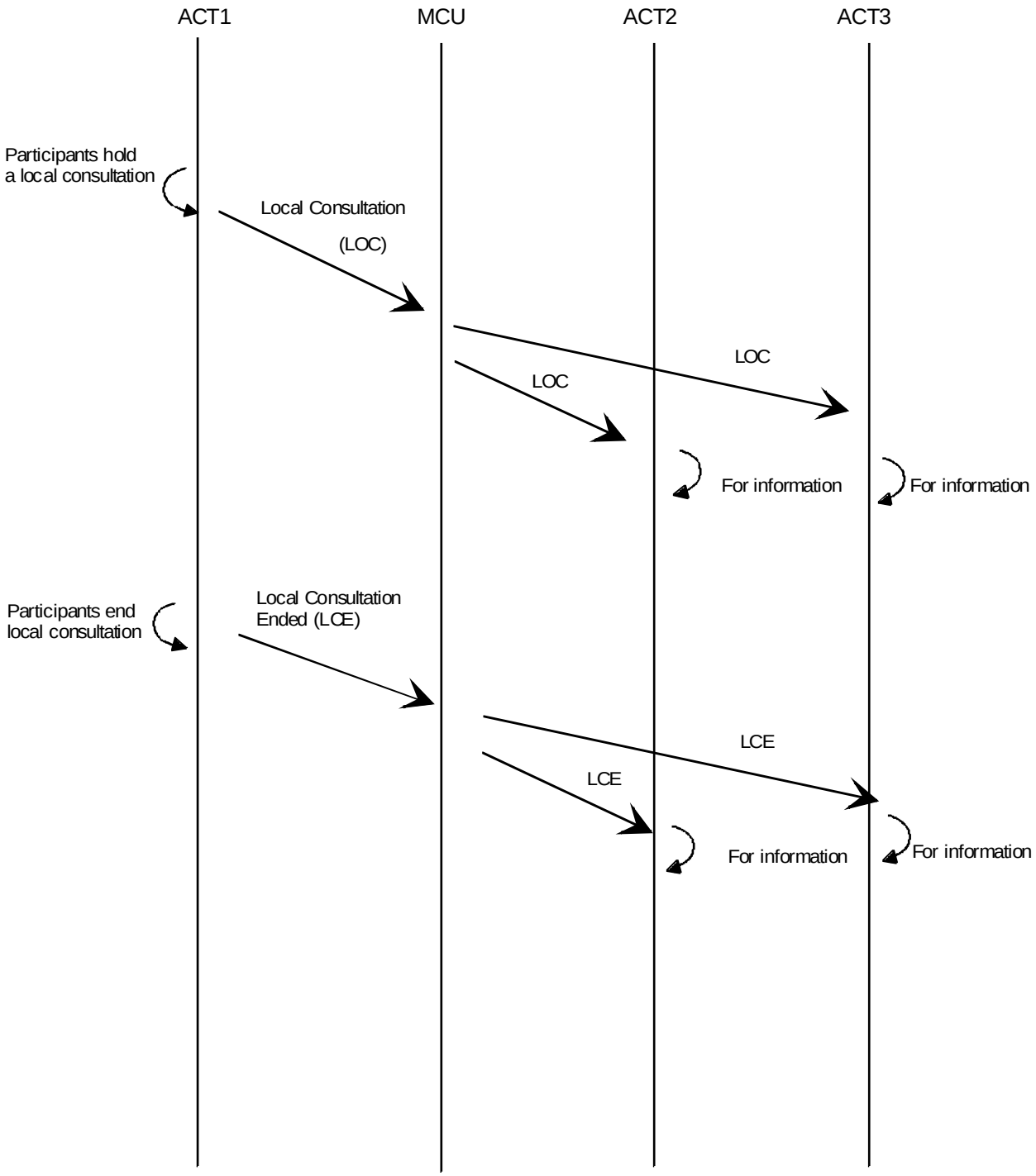


Figure B.18: Facility number 17 (facility title: Signalling of a local consultation)

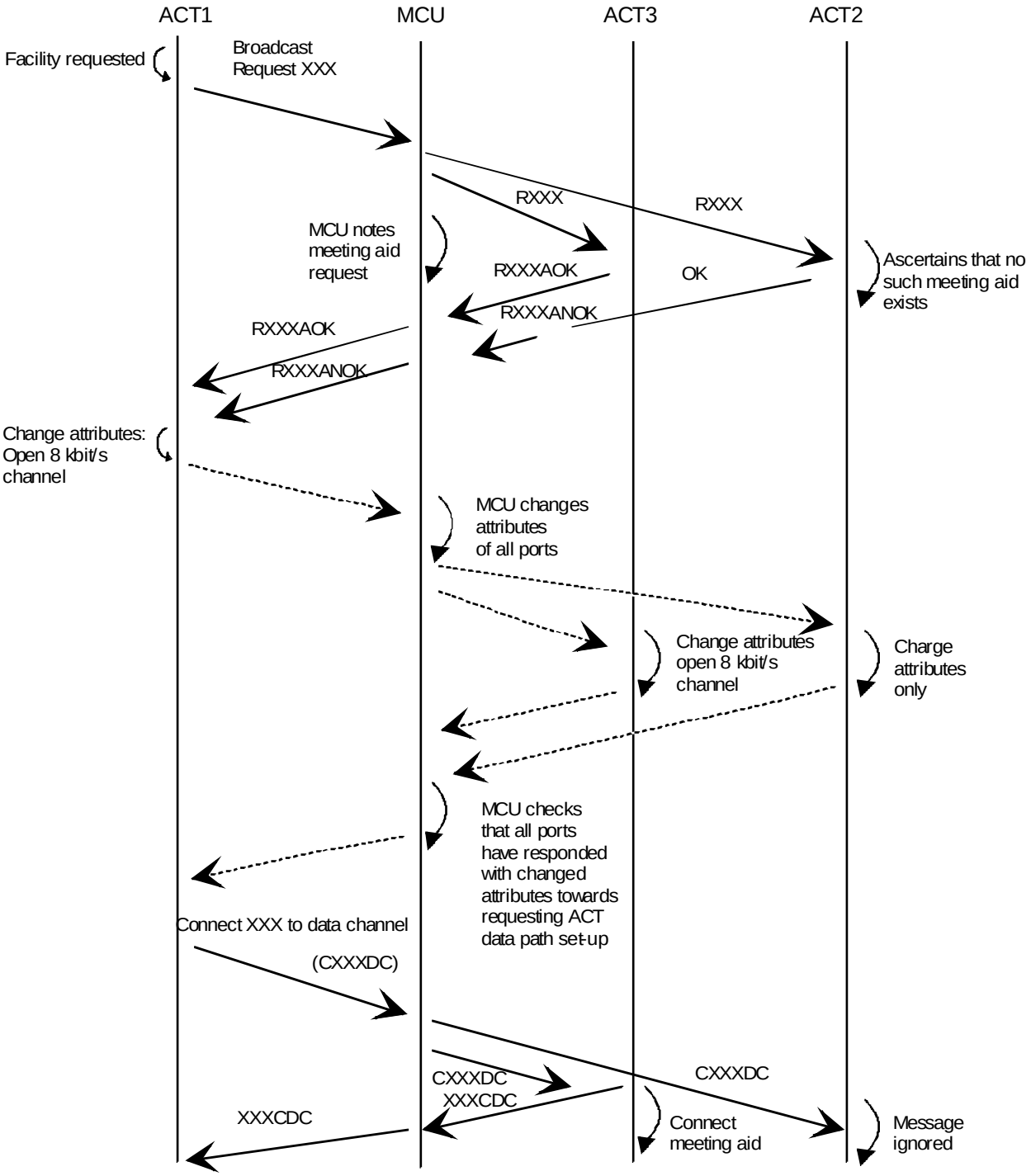


Figure B.19a: Facility number 18 (facility title: Transmission of meeting aid information (successful case set-up))

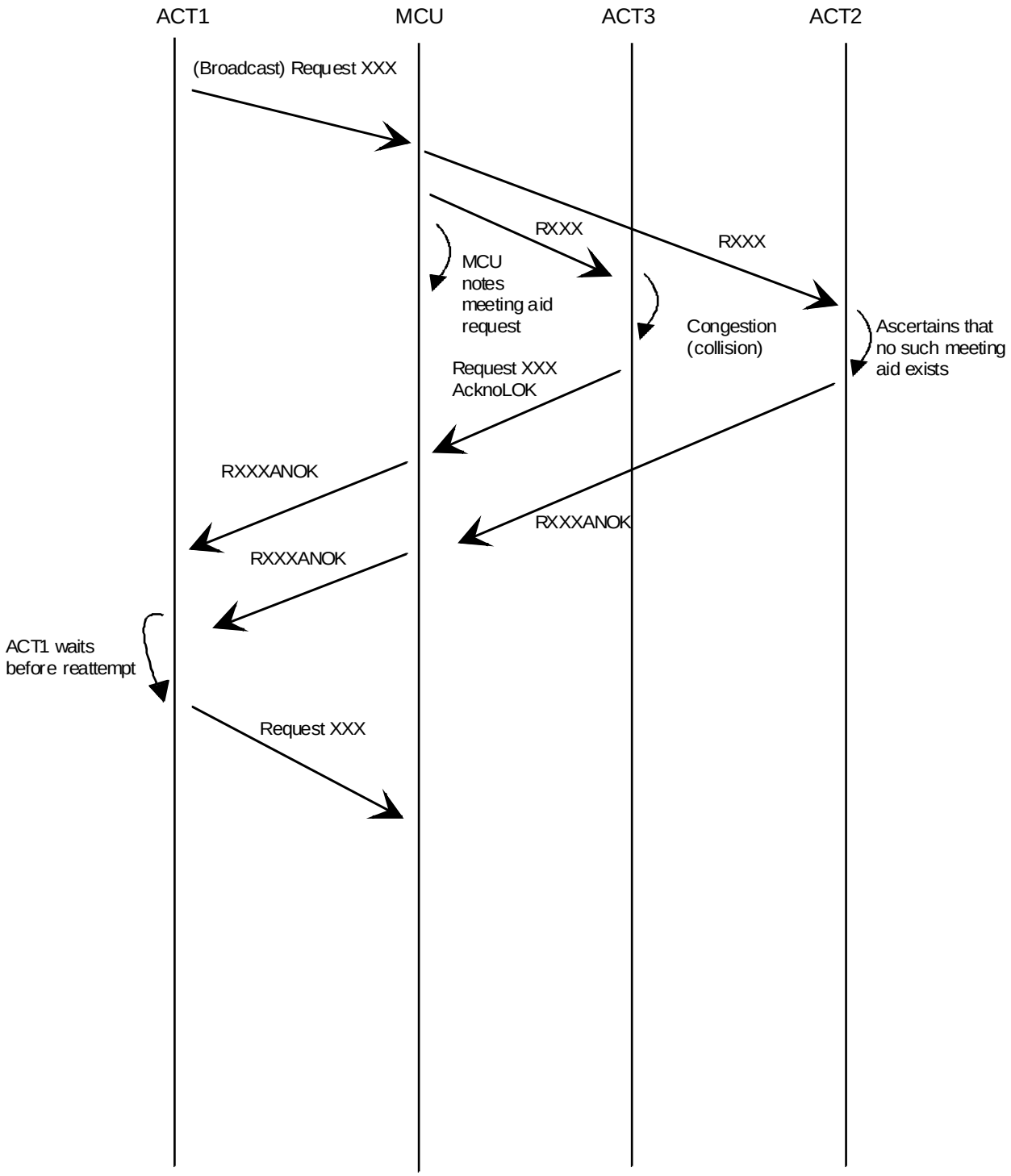


Figure B.19b: Facility number 18 (facility title: Transmission of meeting aid information (unsuccessful case (A)))

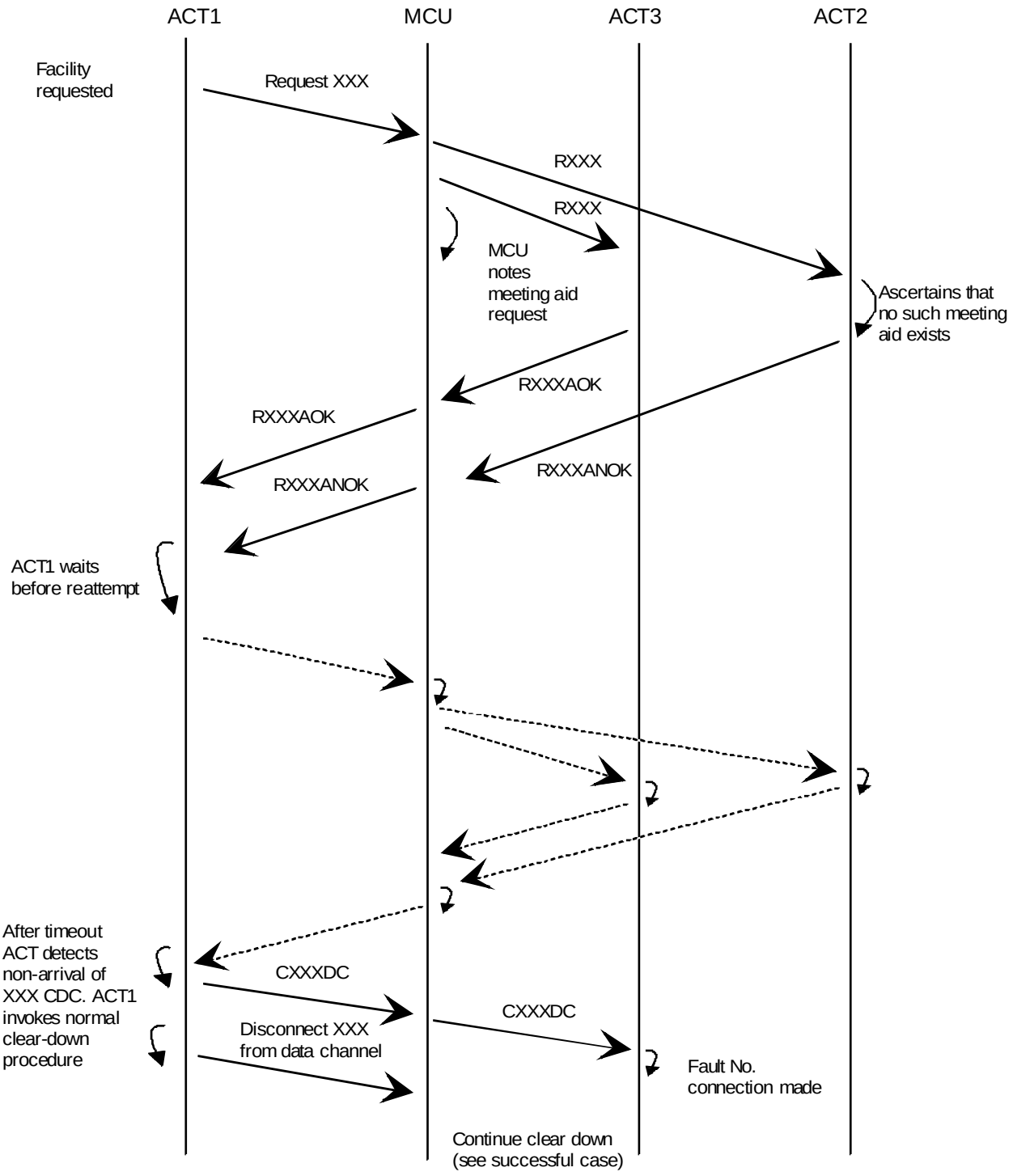


Figure B.19c: Facility number 18 (facility title: Transmission of meeting aid information (unsuccessful case (B)))

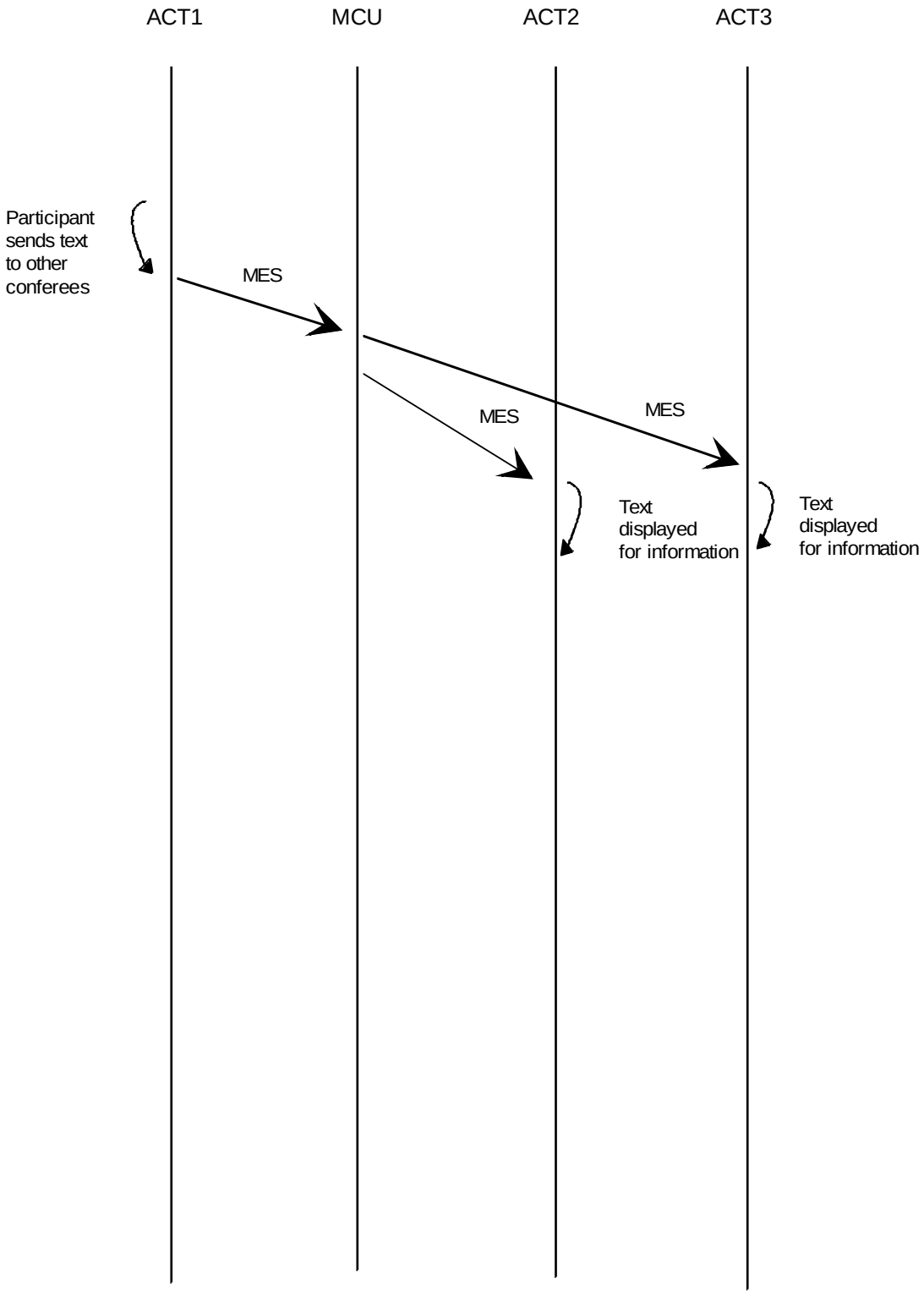


Figure B.20: Facility number 19 (facility title: Transmission of text messages)

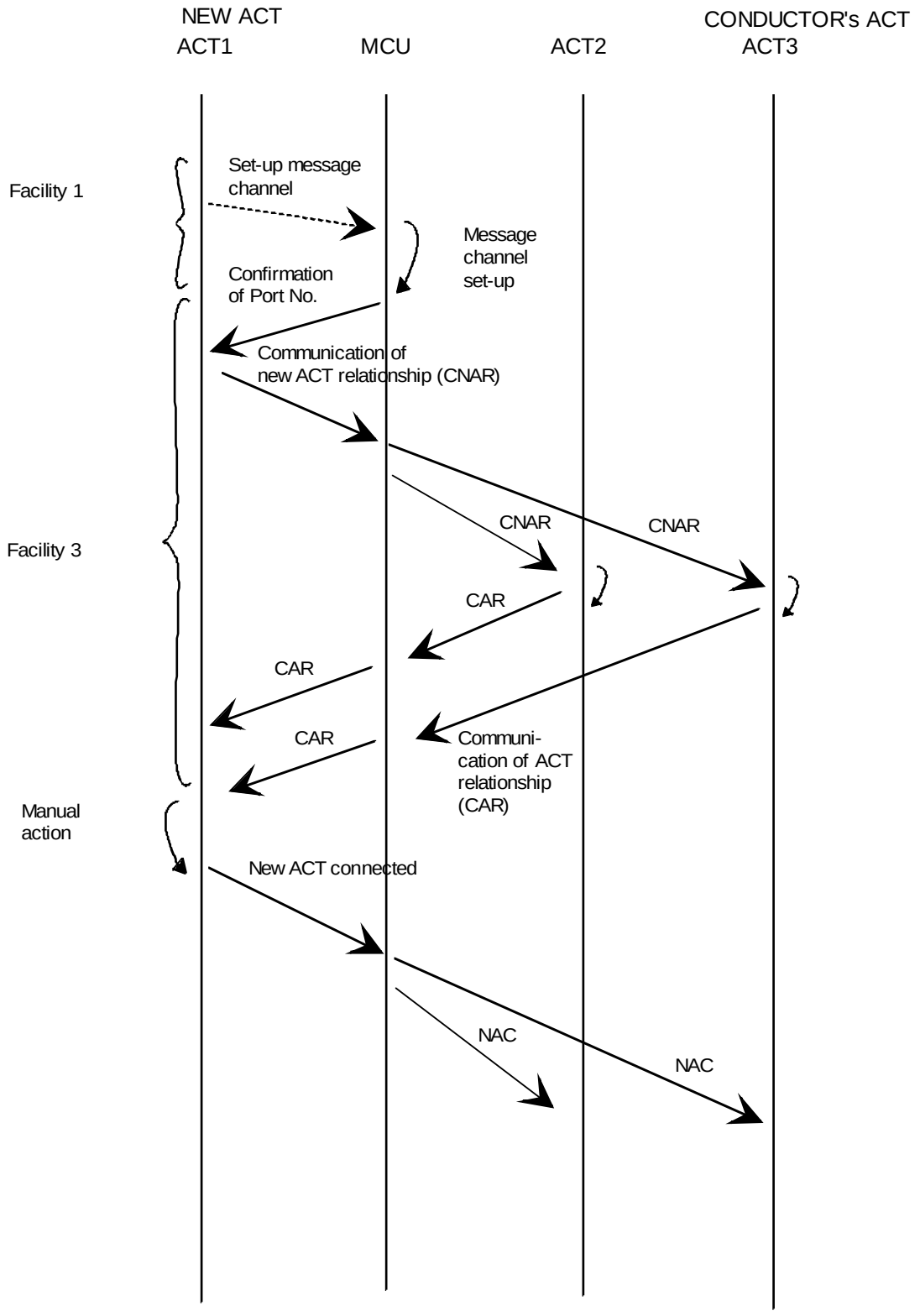


Figure B.21: Facility number 20 (facility title: Addition of an ACT to the conference)

B.10 Message structure layers 1-6

B.10.1 Introduction

This Clause presents the method agreed in Europe for transmission of control and indications information between terminals and MCUs in both audio and video applications. Layers 1 to 6 are common to audio and video applications and are specified in this I-ETS.

B.10.2 Message channel

The message channel data rate is 4 kbit/s.

In the audio application, the message channel information is carried in the bits 41 to 80 of the service channel (the eighth bit of each octet of the 64 kbit/s channel) as specified in prETS 300 144 [5].

In the Video application, using A-law speech in accordance with CCITT Recommendation H.130 [20], the message channel information is carried in Timeslot 2, odd bit 5.

If the message channel is made available at a terminal via a separate interface, this interface shall comply with CCITT Recommendation X.21 [21].

B.10.3 General message structure

Four layers within the message structure are defined in this I-ETS:

- layer 1: see Clause B.2.

- layer 2: the link control layer which uses a High-Level Data Link Control (HDLC) procedure according to Link Access Protocol Balanced (LAPB) of CCITT Recommendation X.75 [22]. For the selection of the layer 2 address the procedure described in subclause 6.3 of this I-ETS applies.

- layer 3: determines the routing of the messages exchanged between terminals and the MCU, between MCU's and between terminals. The procedures are specified in Clause 6 of this I-ETS.

- layer 6: the presentation layer describing the format and coding of messages, according to CCITT recommendation X.209 [23].

For audio-visual communication, layers 4 and 5 are not needed at present.

B.10.4 Layer 2

B.10.4.1 General aspects

LAPB, as described in CCITT Recommendation X.75 [22] Clause 2, is chosen for the layer 2 protocol of the message channel. The basic mode (modulo 8) is used.

B.10.4.2 Parameters of LAPB

The following parameters shall be used:

Information length (max): N1 = 128 bytes (for further study, see NOTE)
Window size: K = 7
Retransmission Time out: T1 = 2 seconds
Number of retransmissions: N2 = 10
Parameters T2, T3:
if a silicon implementation of CCITT Recommendation X.75 [22] layer 2 is used e.g. WD 2511, MC68605, parameters T2 and T3 need not be specified.
Otherwise:
T2 < T1 - (max transmission delay + max layer 2 frame processing time).
T3 > T1 * N2.

NOTE: The needs of some layer 7 facilities, not part of this I-ETS, may require a longer frame length than 128 bytes.

B.10.4.3 Use of XID frames

XID frames shall be used by terminals and MCUs for layer 2 address negotiation, prior to layer 2 CCITT Recommendation X.75 [22] initialisation. The format of XID frames is defined in ISO Recommendation 8885 [24].

The need for XID layer 2 address negotiation is for the following reason. Correct operation of a CCITT Recommendation X.75 [22] link requires that the two ends of the link adopt complementary roles, i.e. DTE - DCE. In this I-ETS the default conditions are:

Terminal = DTE, address 01
MCU = DCE, address 03

However, under some configurations, e.g. terminal-to-terminal and MCU-to-MCU, the above constraint of DTE - DCE is violated. The situation is resolved in the following manner:

1) a default assignment is assumed, terminal = DTE, MCU = DCE;

2) in cases where the two ends of the link are detected as having identical roles at initialisation, then one end shall adopt the complementary role for the duration of the connection.

Such a mechanism is described below, where both ends of the link assume their default assignments, DTE or DCE, initially. Both sides shall start this procedure immediately when the physical link becomes active.

XID frames are transmitted continuously at 5 second intervals until an XID frame is received from the distant end.

The XID frame is always transmitted as a command. If the other end of the link interprets the received XID frame as a command, then the link shall be correctly configured. If not, then the situation is resolved by comparing local and remote random numbers that are transmitted in the XID frames. Should the XID random numbers be the same, then the procedure is repeated.

The frame structure of the XID frame, according to ISO 8885 [24], is given below.

| Addr | Cntrl | FI | GI | GL | PI | PL | PAR | FCS |

Addr	Address: 01 (Cmnd from DTE) 03 (Cmnd from DCE)
Cntrl	Control: AF (XID control code)
FI	Format Ident: 82 (XID frame format identifier)
GI	Group Ident : 41 (Address Resolution)
GL	Group Length: 0004 (Length of PI+PL+PAR)
PI	Param Ident: 01 (Parameter Ident for Unique Identifier)
PL	Param Length: 02 (Length of Parameter value) 1 byte
PAR	Parameter: Random Number (2 bytes)
FCS:	Frame check sequence

Figure B.22 shows the layer 2 Address negotiation procedure.

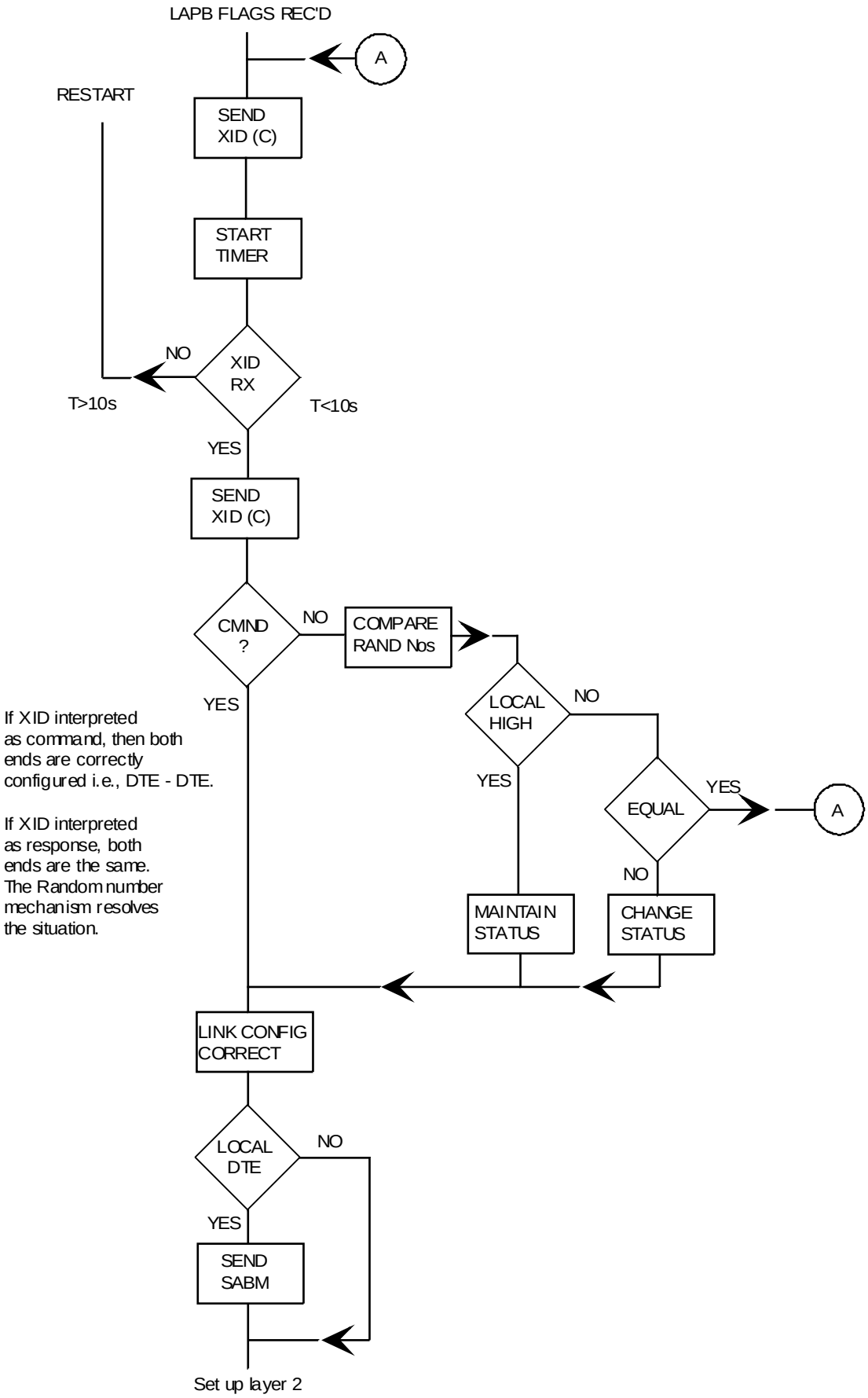


Figure B.22: Address negotiation procedure

B.10.5 Layer 3

B.10.5.1 Routing

Messages are transferred on a point-to-point basis between terminals and/or MCUs. The MCU acts as a message switch. The following routings are possible:

- terminal-to-terminal directly connected;
- terminal-to-terminal via MCU or MCUs;
- terminal-to-MCU;
- MCU-to-terminal;
- MCU-to-MCU(s);
- broadcast terminal-to-terminals;
- broadcast terminal-to-terminals plus MCUs;
- broadcast MCU-to-terminals.

B.10.5.2 Format

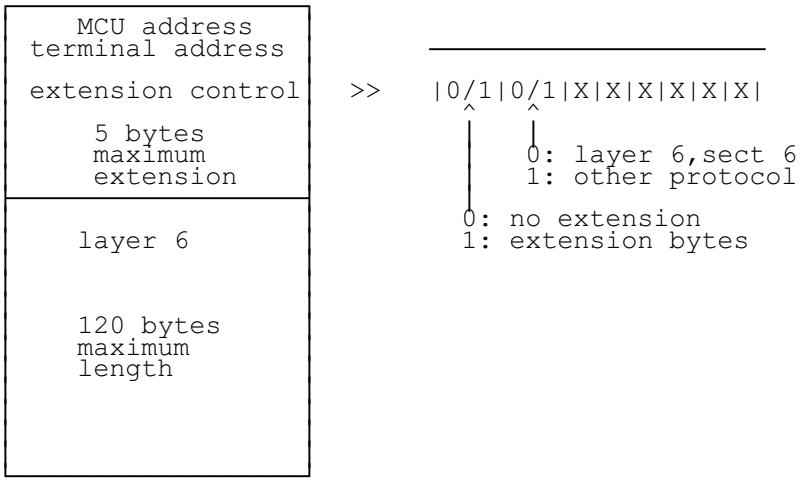


Figure B.23: Layer 3 format

The first two bytes at layer 3 are as given in table B.1.

Table B.1

1st byte (MCU)	2nd byte (Terminal)	destination
00	-- (NOTE 1)	(point-point operation (NOTE 2)
MCU>	00	Specific MCU (NOTE 4)
MCU>	<TML>	Specific Terminal
FF	--	All Terminals
FE	--	All Terminals plus MCUs
FD	--	All MCUs
FC	--	All local Terminals (i.e. TMLs connected to MCU where message originated (NOTE 3)

NOTE 1: --' means that the content of this byte is irrelevant. A 00' codeword can be used.

NOTE 2: Used in point-to-point conferences, or by a terminal which does not know its own number yet, during the address allocation phase.

NOTE 3: Used, for instance, during a double MCU conference when a MCU informs its locally connected TMLs that the inter-MCU link is restored, after failure.

NOTE 4: <MCU> may take values from 01 upwards, e.g. 01 and 02 in a double MCU conference. <TML> : Terminals are numbered from 01 upwards, according to the MCU port number.

Byte 3: the first bit is an extension bit, set to 0 if no extension. 5 bytes maximum can be added for future use.

The second bit is a "Protocol Discriminator" (PD). When using layer 6 as defined in chapter 6, PD = 0 and the third byte has the following structure:

0 0 X X X X X X where X is "don't care".

Other codes may be used in future for further extension of layer 3, if needed.

NOTE: If no layer 6 content,(e.g. address allocation procedure as in subclause B.10.5.3), PD = 0.

B.10.5.3 Address allocation procedure

The MCU number is pre-allocated by prior agreement, e.g. in the reservation phase. The goal of this address allocation procedure is to let each terminal know its own address, and to let each MCU know whether its ports are connected to a terminal, or another MCU.

a) from the MCU side, the procedure takes place in three steps:

Step 1: send to each port a layer 3 message, i.e. 3 byte containing its own MCU number, the port number, the extension byte. (no information field, at this stage).

Step 2: three possible messages may then be received:

a) 00/00/00: message sent by a terminal which has not yet received the message sent in step 1;
b) MCU/00/00: message sent by a terminal which received the message sent in step 1, and which acknowledges it;
c) (Other MCU)/(other port)/00: message sent by another MCU as described in step 1. In this case, step 3 shall be activated.

Step 3: the MCU re-sends a layer 3 message with the content MCU'/00/00, acknowledging the other MCU (MCU' = other MCU number).

b) from the terminal side, the procedure takes place in three steps:

Step 1: the terminal continuously sends a layer 3 message consisting of 00/00/00.

Step 2: two possible messages may then be received:

a) 00/00/00: message sent by another terminal, implying a point-to-point configuration;
b) MCU/port/00: message sent by a MCU. In this case, step 3 is activated.

Step 3: the terminal replies with a message with MCU/00/00.

Figure B.24 below illustrates the procedure as described.

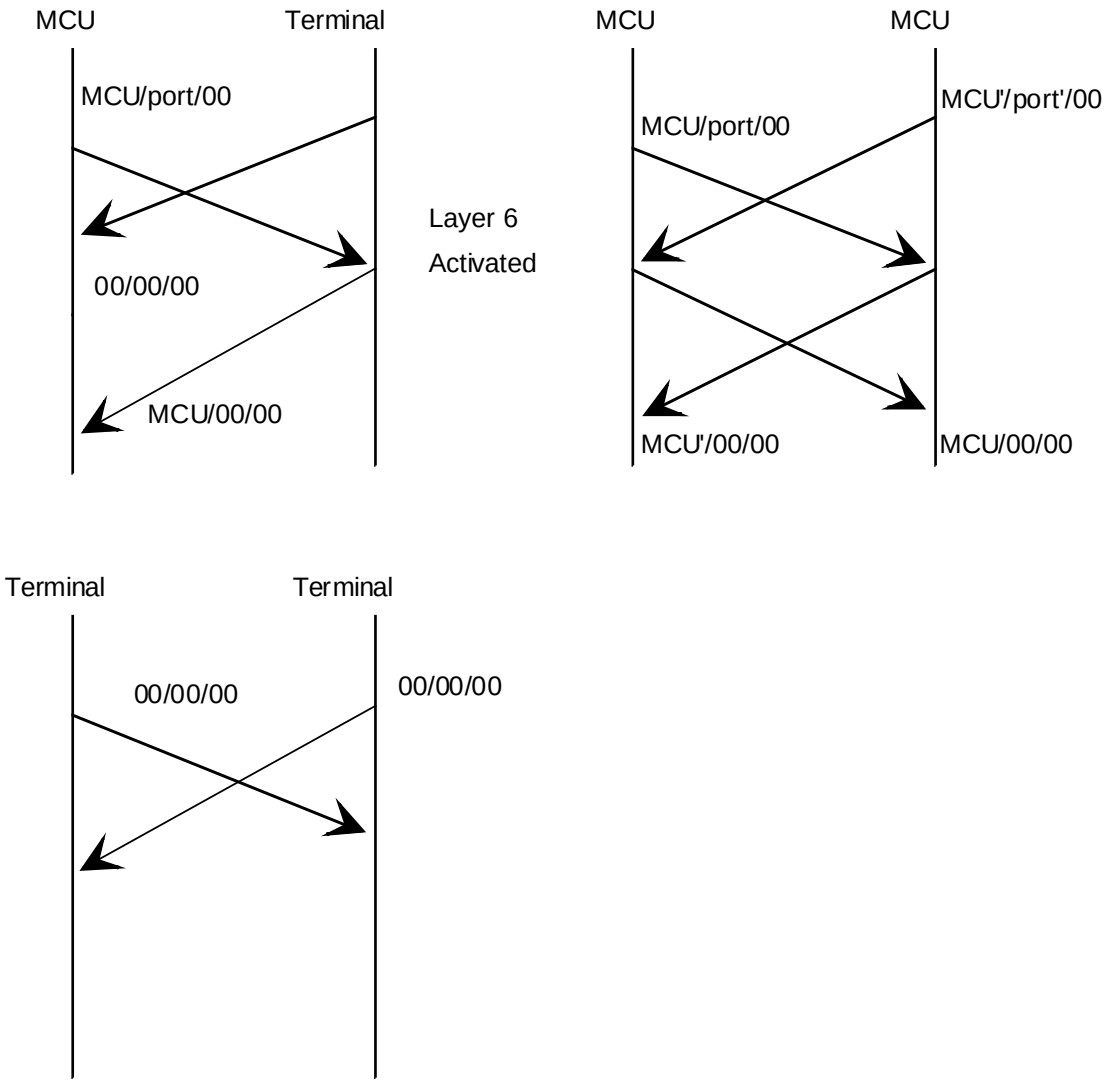


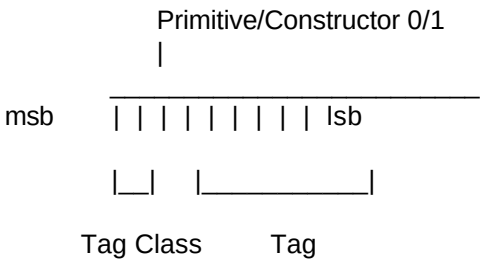
Figure B.24: Address allocation procedure

B.10.6 Layer 6

B.10.6.1 Coding of messages

At layer 6, the messages are encoded, according to CCITT Recommendation X.209 [23], in the Identifier, Length, Content (ILC) form.

An CCITT Recommendation X.209 [23] Identifier byte is of the form:



In the above diagram the bits are allocated as follows:

Tag class: defines the type of identifier -
01 Application wide, e.g. unique to audio/video conferencing message repertoire;
10 Context specific, e.g. unique within a part of a message.

Primitive: single ILC.

Constructor: nested ILC(s) e.g. IL{(ILC)(ILC)}.

NOTE 1: Maximum of 2 levels of nesting are recommended.

Tag: uniquely defines the identifier (according to its class).

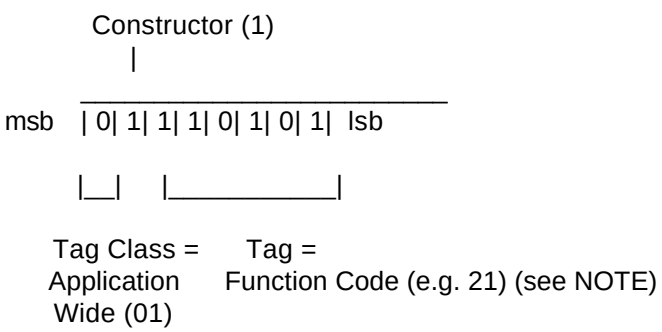
NOTE 2: The 5 bits available for tagging allow 30 unique values. Values higher than 30 require the use of the "extended form" of tagging.

All messages contain the following: function code, destination address, source address.

Those messages which include data shall also have an information field.

B.10.6.2 Function code

The CCITT Recommendation X.209 [23] facility of "tagging" an Identifier allows the function code of each message to be placed in the tag of the overall message Identifier, i.e. in the first byte, as shown in the following example:



NOTE: For function codes greater than 30, the tag is set to 11111 which indicates that an extension byte(s) follows. Extension byte(s) cater for tags greater than 30. The last extension byte has msb bit 8 set to zero.

B.10.6.3 Address fields

The contents of the layer 6 destination and source fields are 3 octets long and are encoded as shown below:

Destination: identical to the layer 3, octets 1 and 2.

NOTE: Destination has no routing function but is retained in layer 6 for possible future use.

Source:

1st Byte (MCU)	2nd Byte (TML)	Source
00	00	Point to point
<MCU>	<TML>	Specific TML
<MCU>	00	Specific MCU

Byte 3: the third byte allows sub-addressing e.g. participant number or microphone number. Set to zero when not used. The Identifier bytes for destination and source can be defined uniquely since, from subclause B.10.6.1, both are of class: context specific, and both are always of type: primitive.

CCITT Recommendation X.209 [23] tags are allocated as shown, giving Identifier bytes for each field as follows:

Destination (tag 0) identifier has value 80H
Source (tag 1) identifier has value 81H

Annex C (normative): Frame structure at 64 kbit/s for multimedia applications

The framestructure to be used, based on prETS 300 144 [5], is composed of either:

- 64 kbit/s (mode 0, mode 1);
- 56 kbit/s + 8 kbit/s (mode 2); or
- 48 kbit/s + 16 kbit/s (mode 3).

The initial mode (default) is assumed to be mode 2, i.e. 56 kbit/s + 8 kbit/s.

Annex D (normative): Procedures for the handling of group 3 facsimile signals

D.1 Introduction

This annex details the procedures to be adopted for the handling of facsimile signals within an audioconference. At the present time, information is given solely for group 3 facsimile.

D.2 Choice of facsimile machine

The machine should be a standard group 3 facsimile machine adapted to operate in leased line mode. Since group 3 machines were designed for point-to-point operation, it shall be necessary for multipoint operation to modify the signalling protocol between facsimile machines. Therefore, for correct operation, the type of facsimile machine chosen for this application should be capable of using the non-standard facilities signals as defined in CCITT Recommendation T.30 [8]. In addition, the IPA should be programmed according to the call set-up facilities at the specific facsimile machine.

D.3 Operation of facsimile machine

To use the facsimile meeting aid, the user shall load a document (1 or more pages) in the facsimile machine and press the "transmit" button. The facsimile machine shall signal this fact to its IPA which shall request the use of the data channel. When granted, the IPA continues signalling with the facsimile machine, and with the receiving IPAs for the purposes of parameter exchange.

On obtaining indications from the receiving IPAs that they have completed signalling procedures with their attached facsimile devices, the sending IPA shall enable the sending facsimile machine to transmit the first page. This data is received by the IPA and formatted into HDLC frames. These are transmitted on the data channel to the MCU (or ACT in point-to-point configuration). The MCU shall forward the data to all receiving IPAs.

When the end-of-page is signalled by the sending facsimile machine, this fact shall be relayed to all receiving IPAs by means of the message channel. Each receiving IPA then completes end-of-page signalling with its own facsimile machine and then transmits an indication of this to the sending IPA. If the sending IPA has more pages to transmit, it shall wait for responses from all receiving IPAs.

D.4 Signalling and data

D.4.1 Facsimile interface

The connection from the facsimile meeting aid to the facsimile IPA shall be a 2-wire analogue telephone connection. This interface shall be operated according to CCITT Recommendations T.4 [9] and T.30 [8] which specify V.21 modulation (300 bit/s) to be used for signalling; and CCITT Recommendation V.29 [28] (7 200 or 4 800 bit/s) to be used for facsimile data.

In this application, CCITT Recommendation V.29 [28] at 7 200 bit/s shall be used to provide transmission over the 8 kbit/s channel available. If required, there may be the option to operate at 4 800 bit/s in the event of high error rates.

D.4.2 Facsimile signalling (CCITT Recommendation V.21)

For a minimum interworking capability, the IPA should support a limited sub-set of the CCITT Recommendation T.30 [8] facsimile signalling protocols, operating in leased line mode. The binary coded signals defined in CCITT Recommendation T.30 [8] are used. The following messages should be supported by the IPA according to CCITT Recommendation T.30 [8]:

Initial identification:

NSF Non-standard facilities request (optional);
CSI Called subscriber identification (optional);
DIS Digital Identification Signal.

Command to receive:

NSC Non-standard facilities response (optional);
TSI Transmitting subscriber identification (optional);
DCS Digital command signal.

Pre-message response signals:

CFR Confirmation to receive.

Post message commands:

MPS Multi-page signal;
EOP End of procedures.

Post-message responses:

MCF Message confirmation.

Other line control signals:

DCN Disconnect.

The use of these signals is described in detail in subclause 4.6.2 of this I-ETS.

D.4.3 Facsimile data (CCITT Recommendations V.29/V.27ter)

The data phase of facsimile operation, defined by CCITT Recommendation T.4 [9], is transmitted according to CCITT Recommendation V.29 [28] (or V.27ter) and can be divided into four phases as follows:

V.29 Training	Modem training sequence.
V.29 TCF	Request training confirmation.
V.29 data	Facsimile message coded according to CCITT Recommendation T.4 [9].
V29 RTC	Return to control (end of page) indication in CCITT Recommendation T.4 [9] data.

D.4.4 Facsimile Interface and Protocol Adaptor (IPA)

The facsimile IPA shall be used to adapt CCITT recommended Group 3 facsimile signalling and data to the Audioconference system. It provides an "Interface A" to its attached meeting aid in the form of a two wire analogue line and an "Interface B" to the ACT. This second interface B is the responsibility of the equipment designer.

The facsimile IPA shall use the 8 kbit/s teleconference data channel, in transparent mode, to transfer facsimile data from the sending meeting aid, via the MCU, to FAX IPAs in other ACTs which shall transmit it to their attached facsimile meeting aids. The data arriving from the facsimile machine at a constant 7 200 or 4 800 bits/s shall be assembled into HDLC frames, 1 024 bits in length, by the IPA and transmitted on the 8 kbit/s data channel.

At the receiving IPA, HDLC frames are received and their contents transmitted on interface A to the attached facsimile meeting aid. CRC errors in the incoming data may be logged but their contents are, nevertheless, transmitted to the fax. Forward error correction is considered unnecessary as the coding scheme for group 3 facsimile is designed for use on the General Switched Telephone Network (GSTN) with error rates much higher than those which are encountered on digital 64 kbit/s links.

The IPA may be considered to consist of two parts; a modem and a controller. The modem may consist of a facsimile modem, an HDLC controller to provide the HDLC framing formatting for the CCITT Recommendations V.21/T.30 [8] facsimile signalling between the facsimile machine and the IPA, and an HDLC controller to provide the HDLC framing for the data to be transmitted on the data channel. The controller provides the means of implementing the signalling protocols between the facsimile IPA at the sending ACT and the receiving ACTs.

D.4.5 Message channel usage

Use of the message channel required for meeting aids is defined in Annex B, under the heading facility 18 "Transmission of meeting aid information (using 8 kbit/s channel)". The messages required are:

REQUEST FAX	(RFAX)
REQUEST FAX ACKNOWLEDGE OK	(RFAXAOK)
REQUEST FAX ACKNOWLEDGE NOT OK	(RFAXANOK)
CONNECT FAX TO DATA CHANNEL	(CFAXDC)
FAX CONNECTED TO DATA CHANNEL	(FAXCDC)
FAX HANDSHAKE	(FAXMAH)
DISCONNECT FAX FROM DATA CHANNEL	(DFAXDC)
FAX DISCONNECTED FROM DATA CHANNEL	(FAXDDC)

By using the message channel to convey any backwards information from the receiving to the originating facsimile machine, the 8 kbit/s data channel can be reserved for the unidirectional distribution of the facsimile data.

D.5 Adaptation of Group 3 facsimile procedures

Here the procedures used to adapt Group 3 facsimile to the teleconference environment are described.

D.5.1 Leased line mode operation

Current CCITT Recommendations for Group 3 facsimile specify procedures for transmission on the GSTN (CCITT Recommendation T.30 [8]). Briefly the procedures are divided into five separate and consecutive phases:

Phase A	-	Call set up;
Phase B	-	Pre-message procedure for identifying and selecting the required facilities;
Phase C	-	Message transmission;
Phase D	-	Post message procedure including end-of-message and confirmation and multi-document procedures;
Phase E	-	Call release.

No procedures are specified for transmission over a dedicated line such as a leased line or the connection from facsimile meeting aid to the facsimile IPA in the teleconference ACT. Many commercially available facsimile machines do provide for such procedures. This so called "Leased Mode Operation" replaces the Phase A call set up with the transmission of a tonal Procedure Interrupt Signal (PIS) as defined in CCITT Recommendation T.30 [8] (462 Hz ± 1,5 Hz for 3 seconds minimum).

This is necessary as the Phase B pre-message procedures are initiated by the called side according to CCITT Recommendation T.30 [8]. Phase E call release is not required. Phases B to D operate as specified in CCITT Recommendation T.30 [8].

Data transfer between two facsimile machines operating in this leased line mode is as given in figure D.1.

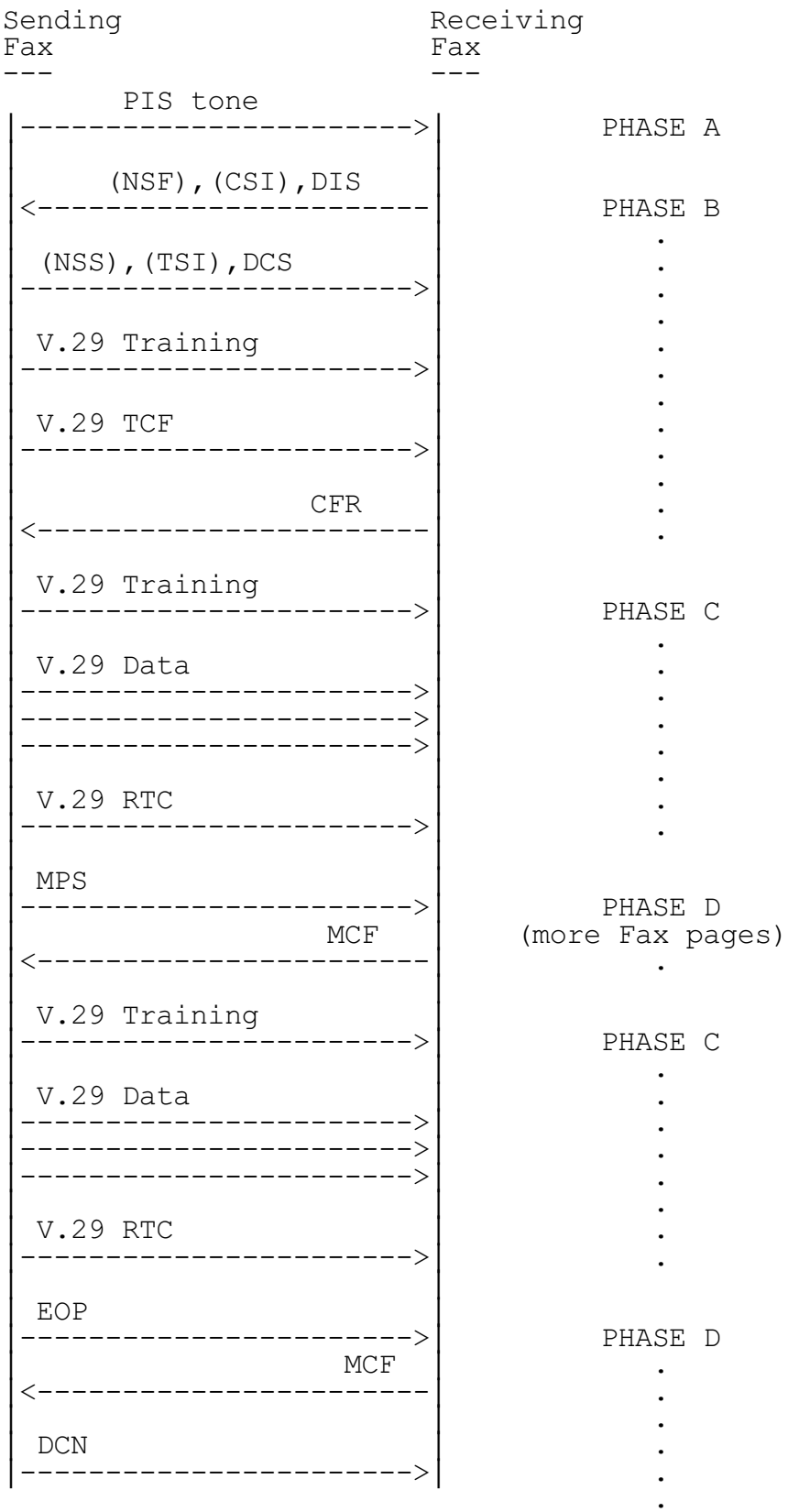


Figure D.1: Data transfer between two facsimile machines

Unless otherwise indicated, the signals are binary coded HDLC frames according to CCITT Recommendation T.30 [8], as described in subclause D.5.2. Signals in parentheses are optional. CCITT Recommendation V.29 [25] signals are described in subclause D.5.3.

D.5.2 Protocol operation in the Teleconference environment

This subclause describes how the various phases of leased line mode facsimile operation are adapted by the IPA to the Teleconference signalling protocols for meeting aids (facility 18 in Annex B).

The description of each phase should be read in conjunction with the scenario show in figure D.2.

NOTE: Letters A to L in margins of figure D.2 refer to subclause D.6.4

PHASE A:

Sending

The IPA receiving the tone (sending IPA) requests use of the data channel. When this has been granted it shall enter phase B.

Receiving

A receiving IPA, on receiving the CFAXDC transmits the PIS tone to the receiving facsimile and enters phase B.

PHASE B:

Receiving

A receiving IPA receives the initial identification signal from its attached fax (i.e. (NSF), (CSI), (DIS)). This is relayed to the sending IPA using a FAXMAH message on the message channel. On receiving the FAXMAH reply from the sending IPA the signalling contained therein is sent to the attached fax (i.e. (NSS), (TSI), (DCS)), followed by the V.29 modem training sequence and the V.29 TCF (Training check) command. The fax should then reply with CFR (Confirmation to receive) response indicating that pre-message procedures have been completed and that message transmissions may commence. This signal is sent to the sending IPA as a FAXMAH message and the receiving IPA enters phase C.

Sending

When the sending IPA has received initial identification signals from all receiving IPAs (i.e. (NSF), (CSI), (DIS) - contained in FAXMAH messages) it forms a composite initial identification signal for transmission to the sending fax. The reply from the fax (i.e. (NSS), (TSI), (DCS commands)) is returned to the receiving IPAs in a FAXMAH message. The V.29 modem training sequence followed by the V.29 TCF message is then received from the sending fax. When FAXMAH messages containing CFR responses have been received from all receiving IPAs a CFR response is sent to the sending facsimile and the sending IPA enters phase C.

PHASE C:

Sending

On entering phase C the sending IPA receives the V.29 training sequence, followed by V.29 data. The start of the V.29 data is identified by receipt of an EOL synchronising sequence as defined by CCITT Recommendation T.4 [9]. The data received is formatted into frames of 1 024 bits in length. These frames are transmitted on the teleconference data channel at 8 kbit/s as described in subclause 4.5.4. On receipt of an RTC sequence in the V.29 data stream from the facsimile, the sending IPA enters phase D.

NOTE: The RTC sequence is sent on the data channel to receiving IPAs.

Receiving

In phase C a receiving IPA waits to receive frames from the data channel on the muldex interface. The data of each frame received is transmitted to the receiving fax (including those received with CRC errors).

When the RTC sequence is detected in the data stream this is transmitted to the fax and the IPA enters phase D.

PHASE D (more pages):

Sending

The IPA shall receive a MultiPage Signal (MPS) command from the fax. This is sent in a handshake message to the receiving IPAs. When a FAXMAH message containing a Message Confirmation (MCF) response has been received from all receiving IPAs, an MCF response is sent to the fax. The sending IPA then returns to phase C to handle the data for the next page.

Receiving

A receiving IPA awaits the MPS (or EOP) command in a FAXMAH message from the sending IPA. The MPS command is sent to the fax and the MCF response is sent to the sending IPA in a FAXMAH message. The IPA then returns to phase C to receive the next page.

PHASE D (end of procedures):

Sending

The IPA shall receive an EOP command from the fax. This is sent in a FAXMAH message to the receiving IPAs. The sending IPA replies directly to the fax with an MCF command. On receiving a Disconnect (DCN) command from the fax the sending IPA enters phase E.

Receiving

An IPA receives the EOP command in a FAXMAH message. This is transmitted to the receiving facsimile. When the MCF response is received from the fax a DCN command is sent to the fax and the receiving IPA enters phase E.

PHASE E:

Sending

The IPA sends a DFAXDC message to the TCU to indicate that it should release the data channel. This is broadcast by the TCU to all other ACTs. The fax requires no phase E signalling.

Receiving

The IPA waits for a DFAXDC message from the TCU. It then replies with a FAXDDC indicating that disconnection procedures are complete. Again the fax requires no phase E signalling.

It should be noted that certain parts of the CCITT Recommendation T.30 [8] signalling procedures are not supported by the facsimile IPA. These are detailed in the following paragraphs.

The use of the command to send (DTC, CIG and NSC commands) is not allowed. This is used when a calling station wishes to receive from a called station. This type of polling by the receiver is not appropriate to the multipoint broadcast configuration.

Some responses from a receiving facsimile which initiate recovery procedures according to CCITT Recommendation T.30 [8] shall result in termination of transmission to that facsimile. This is because the time taken to initiate the recovery procedures would delay the sending facsimile, and would result in timeout of other receiving facsimiles in the multipoint configuration. This should occur extremely infrequently. These responses include :

FTT	- rejection of the training signal;
RTP,RTN	- post message responses requesting re-training;
PIP,PIN	- post message responses requesting operator intervention.

D.5.3 Facility negotiation and data transmission rate

According to CCITT recommended facsimile signalling procedures, two communicating facsimiles shall negotiate the facilities to be used during data transmission. The DIS and NSF signals characterise the standard and non-standard capabilities of the called apparatus. The calling apparatus examines this data and replies with DTC and NSS commands indicating precisely which facilities it shall use.

In multipoint it is possible that the capabilities of the receiving facsimile machines are not all the same. Therefore, on receiving the initial identification signals (DIS and optionally CSI and NSF) from the receiving IPAs the sending IPA shall form a composite initial identification for transmission to the sending facsimile.

The following paragraphs describe the scheme for forming the composite initial identification signal in order to satisfy varying capabilities of the receiving facsimile machines.

D.5.3.1 Non-standard facilities

Non-standard facilities frames contain a facsimile information field comprising at least 2 octets. The first octet contains the CCITT country code defined in CCITT Recommendation T.35 [26]. The second octet typically identifies a particular manufacturer of facsimile apparatus. The rules for forming the optional NSF signal to be transmitted to the sending facsimile are as follows:

a) if all received NSF signals are identical then the signal is included without modification in the initial identification sent to the to the sending facsimile;

b) except in the cases described in rule c) below, if the received NSF signals differ from each other, or if any of the initial identification signals do not contain an NSF, then the NSF signal is omitted from the composite initial identification signal;

c) where the NSF signals received are from the same country and/or manufacturer, and the IPA has knowledge of the non-standard facilities specified, then the IPA may use this knowledge to form a composite NSF signal to be included in the initial identification signal.

D.5.3.2 Digital identification signal

This signal specifies the CCITT recommended facilities of the receiving facsimiles. The following paragraphs refer to the coding of the DIS message in table 2 of CCITT Recommendation T.30 [8]. They describe the values to be used in the composite DIS signal given the range of values present in the individual DIS signals received from the receiving facsimiles. However, that some combinations are incompatible.

Data coding

Shall be CCITT Recommendation T.4 [9] hence: bits 1-8 = 00000000
bits 9,10 = X1

Data Signalling Rate

	bits 11,12	
a)	00	V.27ter fallback
b)	01	V.27ter
c)	10	V.29
d)	11	V.27ter and V.29

If both c) and either a) or b) are present then it shall be impossible to satisfy the facilities in all the receiving facsimiles. Some can only support V.27ter (2 400 or 4 800 bits/s) whilst others support only V.29 (7 200 or 9 600 bits/s). In this case the transmission shall be aborted. Otherwise, the composite value is chosen from those present with the above order of precedence (i.e. a) if present, else b) if present, etc.).

See also subclause D.5.3.3 on the selection of the data signalling rate with relation to data channel capacity.

Vertical Resolution

	bit 15	
a)	0	3,85 lines/mm
b)	1	7,7 lines/mm

The lower resolution value a) is used if present in any of the signals. Otherwise the higher resolution value is used.

Recording Width Capability

	bits 17,18	
a)	00	1 728 pels/215 mm scan line
b)	10	2 048 pels/255 mm scan line AND 1 728 pels/215 mm scan line
c)	01} 11}	2 432 pels/303 mm scan line AND 2 048 pels/255 mm scan line AND 1 728 pels/215 mm scan line

The composite value is chosen from those present with the above order of precedence (i.e. a) if present, else b) if present, etc.)

Maximum Recording Length Capability

	bits 19,20	
a)	00	A4 (297 mm)
b)	10	A4 (297 mm) and B4 (364 mm)
c)	01	Unlimited

Again the composite value is chosen from those present with the above order of precedence.

Minimum Scan Line Time Capability

	bits 21,22,23	
a)	000	20 ms
b)	001	40 ms
c)	010	10 ms
d)	100	5 ms
e)	011	10 ms if vertical resolution = 3,85 L/mm 5 ms if " " = 7,7 L/mm
e)	011	10 ms if vertical resolution = 3,85 L/mm 5 ms if " " = 7,7 L/mm
f)	110	20 ms if vertical resolution = 3,85 L/mm 10 ms if " " = 7,7 L/mm

g)	101	40 ms if vertical resolution = 3,85 L/mm 20 ms if " " = 7,7 L/mm
h)	111	0 ms

The largest minimum scan time present is determined. If any of configurations a), b), c) or d) are present then the one which represents the largest minimum scan present is selected as the composite value. If none of the configurations a) to d) is present then the configuration e) to h) which represents the largest minimum scan time present is selected as the composite value.

D.5.3.3 Data transmission rate

According to CCITT Recommendation T.30 [8] the receiving facsimile may specify that it can receive using V.29 (9 600 or 7 200 bits/s), V.27ter (4 800 or 2 400 bits/s) or V.27ter fallback 2 400 bits/s only).

In teleconference we have a data channel capacity of 8 kbit/s precluding the use of the 9 600 bits/s rate. It is not, however, possible to specify in the signalling that the facsimile transmit at 7 200 bits/s. The facsimile apparatus itself is left to choose between 9 600 bit/s and 7 200 bits/s.

Most facsimile machines have the capability to set the maximum rate for transmission. This should be set to 7 200 bits/s if possible, if not to 4 800 bits/s. Failing this, the data field of the INIT_FAX message sent to the IPA from the TCU should indicate 4 800 bits/s. In this case the IPA shall modify the composite DIS signal sent to the sending fax to force it to transmit at 4 800 bit/s.

D.5.4 Timing considerations

CCITT Recommendation T.30 [8] defines timeout values for the different phases of operation of group 3 facsimile apparatus. In order for such apparatus to function correctly in the teleconference environment it is necessary that the delays imposed by the teleconference ACTs and MCUs do not cause these timeouts to be exceeded. Here we look at the critical sections of the protocol where a response to a facsimile meeting aid depends on signalling between two or more ACTs. The timer numbers refer to CCITT Recommendation T.30 [8]. Refer to the scenario where the start and end points of timeouts are indicated by letters in the right and left margins.

a) Transmitting fax - phase A (T1 = 35 s)

This is the time from transmission of the PIS tone (point A) to receiving all initial identification signals (point B).

b) Receiving fax - phase B (T2 = 6 s)
Time from transmission of the initial identification signal (point C) to receiving the command to receive (point D).

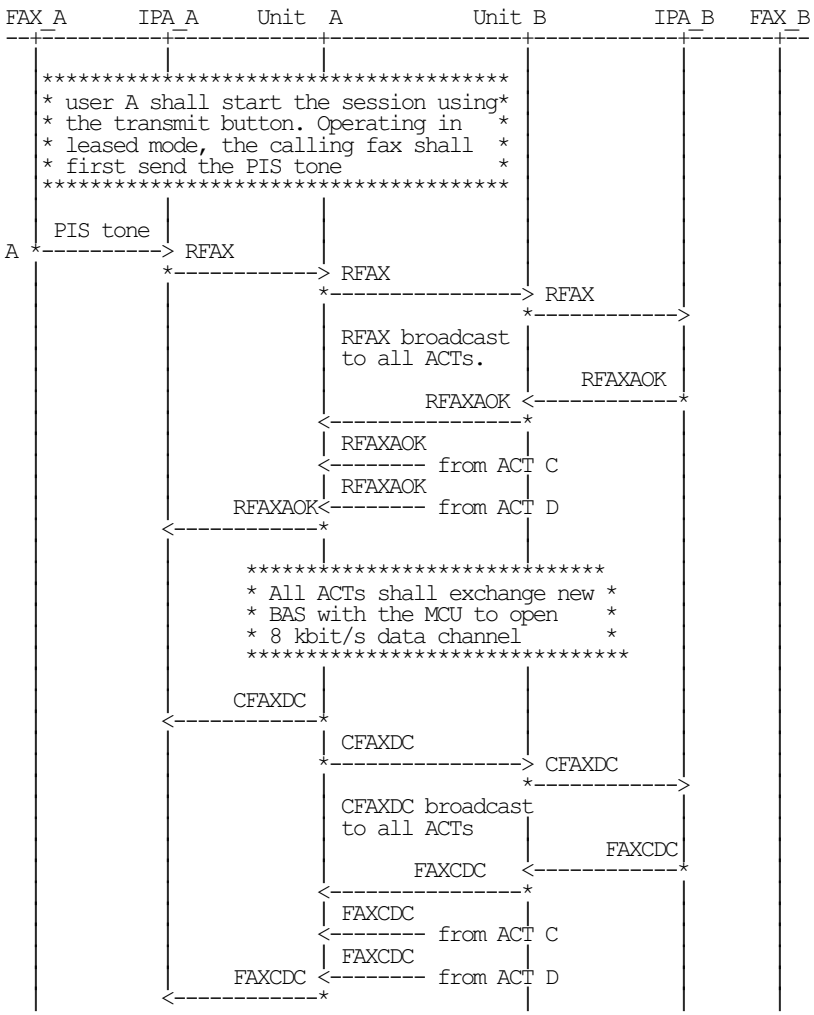
c) Transmitting fax - training (3 x T4 = 9 s)
Time from transmission of TCF (point E) to receipt of all CFRs (point F).

d) Receiving fax - phase C (T2 = 6 s)
Time from transmission of CFR (point G) to receiving V.29 training (point H).

e) Transmitting fax - phase D (T2 = 6 s)
Time from transmitting MPS command (point I) to receiving MCF response (point J).

f) Receiving fax - phase D (T2 = 6 s)
Time from receiving RTC in data stream (point K) to receiving MPS or EOP command (point L).

PHASE A - Multipoint Configuration



NOTE: Note that ACT C and ACT D not shown.

Figure D.2: Multipoint facsimile scenario - part 1

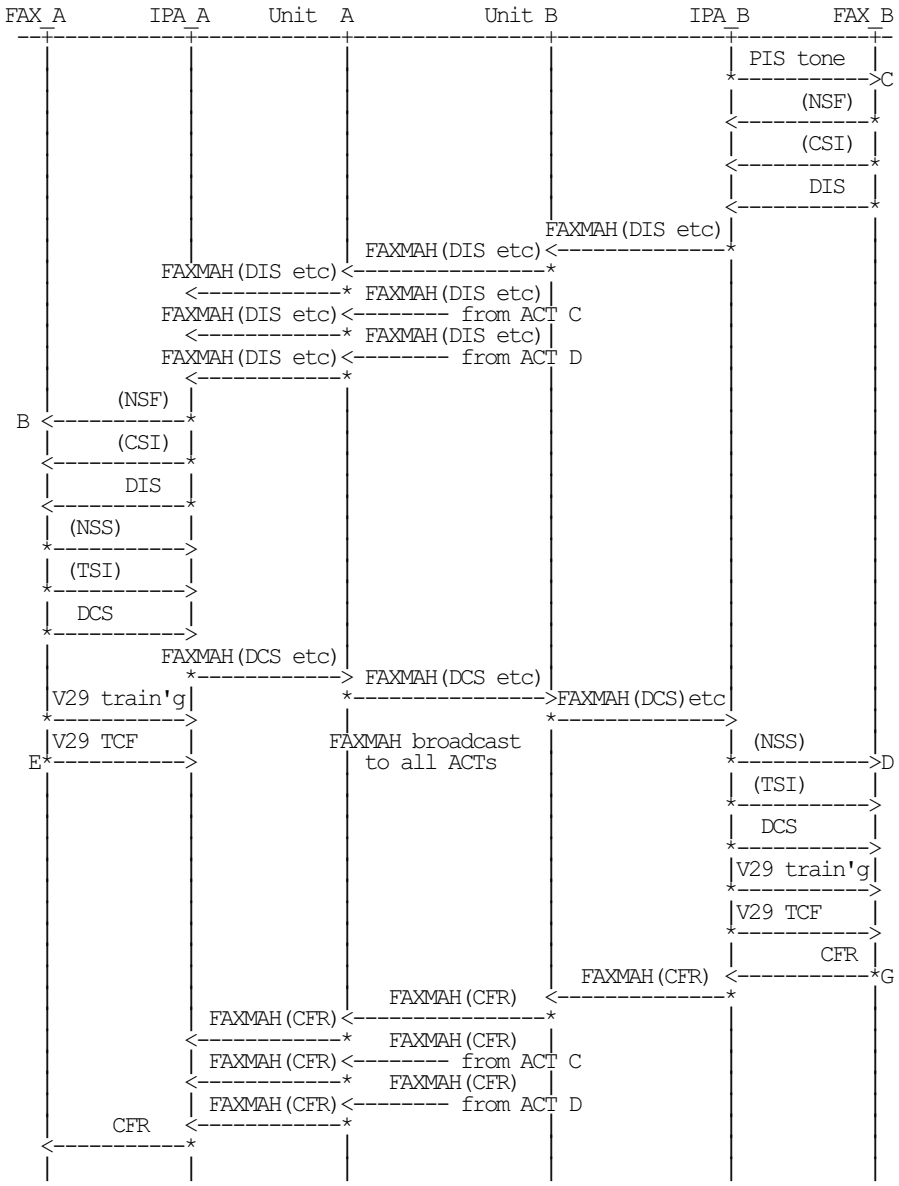


Figure D.2: Multipoint facsimile scenario - part 2

PHASE C & D (more pages) - Multipoint (note that ACT C and ACT D are not shown)

Message Channel Message channel

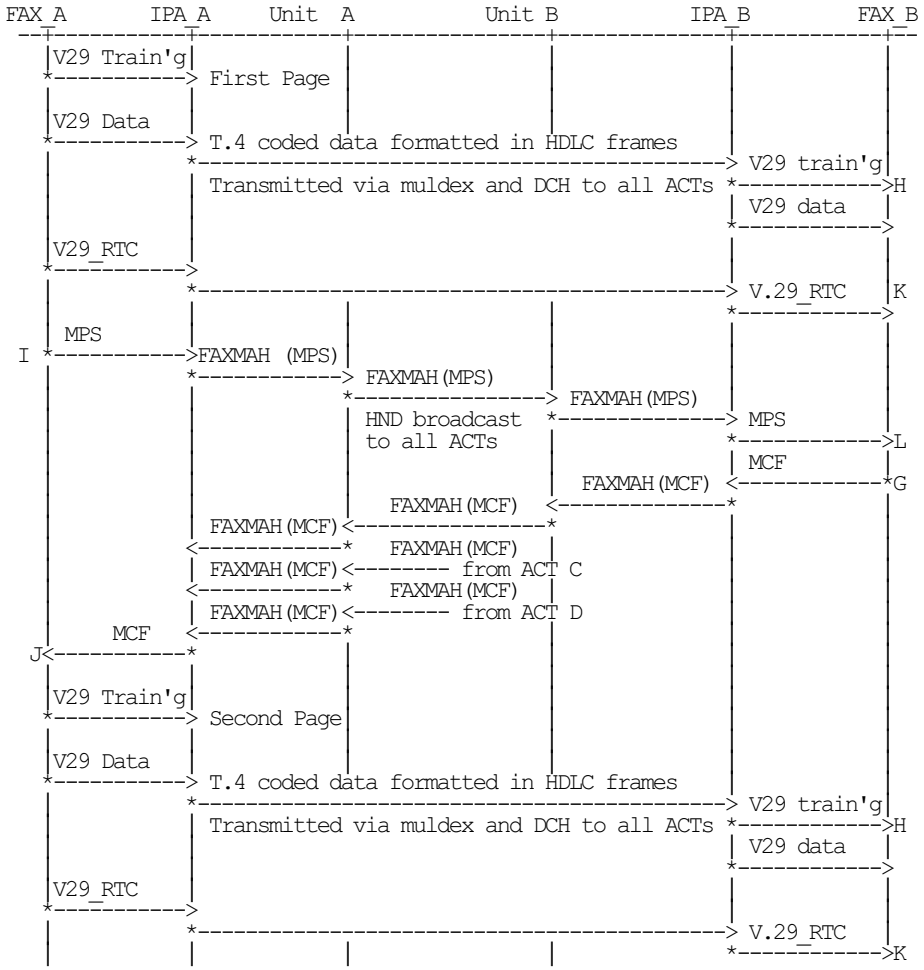


Figure D.2: Multipoint facsimile scenario - part 3

PHASE D & E - Multipoint (note that ACT C and ACT D are not shown)

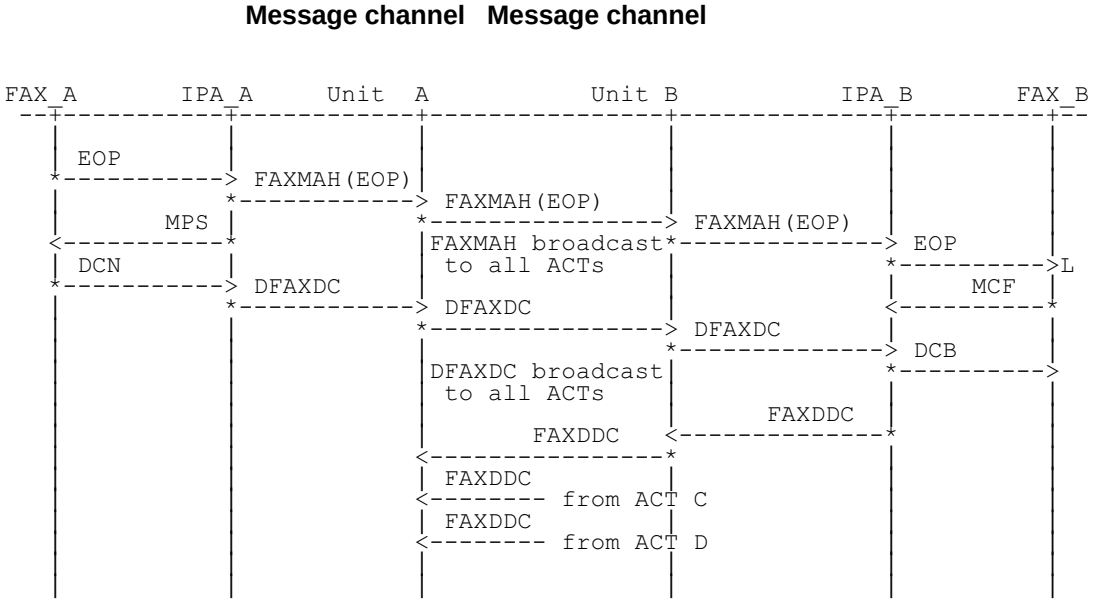


Figure D.2: Multipoint facsimile scenario - part 4

Annex E (normative): Procedures for the handling of Still Picture TV (SPTV) signals

E.1 Introduction

This annex details the procedures to be adopted for the handling of SPTV signals within an audioconference.

E.2 Choice of SPTV machine

There are currently a number of SPTV devices available which may not be compatible. For use in audioconference, the SPTV chosen should have a digital interface. Within any one conference, SPTVs using the same coding scheme and data transmission method shall be used.

Consideration should be given to the screen update direction and progress indication.

The manner in which the picture updates on the receiving end display is influenced by a number of factors.

Textual information would, logically, be updated from top to bottom whereas a landscape might sensibly be updated from bottom to top because that is the way that the eye might take it in.

As an alternative, the screen can be flash updated at the end of transmission, where it is found that a slowly updating picture is a distraction. Along with this update mode goes the possible requirement for control from the transmitting equipment of the actual instant that the update occurs.

It may also be that the chosen algorithm for picture compression dictates the update mode.

E.3 Operation

The SPTV enables the exchange of stationary colour images derived from a colour camera or electronic generator. Dependent upon the required quality of the picture and the update time required, a number of different picture resolutions and coding methods may be provided.

To increase the usefulness of the equipment, a number of ancillary units may be connected, e.g. a hard disk unit for the permanent storage of images.

In a multipoint environment the SPTV image may be displayed at all locations at the same time.

To use the SPTV meeting aid the user shall capture a picture and send it. In the absence of an incoming picture from another SPTV in the conference, the information displayed locally shall be transmitted to other connected SPTVs. If another meeting aid is currently in use, the ability to send shall be inhibited.

E.4 SPTV communication

For a minimum interworking capability, the same encoding and data transmission formats shall be chosen. The SPTV is the shared user of the transparent channel (normally 8 kbit/s located in bit 7 of each octet of the connected 64 kbit/s stream) defined in the main Recommendation. The SPTV is arranged such that it can only transmit when it receives the correct interface conditions. Under these circumstances, the locally generated image is displayed directly on the originating screen. The information transfer is therefore two way alternate. In a multipoint environment, the MCU is designed such that information from an active SPTV is transmitted without modification to all other connected SPTVs.

After completion of transmission by one terminal, another terminal may start transmission.

Negotiation for the use of the SPTV channel may take place in a formal way: the user starts by operating the "send" control on his equipment. The negotiation for the use of the data channel is then carried out automatically as described in Annex B. As long as no other use is made of the data channel, the use of the channel is permitted.

E.5 Signalling and data

E.5.1 SPTV interface

The connection from the SPTV meeting aid to the SPTV IPA shall be an CCITT Recommendation X.21 [21] leased line.

E.5.2 SPTV signalling

SPTV to IPA

Quiescent

When the SPTV equipment is neither receiving nor transmitting pictures, the DTE (SPTV) and the DCE (IPA) should remain in the "Ready" state. This is indicated by t = 1, r = 1, i = off, c = off.

Data channel request

When the DTE wishes to send a picture it shall issue a data channel request. It does this by giving out c = on, t = flags.

Data channel grant

If the data channel is granted then the DCE gives back i = on, r = 1. To ensure that the receiver is ready and that the channel has settled, flags should continue to be sent for a further period (typically 5 seconds). At this point, it would change from flags to data.

If the data channel is not available then the DTE shall time out (typically 10 seconds) and revert to the quiescent state.

SPTV receive

The DCE shall signal to the DTE that the channel is being opened to it by going to r = 1, i = on. If the DTE is able to receive the picture, it shall signal back t = 1, c = on. Once all receiving DTEs have responded in this way the data channel grant is communicated back to the sending DTE.

Call clearing

At the conclusion of picture transmission the sending DTE shall give out t = 1, c = off. This initiates a data channel relinquish procedure and at the receiving DTE's the DCE shall give r = 1, i = off. In response, the DTEs shall give back t = 1, c = off. This shall be communicated through the system to the MCU and, when all receiving DTEs have acknowledged close-down, the condition r = 1, i = off shall be communicated to the sending DTE.

NOTE: When the DTE is not plugged to its IPA, measures should be taken to ensure that the condition t = 0, c = off is communicated to the DCE to indicate that the service is not available.

E.5.3 SPTV data

The exact method of data transmission depends upon the coding algorithm used.

Since the equipment shall be used in broadcast mode, a full CCITT Recommendation X.75 [22] protocol for error control is not possible. The data should be blocked in HDLC format and the block size chosen having due consideration for the compression algorithm used. If necessary, forward error correction may be employed.

This format may apply to the interface A of figure 1 of this I-ETS as well as to the transmission channel.

E.5.4 SPTV Interface and Protocol Adaptor (IPA)

After an ACT is connected to the conference, the SPTV IPA shall use the 8 kbit/s data channel, to transfer SPTV data from the sending meeting aid, via the MCU (if any), to SPTV IPAs in other ACTs which shall transmit it in turn to their attached SPTV meeting aids.

In some cases, the IPA shall adapt the data format from that used by the SPTV to one suitable for transmission over the SPTV channel. In the case of the data format described above such adaptation is unnecessary.

The IPA shall supply a 8 kHz clock to the SPTV, derived from the 64 kbit/s network timing.

E.5.5 Message channel usage

Use of the message channel is required for the SPTV. Use of the message channel required for meeting aids is defined in Annex B under the heading of "Facility 18 Transmission of meeting aid information using 8 kbit/s data channel". The messages required are:

REQUEST SPTV
REQUEST SPTV ACKNOWLEDGE OK
REQUEST SPTV ACKNOWLEDGE NOT OK
CONNECT SPTV TO DATA CHANNEL
SPTV CONNECTED TO DATA CHANNEL
SPTV MEETING AID HANDSHAKE
DISCONNECT SPTV FROM DATA CHANNEL
SPTV DISCONNECTED FROM DATA CHANNEL

The use of the SPTV MEETING AID HANDSHAKE message is not foreseen for this I-ETS.

By using the message channel to convey any backwards information from the receiving to the originating facsimile machine, the 8 kbit/s data channel can be reserved for the unidirectional distribution of the SPTV data.

E.5.6 Coding algorithms and update times

The screen resolution is typically 575 displayed lines each of 702 displayed pixels (conforming to CCIR Recommendation 601). Each pixel consists of a 16 bit value containing luminance (Y) and colour difference information (U and V).

A full display contains 6,4584 M/bits of data. If transmitted in uncompressed form over an 8 kbit/s channel, this would take over 13 minutes.

The transmission time can be reduced in several ways from simply reducing special resolution to complex transform or predictive compression algorithms.

Tabulated below are transmission times for various degrees of compression.

COMPRESSION ALGORITHM	TIME
No compression	13,5 minutes
Reduced U and V special resolution	7,1 minutes
Simple intra-frame DPCM	3,1 minutes
Recursive Binary Nesting (RBN)	50 s to 3 minutes depending on picture content and quality required.
Discrete Cosine Transform (DCT) used for photovideotex	3,5 sec for first pass, 35 for full resolution

E.6 Interworking with telewriter

In some conference situations, it may be desired to superimpose the image from a telewriter on a picture displayed on an SPTV screen. In such circumstances, it is recommended that the telewriting part of the SPTV equipment conform to the principles described in Annex F.

E.7 Adaptation of SPTV procedures in multipoint environment

E.7.1 Protocol operation in the teleconference environment

Figure E.1 shows the message flows in a multipoint environment for the SPTV meeting aid.

Multipoint Configuration (note that ACT C and ACT D are not shown)

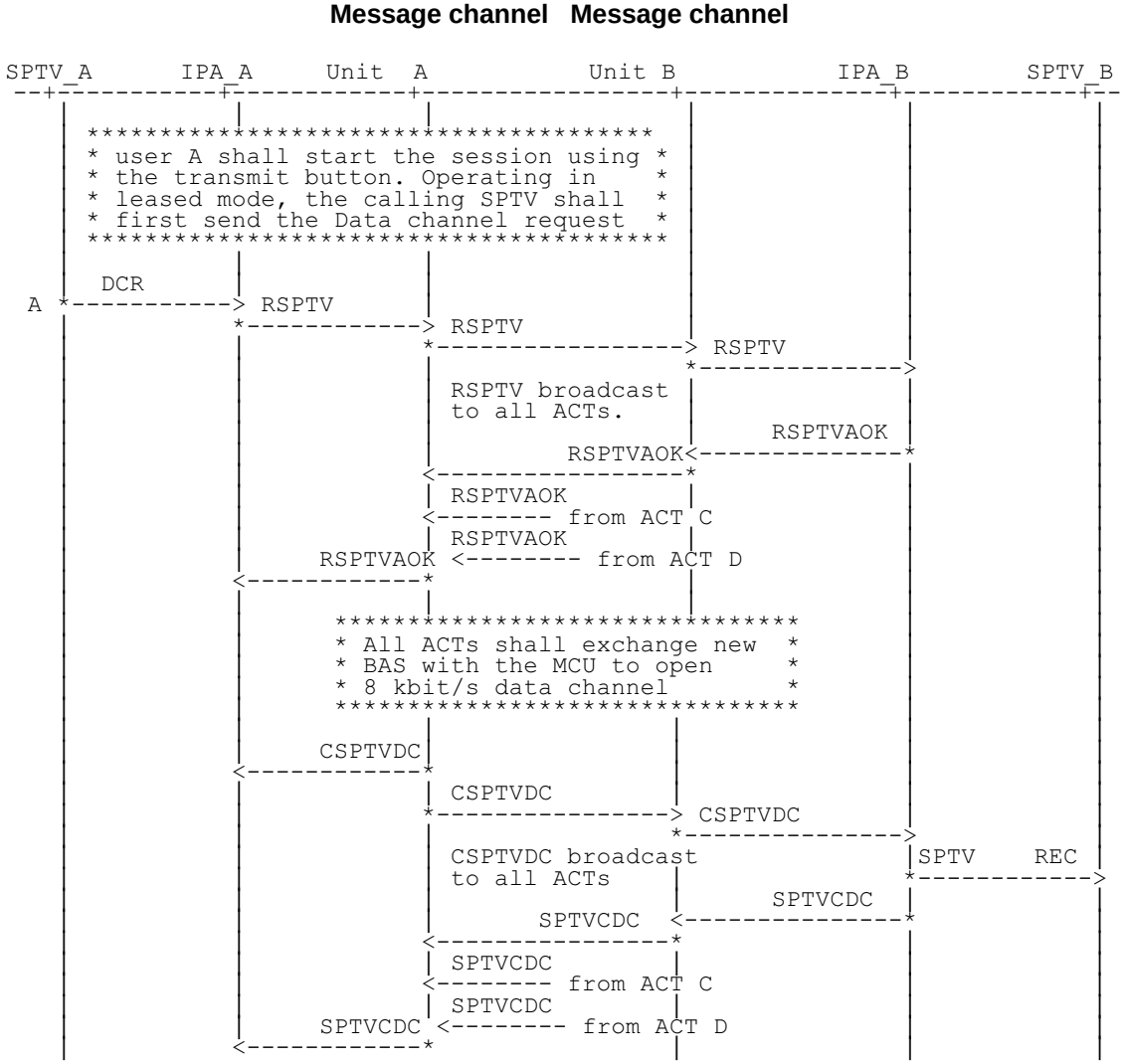


Figure E.1: Multipoint SPTV scenario - part 1

KEY:

DATA CHANNEL REQUEST	DCR
REQUEST SPTV	RSPTV
REQUEST SPTV ACKNOWLEDGE OK	RSPTVAOK
REQUEST SPTV ACKNOWLEDGE NOT OK	RSPTVANOK
SPTV RECEIVE	SPTV REC
CONNECT SPTV TO DATA CHANNEL	CSPTVDC
SPTV CONNECTED TO DATA CHANNEL	SPTVCDC

Multipoint (note that ACT C and ACT D are not shown)

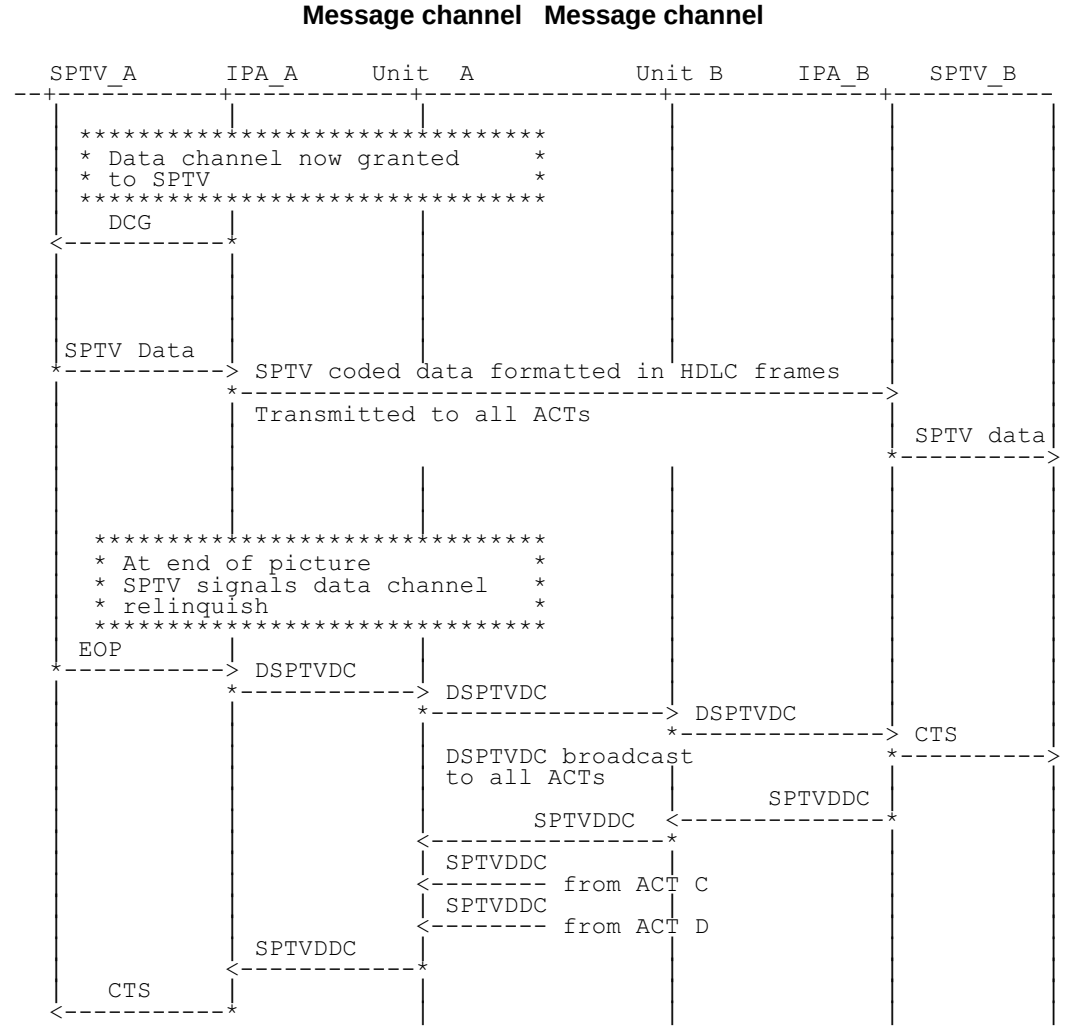


Figure E.1: Multipoint SPTV scenario - part 2

KEY:

DATA CHANNEL GRANTED	DCG
END OF PICTURE	EOP
DISCONNECT SPTV FROM DATA CHANNEL	DSPTVDC
SPTV DISCONNECTED FROM DATA CHANNEL	SPTVDDC
CLEAR TO SEND	CTS

Annex F (normative): Procedures for the handling of telewriter signals

F.1 Introduction

This annex details the procedures to be adopted for the handling of telewriter signals within an audioconference.

F.2 Choice of telewriter machine

There are currently a number of telewriter devices available which may not be compatible. A recommendation for the telewriter terminal equipment is given in CCITT Recommendation T.150. CCITT has identified the main types of coding; zone coding and differential chain coding. Within the Differential Chain Coding (DCC) there are two more alternatives: incremental mode and displacement mode. The displacement mode is also standardised in CEPT T/CD 6.2 and it is the mode suggested for this application. For selective erasure purposes the "colour transparent" attribute shall be selected.

F.3 Operation

The telewriter enables the exchange of handwritten information such as text, drawings, diagrams.

The input device may consist of a writing tablet, a writing pen and some softkeys to perform functions such as erasure and marker. The telewriting function has its own marker or cursor, to be controlled by the writing pen. This marker can be superimposed on the telewriting image.

In a multipoint environment, the telewriting image is displayed at all locations at the same time. All locations may contribute to the same image, one after another. Every location is able to erase the image.

Every location may activate the telewriting marker. Since the marker only remains visible as long as it is activated, only one marker at a time can be present in an image.

To use the telewriter meeting aid, the user shall press the writing pen. In the absence of an incoming signal from another telewriter in the conference, the information written and displayed locally shall be transmitted to other connected telewriters. If another telewriter is currently in use, the local writing pen shall be inhibited.

F.4 Telewriter communication

For a minimum interworking capability, the same encoding and data transmission formats shall be chosen. The telewriter is the exclusive user of a transparent channel of 800 bit/s located in bits 33 - 40 of the service channel defined in Annex C. The telewriter is arranged such that it can only transmit when it is not receiving an active signal from another telewriter. Under these circumstances, the locally generated image is displayed directly on the originating screen. The information transfer is therefore two-way alternate. In a multipoint environment, the MCU is designed such that information from an active telewriter is transmitted without modification to all other connected telewriters.

After completion of transmission by one terminal, another terminal may start transmission. The information sent may now be superimposed over the same image as that produced by the previous transmitter. In this way interaction of various terminals in one image can be obtained.

Such interactions include:

- creation of an image;
- modifying an image;
- erasure;
- activation of a marker.

Negotiation for the use of the telewriter channel may take place in a non-formal way: the user starts by using his input device, e.g. by transmitting a marker. As long as no active signal is received by the originator, the use of the channel is permitted.

F.5 Signalling and data

F.5.1 Telewriter interface

The connection from the telewriter meeting aid to the telewriter IPA shall be a CCITT Recommendation X.21 [21] leased line.

F.5.2 Telewriter signalling

There is no dedicated signalling.

F.5.3 Telewriter data

The exact method of data transmission is not specified. One proposed method is as follows:

- in the 800 bit/s channel, start stop transmission format is used. Each byte is transmitted as a serial data signal preceded by one start bit and followed by two stop bits. The byte plus the start and stop bits occupy 11 contiguous bits in the transmission signal. The two stop bits represent the obligatory minimum. A higher number of stop bits may occur if a new byte is not immediately available;

- if no new bytes appear, continuous stop bits are transmitted. The start bit has the binary value ZERO, the stop bit has the binary value ONE.

This format may apply to the interface A as well as to the transmission channel.

F.5.4 Telewriter Interface and Protocol Adaptor (IPA)

After an ACT is connected to the conference, and the telewriter data channel is established, no further dialogue is required between the IPA and the telewriter. The originating telewriter can simply continue transmission according to the telewriting coding rules.

The telewriter IPA shall use the 800 bit/s data channel, to transfer telewriter data from the sending meeting aid, via the MCU, to telewriter IPAs in other ACTs which shall transmit it in turn to their attached telewriter meeting aids.

In some cases, the IPA shall adapt the data format from that used by the telewriter to one suitable for transmission over the telewriter channel. In the case of the data format described above such adaptation is unnecessary.

The IPA shall supply a 800 Hz clock to the telewriter, derived from the 64 kbit/s network timing.

F.5.5 Message channel usage

Use of the message channel is not required for the telewriter.

F.5.6 Coding algorithms

Compatible coding algorithms shall be used. These are detailed in subclause F.5.3.

F.6 Interworking with SPTV

In some conference situations, it may be desired to superimpose the telewriting image on a picture displayed on an SPTV screen. In such circumstances, it is recommended that the telewriting part of the SPTV equipment conform to the principles described in this annex.

F.7 Adaptation of telewriter procedures in multipoint environment

If the simple protocol described in Clause F.5 is used, no specific difference exists between the point-to-point case and that of multipoint. The telewriter is the exclusive user of the 800 bit/s channel. Only one terminal is permitted to transmit at any one time. The transmitted information is broadcast to all ACTs connected to the MCU except the originator.

The only difference relates to the effect for the user in the case of simultaneous writing attempts. In the point-to-point situation this results in both writing tablets being temporarily disabled.

Negotiation on the use of the 800 bit/s channel may take place in a non-formal way via the channel itself: the user is permitted to write as long as no signals are being received. If another terminal has started a fraction of time earlier, the local terminal notices the received signal and interrupts its own sending action.

In the case of a two or more MCU conference each MCU may decide on the use of the 800 bit/s channel autonomously. As a consequence, MCUs may temporarily distribute signals from different originators. It may be assumed that this fact should soon be corrected by human intervention.

Annex G (informative): Procedures for handling of data transmission

Not specified.

Annex H (informative): Bibliography

The following texts are referred to for information by this I-ETS.

CCITT Recommendation V.27: "4 800 bits per second modem with manual equaliser standardised for use on leased telephone type circuits".

CCITT Recommendation V.27ter (1988): "4 800/2 400 bits per second modem standardised for use in the general switched telephone network".

CCITT Recommendation V.21 (1988): "300 bits per second duplex modem standardised for use in the general switched telephone network".

CCITT Recommendation T.150: "Telewriting terminal equipment".

CCITT Recommendation P.64, Annex A (1988): "Determination of sensitivity/frequency characteristics of local telephone systems to permit calculation of their loudness ratings".

History

Document history	
February 1993	First Edition
March 1996	Converted into Adobe Acrobat Portable Document Format (PDF)