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SERIES Q: SWITCHING AND SIGNALLING

Interworking of Signalling Systems – General considerations

INTERWORKING BETWEEN THE DIGITAL SUBSCRIBER SIGNALLING SYSTEM LAYER 3 PROTOCOL AND THE SIGNALLING SYSTEM No. 7: ISDN USER PART

Reedition of CCITT Recommendation Q.699 published in the Blue Book, Fascicle VI.6 (1988)

NOTES

1 CCITT Recommendation Q.699 was published in Fascicle VI.6 of the *Blue Book*. This file is an extract from the *Blue Book*. While the presentation and layout of the text might be slightly different from the *Blue Book* version, the contents of the file are identical to the *Blue Book* version and copyright conditions remain unchanged (see below).

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

SECTION 3

INTERWORKING BETWEEN DIGITAL SUBSCRIBER SIGNALLING SYSTEM No. 1 AND SIGNALLING SYSTEM No. 7

Recommendation Q.699

INTERWORKING BETWEEN THE DIGITAL SUBSCRIBER SIGNALLING SYSTEM LAYER 3 PROTOCOL AND THE SIGNALLING SYSTEM No. 7

ISDN USER PART

1 General

1.1 *Introduction*

This Recommendation defines the interworking relationship between the layer 3 functions and protocol of Digital Subscriber Signalling System No. 1 (DSS 1) and the ISDN User Part functions and protocol of Signalling System No. 7.

The interworking between the above two signalling protocols typically may occur in an ISDN local exchange and is specified in the context of a typical call in a pure ISDN or mixed ISDN/non-ISDN environment.

1.2 *Purpose*

The purpose of the Recommendation is:

a) to define how the layer 3 protocol of DSS 1 and Signalling System No. 7 ISDN User Part protocol should be used in combination with call control functions, to support the basic bearer service;

b) to provide a logical bridge between the abstract signalling information flows, which are used in the description of ISDN services, and the corresponding messages and elements of procedure of the ISDN User-Network Interface User Part protocols.

1.3 *Scope*

This Recommendation is aimed at defining the interworking relationship between the call control protocol of the Digital Subscriber Signalling System No. 1 and the ISDN User Part of Signalling System No. 7.

The Recommendation defines in detail the relationship between signalling information conveyed via the Digital Subscriber Signalling System No. 1 protocol and similar signalling information conveyed via the ISDN User Part of Signalling System No. 7. The above relationship is described within the context of supporting the provision of basic bearer service for a call within an ISDN or mixed ISDN/non-ISDN environment.

1.4 *Relationship to other Recommendations*

This Recommendation forms part of a set of interlocking ISDN service and signalling Recommendations. Other members of this set include the following:

– the operation of basic ISDN telephony teleservice and 64 kbit/s bearer service, which is supported in part via the interworking of the ISDN signalling systems described herein, is defined in detail in Recommendation Q.71 (basic service stage 2 description);

– the signalling messages and elements of procedure of layer of the Digital Subscriber Signalling System No. 1 and the ISDN User Part of Signalling System No. 7 are defined in Recommendations Q.930/931 (I.450/451) and Recommendations Q.761-Q.764 and Q.766, respectively.

2 Methodology

2.1 *General*

This chapter describes the methodology used to model and define interworking between the ISDN User Part and layer 3 of Digital Subscriber Signalling System No. 1. The methodology is based on the layer service concepts prescribed by the Reference Model of Open System Interconnection (OSI) for CCITT Applications (Recommendation X.200) and uses the terms and conventions defined in Recommendation X.210 (OSI Layer Service Definition Conventions).

The methodology used is for description purposes only. It does not imply that this type of layering is essential in a real implementation.

The interworking model is described in § 2.2. Subsequent sections identify and review the diagrams and tables utilized in describing the model, its functions and the signalling information transfers between the call control functional entities.

2.2 *Interworking model*

The interworking model encompasses 3 functional entities, including call control, the incoming signalling system and the outgoing signalling system, where incoming or outgoing refers to the direction of call set-up. The signalling system entities may represent either the ISDN User Part of the User Network Interface Protocol.

The call control entity acts as an intermediary between the ISDN access and network signalling protocols. It typically invokes local call processing decisions/actions as a result of receiving a primitive from one signalling system (e.g. incoming access). As a result of that processing, it may send a primitive to the same signalling system and/or another signalling system (e.g. outgoing network). Local call processing decisions/actions (e.g. routing and through connection) are independent of the type of signalling system used by call control entities to communicate with each other.

There are 4 types of primitives:

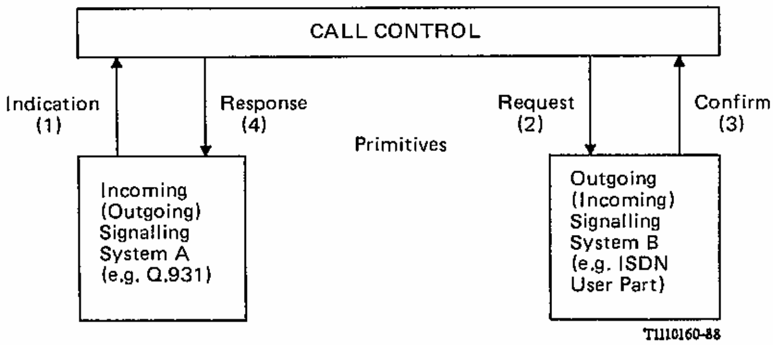
a) Request: A primitive issued by a call control entity to invoke a signalling procedure and thereby transfer information to a peer entity.

b) Indication: A primitive issued by the signalling protocol to invoke a call control procedure or indicate that procedure has been invoked by the peer call control entity.

c) Response: A primitive issued by call control (if required), to indicate completion of a procedure previously invoked by an indication.

d) Confirm: A primitive issued by the signalling protocol to call control (if required) to indicate completion of a procedure previously invoked by a request from the same call control entity.

The descriptions of the incoming and outgoing signalling system functional entities are not part of this Recommendation but are provided in Recommendation Q.931 for Digital Subscriber Signalling System and in Recommendations Q.761-Q.764 and Q.766 for the ISDN User Part.



Note – Numbers in brackets indicate the sending sequence.

FIGURE 1/Q.699

Model for signalling protocol interworking

2.3 *Time sequence diagrams*

Time sequence or “arrow” diagrams are provided to show the permitted temporal relationships between primitives and between primitives and signalling messages, and the time sequence of these relationships during the process of executing a call control procedure. The general format of an arrow diagram is shown in Figure 2/Q.699.

Due to the multiplicity of optional possibilities in both the ISDN User Part and the Digital Subscriber Signalling System protocols not all possible cases are shown in the arrow diagrams. The diagrams which are included represent a sample of typical situations.

Sequences of interactions are shown along vertical lines which represent increasing time in the downward direction.

Broken line arrows represent individual primitives and indicate their direction of propagation, i.e. to or from call control.

Solid line arrows represent signalling messages and indicate their direction of propagation, i.e. to or from the incoming or outgoing signalling system.

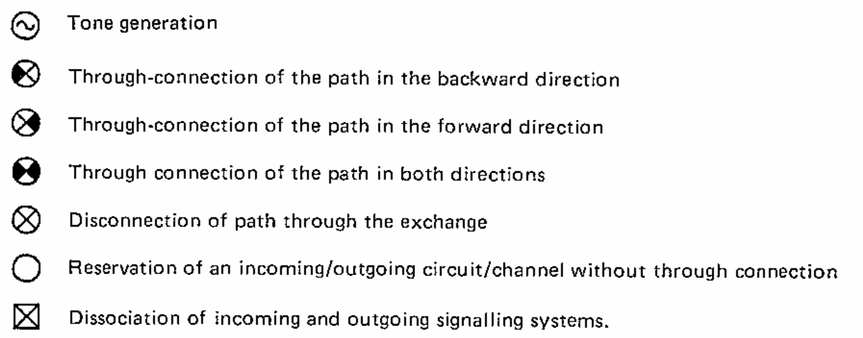
Wavy line arrows (), if present, represent tones or announcements sent inband.

For call control the following symbols are used between vertical lines to indicate the relationship between the incoming and outgoing primitives (e.g. between B indication and B response) and possibly a call control action taken, where it is necessary to indicate clearly a particular function that is invoked by a received primitive.

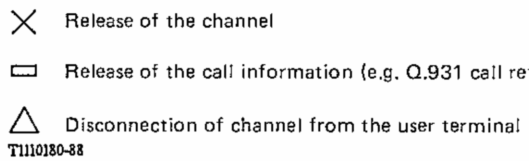
Solid line (——): the incoming and outgoing primitives are unconditionally related, i.e. the incoming primitive always triggers the sending of the outgoing primitive independent of the service context in which the incoming primitive is received.

Broken line (- - -): the incoming and outgoing primitives are related only in the service context considered. In a different service context this relationship may not exist.

Squiggly line (): the reception of the incoming primitive and the transmission of the outgoing primitive are unrelated. This is to indicate that although these primitives are shown as adjacent in the arrow diagram, the generation of the outgoing primitive is unrelated to the receipt of the incoming primitive.



Where it is necessary to indicate the signalling system function performed on transmission or reception of a signalling message, the following symbols are shown below the concerned message:



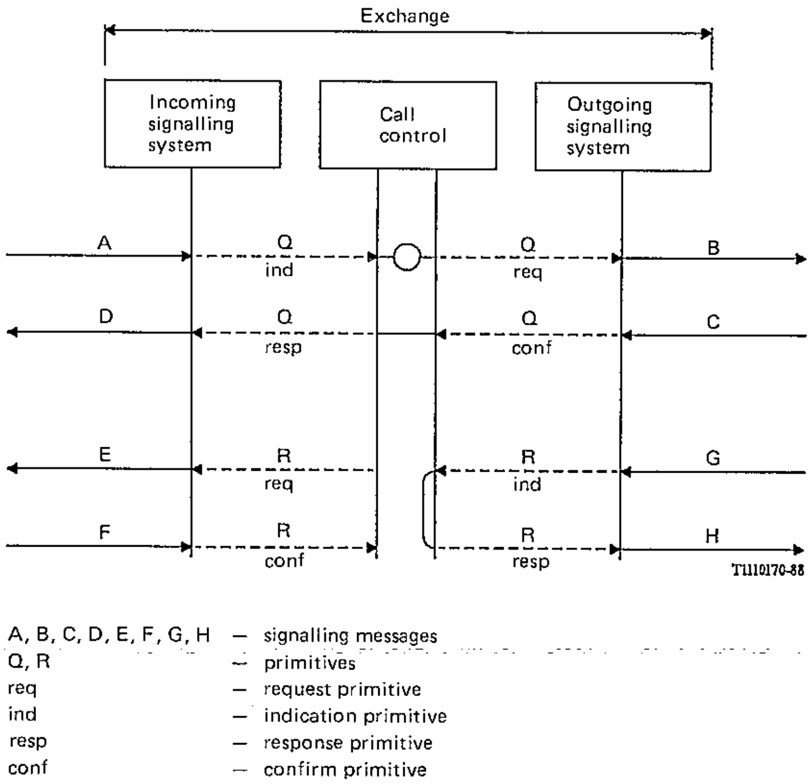


FIGURE 2/Q.699

Example of a time sequence or "arrow" diagram

2.4 *Mapping tables*

Mapping tables are provided to define the relationship between User-Network Interface Protocol messages and information elements on the one hand and ISDN User Part messages and parameters on the other hand.

One table is provided for each User-Network Interface Protocol message that maps onto an ISDN User Part message. The same table also specifies the mapping of elements of information which are carried by the concerned messages.

Elements of information that are of local significance only, i.e. are not mapped onto elements of information in the other signalling system, are not shown.

3 Interworking specification for successful call set-up procedures

3.1 *Arrow diagrams*

This section contains the interworking arrow diagrams for the successful call set-up procedures.

3.1.1 *Enbloc, non-automatic answering terminal, sending of address complete independent of access*

Figure 3/Q.699 shows the sequence of messages for successful call set-up where enbloc address signalling is used, the Address Complete Message (ACM) is sent by the network independent of access indications, and the called party is not an automatic answering terminal.

3.1.2 *Enbloc, automatic answering terminal, sending of address complete independent of access*

Figure 4/Q.699 shows the sequence of messages for successful call set-up where enbloc address signalling is used, the address complete Message is sent independent of access indications, and the called party is an automatic answer terminal (fast connect scenario).

3.1.3 *Enbloc, non-automatic answering terminal*

Figure 5/Q.699 shows the sequence of messages for successful call set-up where enbloc address signalling is used, the Address Complete Message is delayed until receipt of alerting indication from the access, and the called party is not an automatic answering terminal.

3.1.4 *Enbloc, automatic answering terminal*

Figure 6/Q.699 shows successful call set-up with enbloc address signalling, and the address complete indication delayed until receipt of connect indication from an automatic answering terminal. In this case the address complete indication and connect indication are combined in the Connect message in the network.

3.1.5 *Overlap addressing, originating access only, non-automatic answering terminal*

Figure 7/Q.699 shows the sequence of messages when overlap addressing is used between the calling party and the originating local exchange, and enbloc addressing is used within the network. An independent ACM and non-automatic answering terminal is assumed in this case. Variations are possible as in Figures 3/Q.699-6/Q.699.

3.1.6 *Overlap addressing, originating access and network, non-automatic answering terminal*

Figure 8/Q.699 shows the sequence of messages when overlap addressing is used at the originating access and within the network. In this case the ACM through the network informs the originating local exchange that enough address information has been received, and the exchange can therefore indicate CALL PROCeeding to the calling party.

3.1.7 *Overlap addressing, both accesses and network, address complete cannot be determined by number analysis*

In Figure 9/Q.699, overlap addressing is used at both accesses and in the network. An example is a call made to an ISDN PABX, where determination of address complete may only be made as a result of an indication, e.g. alerting, from the called access. In this case, the ALERTing message from the called access allows the sending of an ACM in the network, which since it carries the “subscriber free” indication is mapped to ALERTing at the calling access.

3.1.8 *Overlap addressing, originating access and network, address complete determined by number analysis*

In Figure 10/Q.699, overlap addressing is used to reduce the post-dialing delay by allowing connection set-up to be in parallel with the entering of digits by the calling party. In this case, proceeding indications can be independently derived from number analysis. The diagram assumes independent ACM sending, however alternative cases are possible as in Figures 3/Q.699-6/Q.699.

3.1.9 *ISDN to analogue subscriber*

Figure 12/Q.699 shows the sequence of messages for a call from an ISDN subscriber to an analogue subscriber. The arrows between the local exchange and non-ISDN user indicate signals that may vary with the access protocol.

3.1.10 *Analogue subscriber to ISDN*

Figure 13/Q.699 shows the sequence of messages for a call from an analogue subscriber to an ISDN subscriber. Again, the arrows between non-ISDN user and local exchange indicate signals that may vary with the access protocol. Procedures for ACM and ANM may vary as in Figures 3/Q.699-6/Q.699. Overlap addressing may also be used in this case. Interworking then follows the message flows shown in Figures 8/Q.699 and 10/Q.699.

3.1.11 *ISDN-PSTN interworking*

Figure 14/Q.699 shows the interworking between ISDN and PSTN, in the case where the PSTN does not provide an out-of-band address complete indication. More detailed interworking between ISDN and PSTN is given in the Q.600 Recommendations.

3.1.12 *PSTN-ISDN interworking*

Figure 15/Q.699 shows interworking in a call originating in the PSTN, where the PSTN does not provide an out-of-band address complete indication. Overlap addressing may also be used in this case. Interworking then follows the message flows shown in Figures 8/Q.699 and 10/Q.699.

3.1.13 *ISDN-PSTN interworking, PSTN support out-of-band address complete indication*

Figure 16/Q.699 shows interworking where the PSTN provides an out-of-band address complete indication. As noted, the primitive and ACM indicators may differ depending on whether or not the PSTN provides call progress indications. More detailed interworking between ISDN and PSTN is given in the Q.600 Recommendations.

3.1.14 *PSTN-ISDN interworking, PSTN supports out-of-band address complete indication*

Figure 17/Q.699 shows interworking for a call originating in the PSTN, where the PSTN provides out-of-band address complete indications.

3.1.15 *User-generated PROGress message, sending of address complete independent of access*

Figure 18/Q.699 shows the case where the PROGress message in Q.931 is used to indicate interworking outside of the public network. In order to support user-generated in-band information, the terminating exchange may optionally through-connect in the backwards direction on receipt of the PROGress message (see Annex O of Recommendation Q.931).

3.1.16 *User-generated PROGress message*

Figure 19/Q.699 shows the corresponding case when the address complete indication is delayed until an indication is received from the access, and the PROGress message maps to an Address Complete Message.

3.1.17 *Overlap addressing, both accesses and within network, transfer of address complete indication via call proceeding*

Figure 11/Q.699 shows the case where the indication that complete address information has been received is transferred by the terminating access in the proceeding primitive.

3.1.18 *Notes relative to Figures 3/Q.699 to 19/Q.699*

The following notes apply to all interworking diagrams in this section:

– If continuity check occurs in the network, the SET-UP request primitive in the terminating local exchange is not passed until continuity is verified.

– Through-connection for specific cases may vary from the examples shown, e.g. for different PSTN signalling systems. More detailed information can be found in Recommendation Q.764, §§ 2.1.1.1 and 2.1.2.1.

The remaining notes apply where referenced in particular figures:

Note 1 – This message may be sent by the user to achieve symmetrical working or to avoid timer expiry on response to SET-UP (see Recommendation Q.931 § 5.2.5.1).

Note 2 – This message may be sent by the user to achieve symmetrical working (see Recommendation Q.931 § 5.1.8).

Note 3 – Called line status = no indication; ISDN access indicator = ISDN access.

Note 4 – Called line status = subscriber free; ISDN access indicator = ISDN access.

Note 5 – The number of INFORMATION messages and primitives shown is for example only. In practice the number may be zero or more; of zero, the Set-up request and Proc request primitives may be originated on expiry of timer T302 (see § 5.1.5.2 of Recommendation Q.931).

Note 6 – Progress indicator = 2 – destination address is non-ISDN.

Note 7 – Called line status = subscriber free; ISDN User Part indicator = ISDN User Part used all-the-way; ISDN access indicator = non-ISDN Access.

Note 8 – ISDN User Part indicator = ISDN User Part used all-the-way; ISDN access indicator = non-ISDN Access.

Note 9 – Conditional on type of access.

Note 10 – Progress indicator = 3 – origination address is non-ISDN.

Note 11 – Completion of transmission path timing is described in § 2.1.9.1 of Recommendation Q.764.

Note 12 – Called line status = no indication; ISDN User Part indicator = ISDN User Part not used all-the-way; ISDN access indicator = non-ISDN access.

Note 13 – ISDN User Part indicator = ISDN User Part not used all-the-way; ISDN access indicator = non-ISDN access.

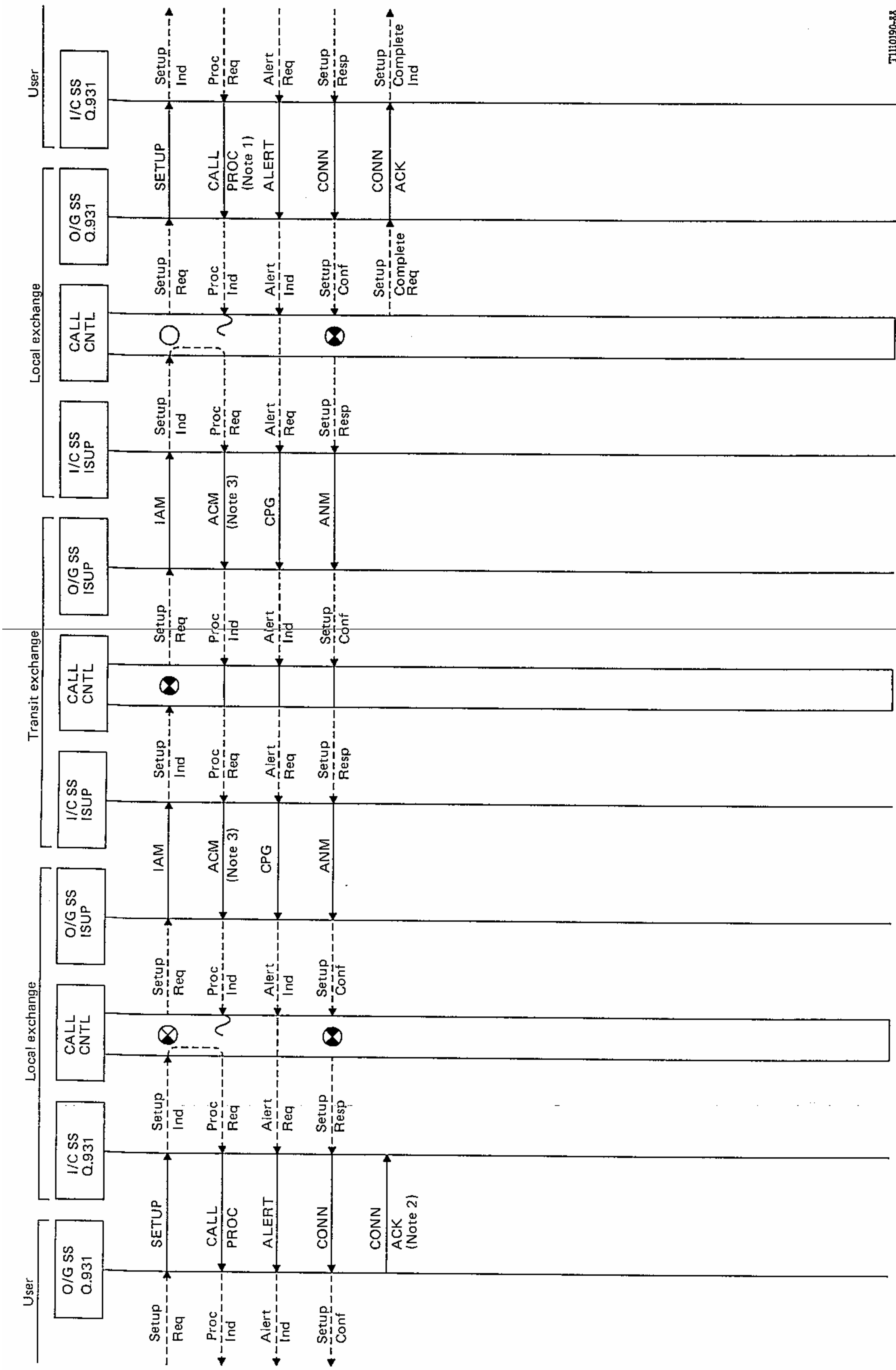
Note 14 – Primitive is either Progress or Alerting, depending on the PSTN indication. If the PSTN indicates Alerting (subscriber free), then an ALERTing message replaces the PROGress message at the originating Q.931 interface.

Note 15 – Called line status depends on PSTN indication; ISDN User Part indicator = ISDN User Part not used all-the-way; ISDN access indicator = non-ISDN access.

Note 16 – Progress indicator = 1 – Call is not end-to-end ISDN, further information available inband.

Note 17 – Called line status = no indication; Access transport parameter contains Progress information element.

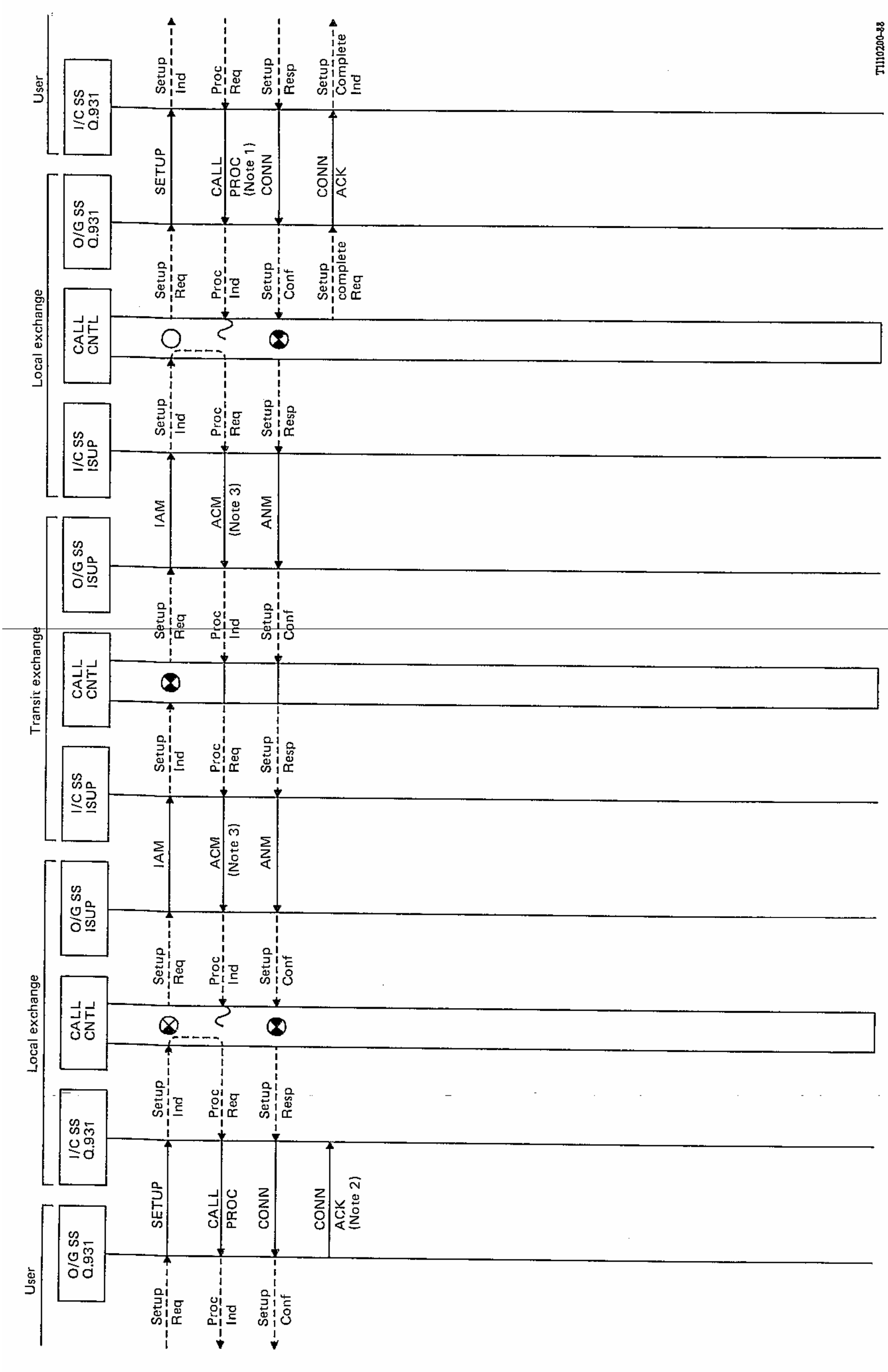
Note 18 – The set-up message may in some cases contain sufficient information. If user equipment can determine immediately that address information is complete, both SET-UP ACK and the sequence of INFO messages are omitted. Alternatively, the SET-UP ACK may be sent, followed by CALL PROC, which maps to ACM.



(Notes are given in § 3.1.18)

FIGURE 3/Q.699

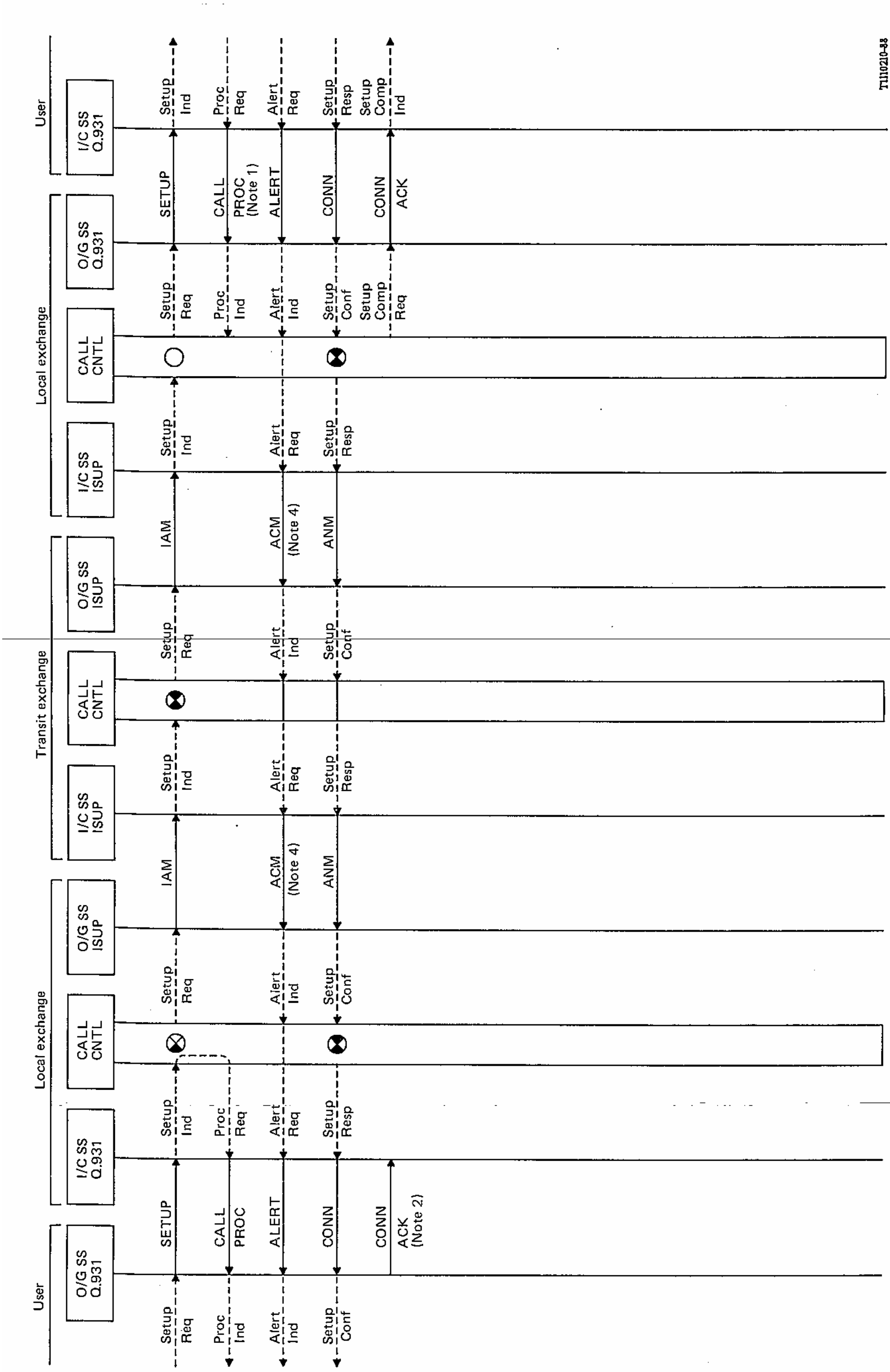
Enbloc, non-automatic-answering terminal, sending of ACM independent of access



(Notes are given in § 3.1.18)

FIGURE 4/Q.699

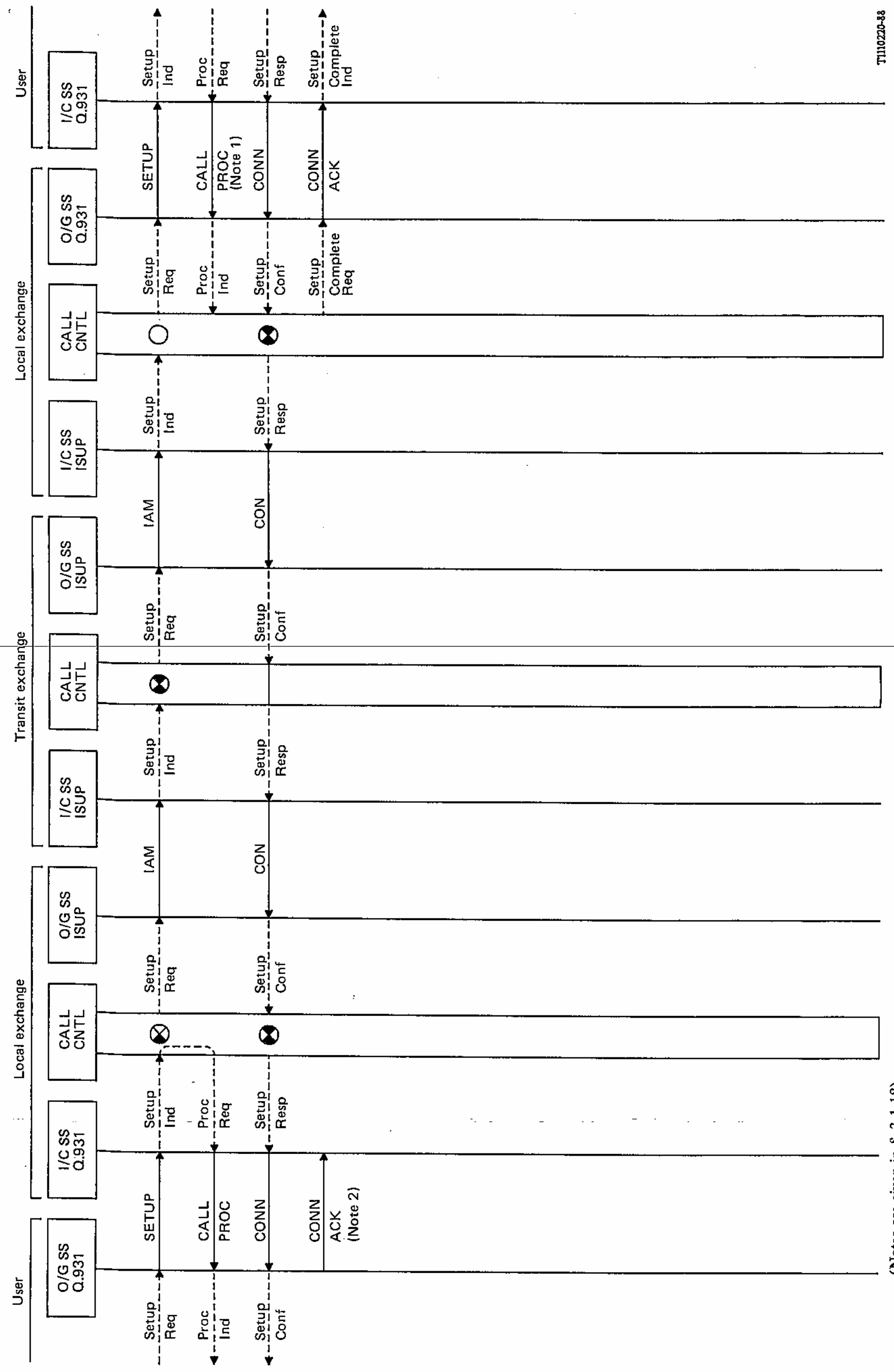
Enbloc, automatic-answering terminal, sending of ACM independent of access



(Notes are given in § 3.1.18)

FIGURE 5/Q.699

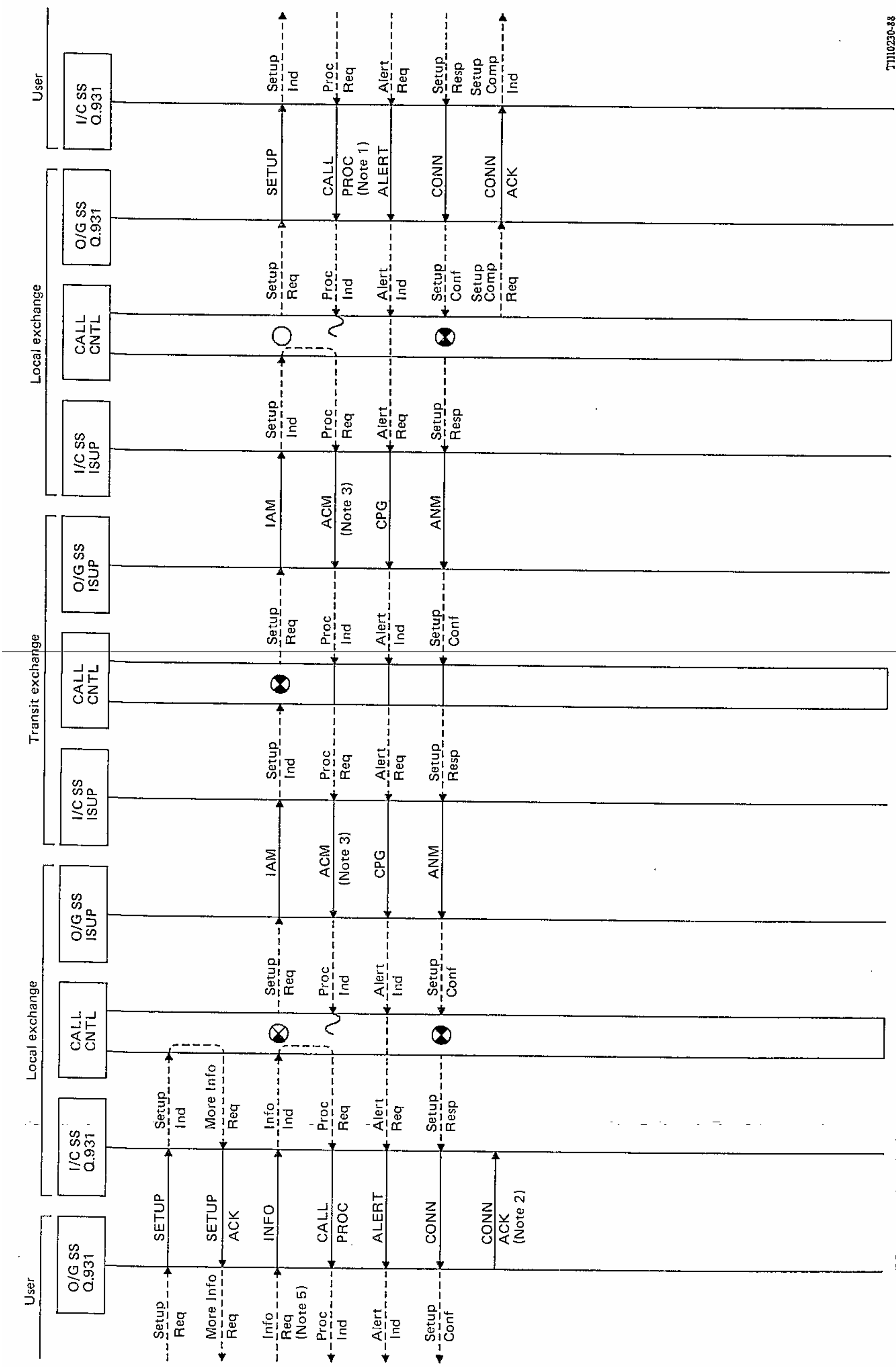
Enbloc, non-automatic-answering terminal



(Notes are given in § 3.1.18)

FIGURE 6/Q.699

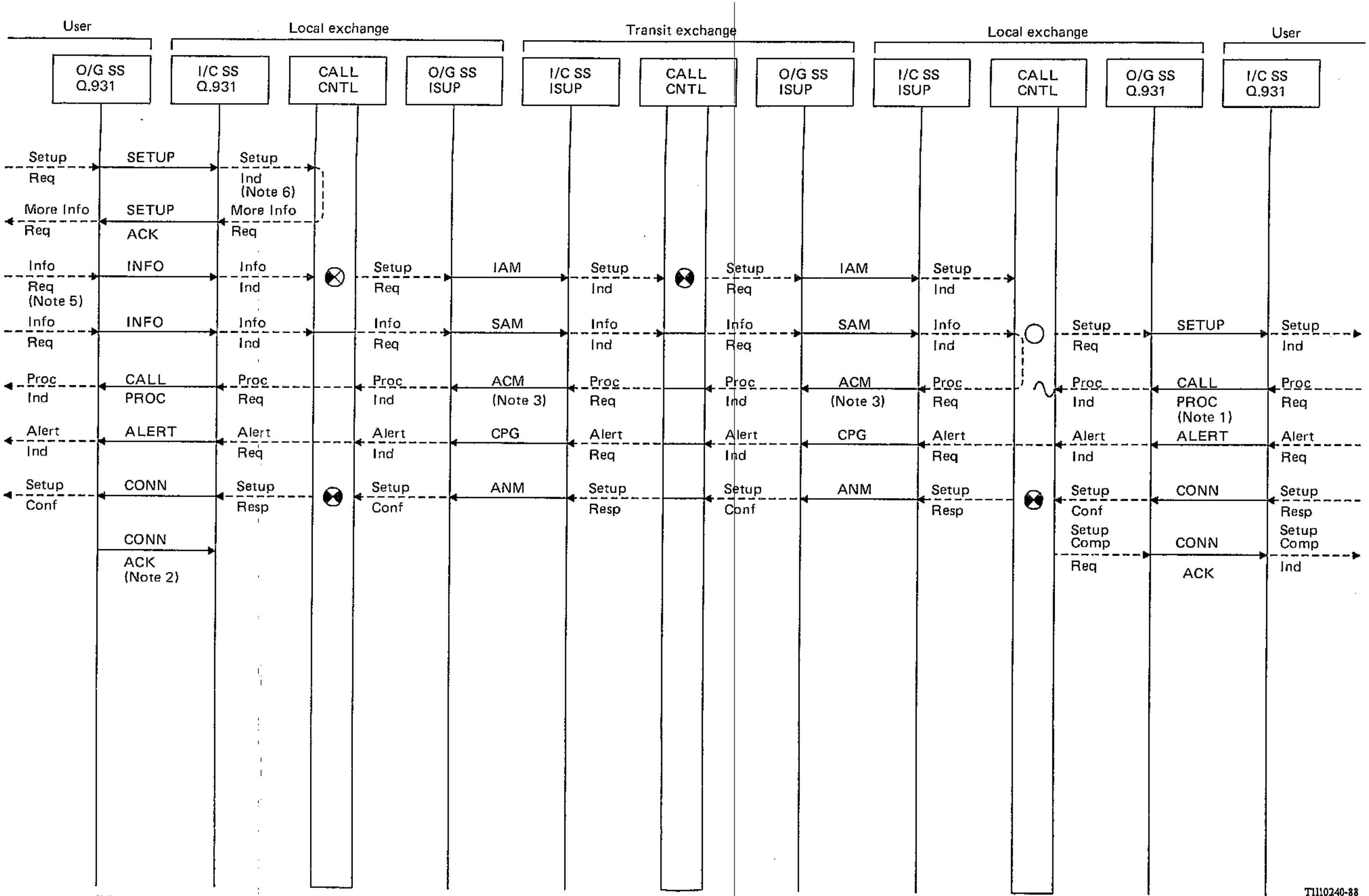
Enbloc, automatic-answering terminal



(Notes are given in § 3.1.18)

FIGURE 7/Q.699

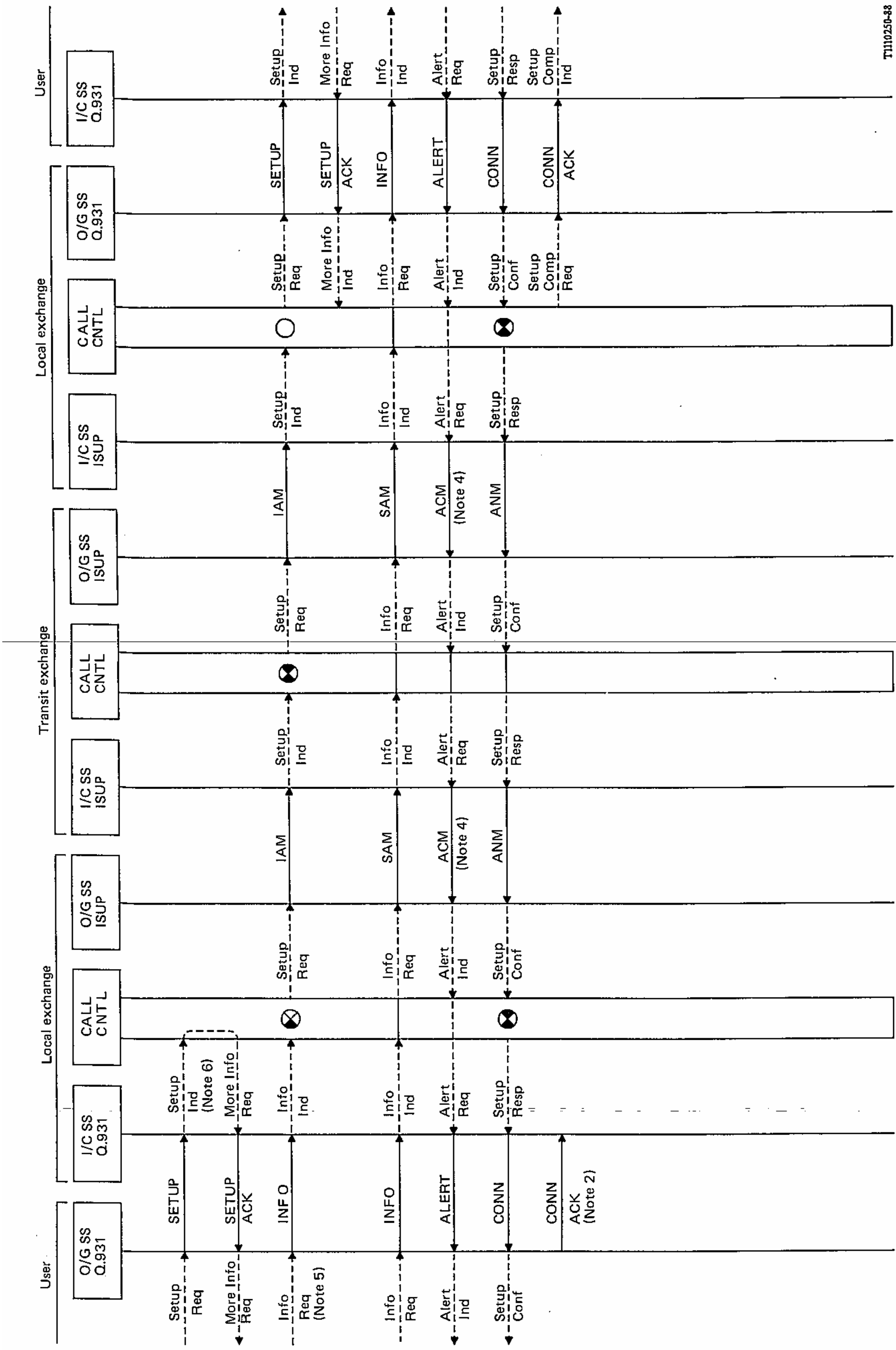
Overlap addressing, originating access only, non-automatic-answering terminal



(Notes are given in § 3.1.18)

FIGURE 8/Q.699

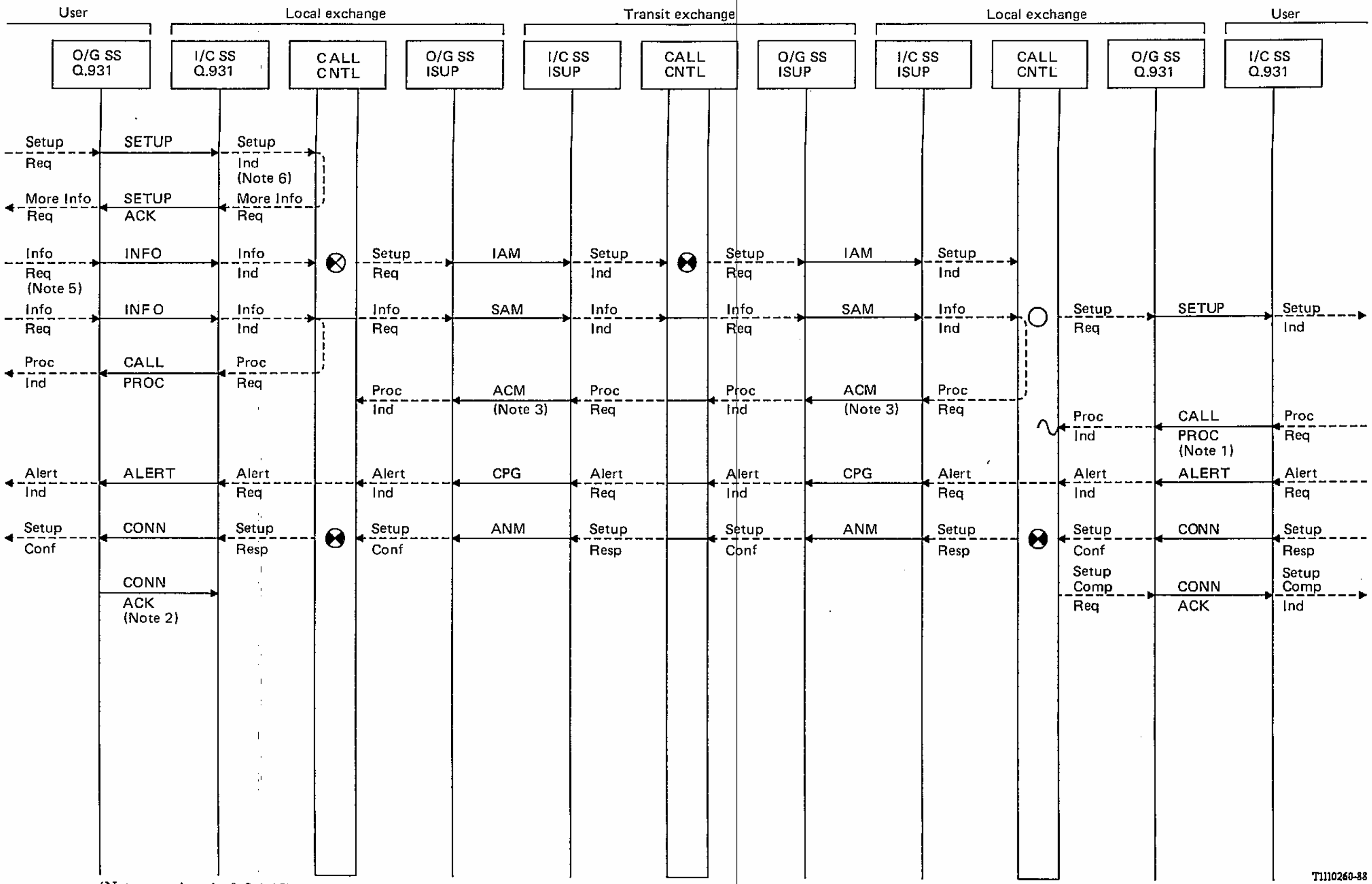
Overlap addressing, originating access and in network, non-automatic-answering terminal



(Notes are given in § 3.1.18)

FIGURE 9/Q.699

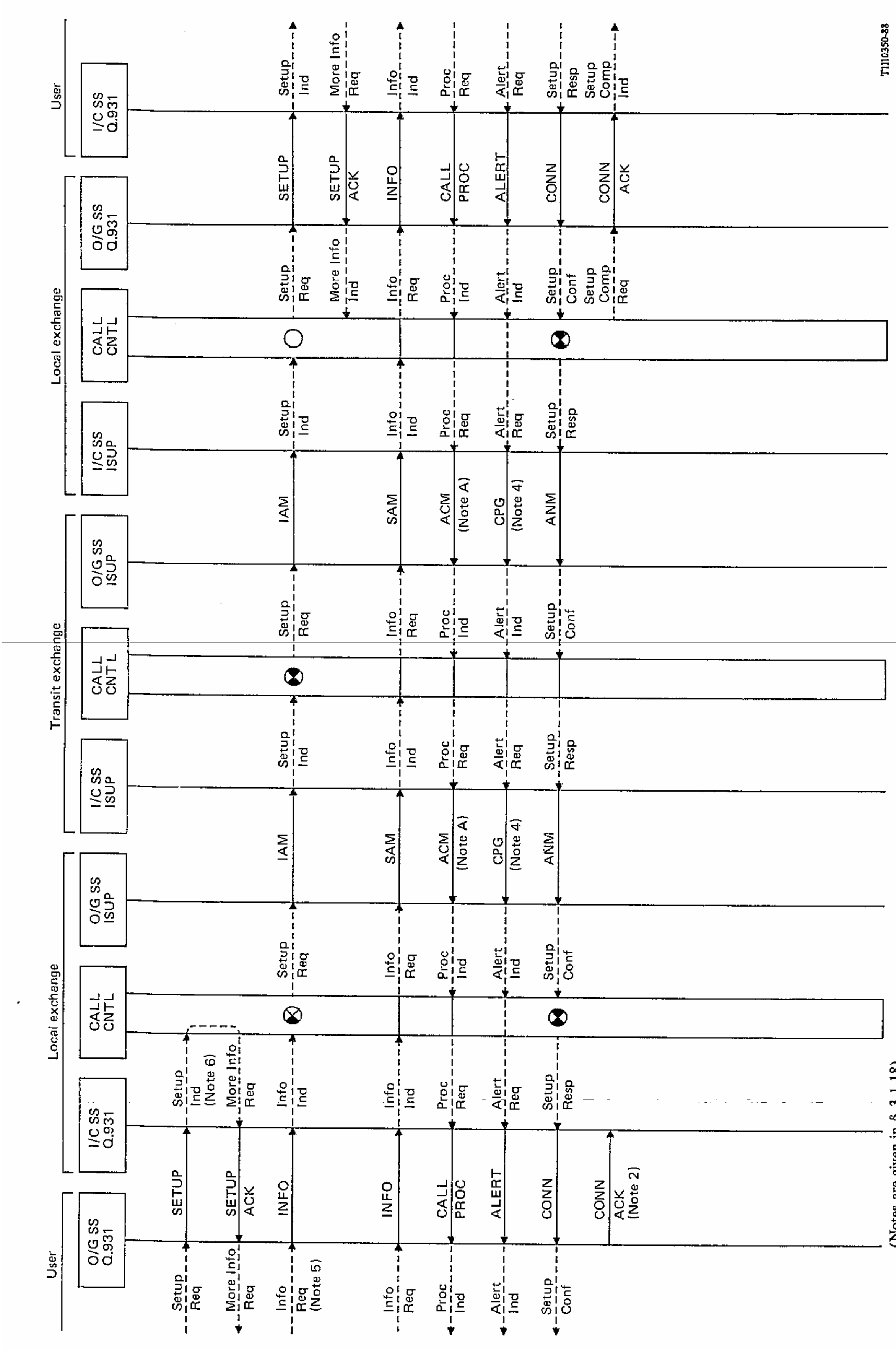
Overlap addressing, both accesses and within network, address complete cannot be determined by number analysis



(Notes are given in § 3.1.18)

FIGURE 10/Q.699

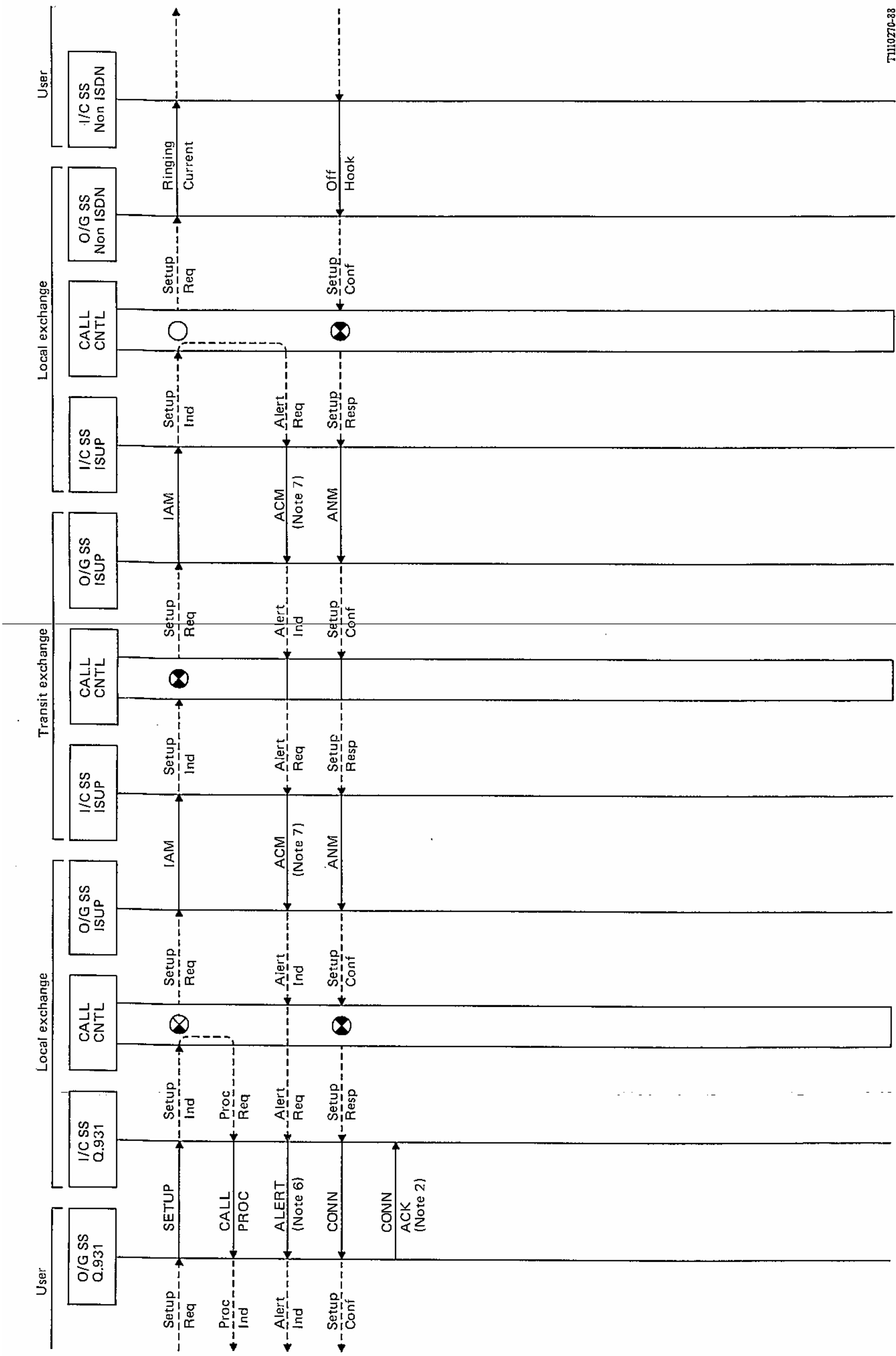
Overlap addressing, originating access and network, address complete determined by number analysis



(Notes are given in § 3.1.18)

FIGURE 11/Q.699

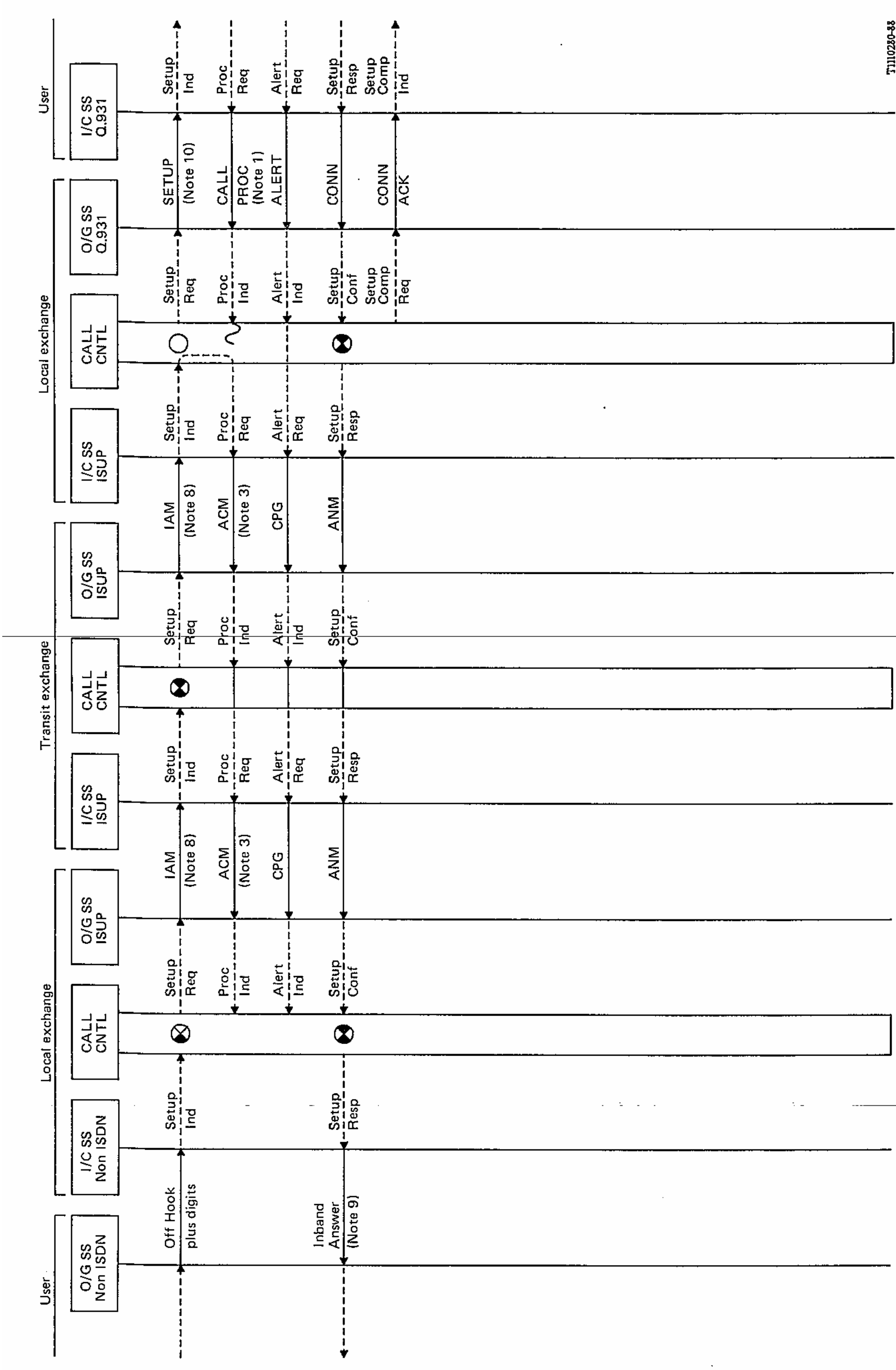
Overlap addressing, both access and within network, transfer of address complete indication via call proceeding (option a: Call proceeding mapped to address complete)



(Notes are given in § 3.1.18)

FIGURE 12/Q.699

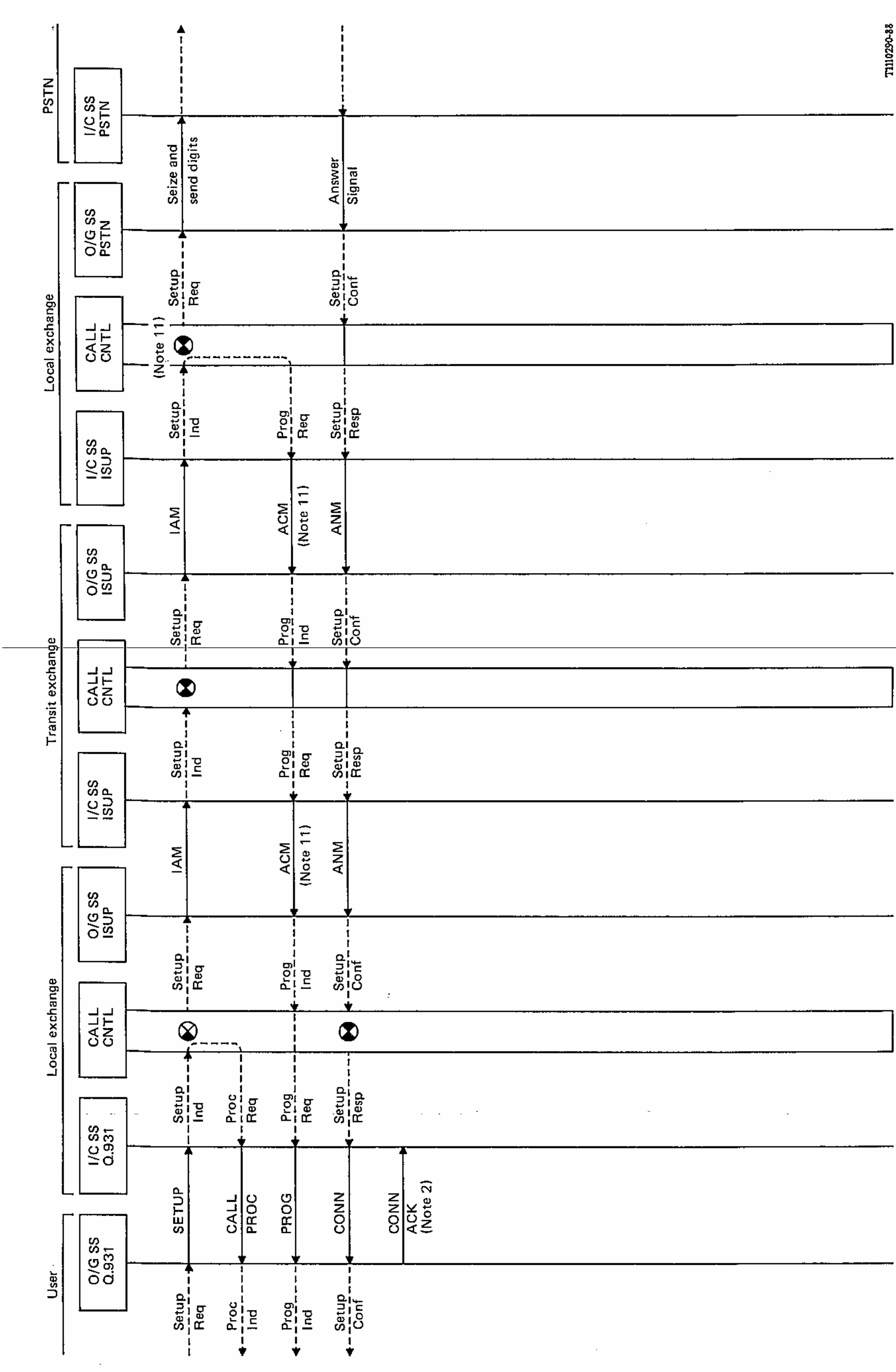
ISDN to analogue subscriber



(Notes are given in § 3.1.18)

FIGURE 13/Q.699

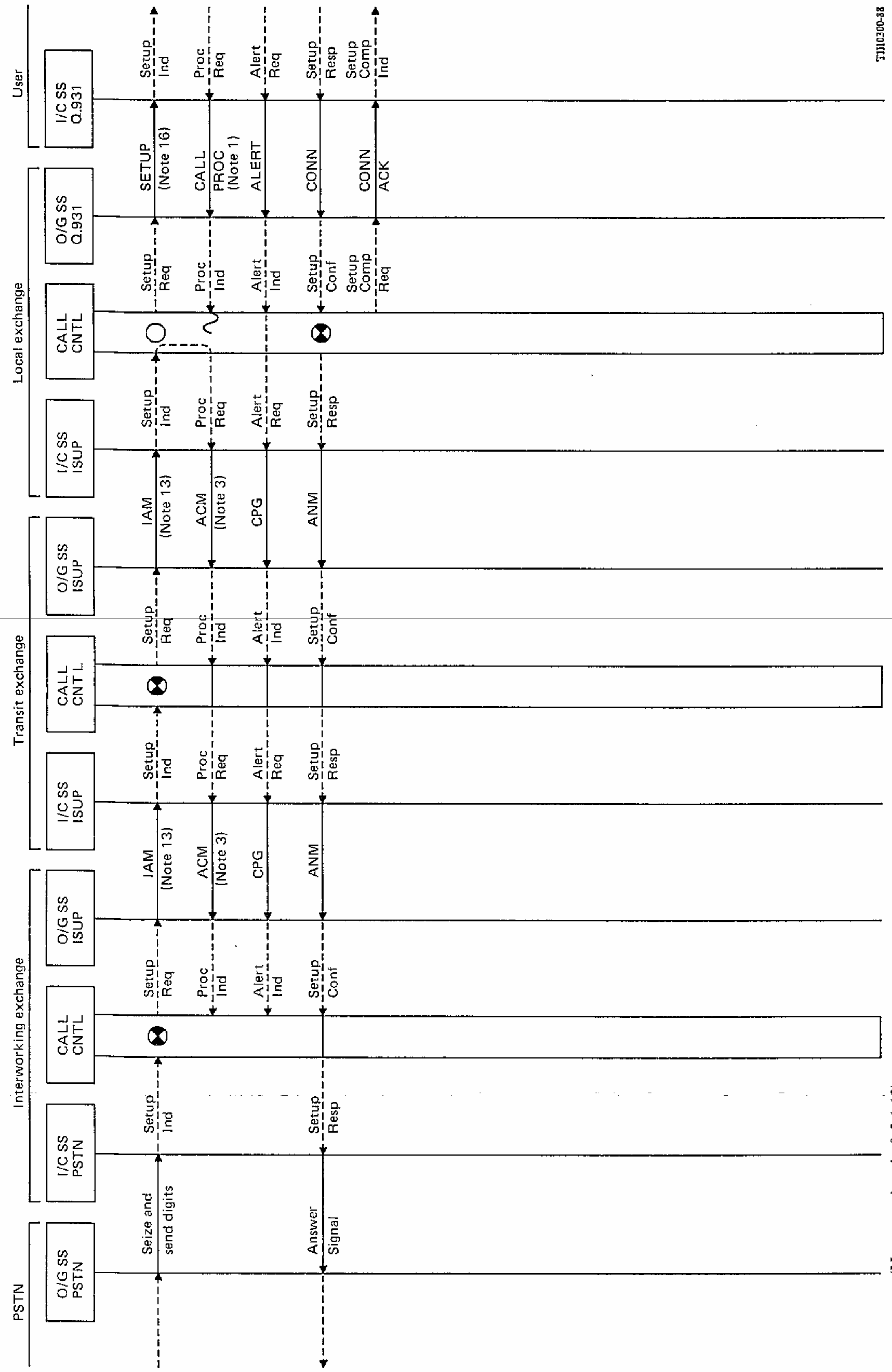
Analogue subscriber to ISDN



(Notes are given in § 3.1.18)

FIGURE 14/Q.699

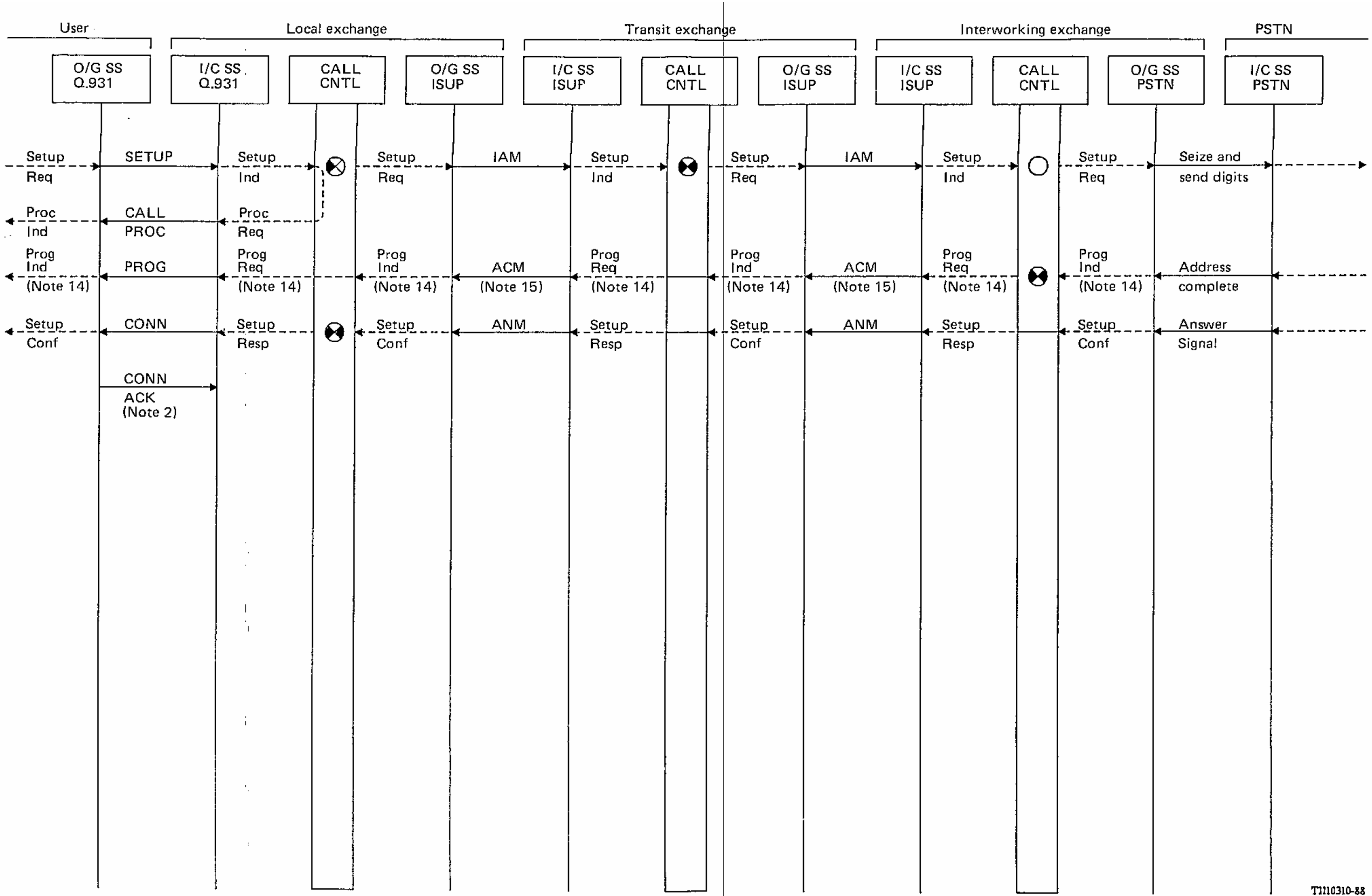
ISDN-PSTN interworking



(Notes are given in § 3.1.18)

FIGURE 15/Q.699

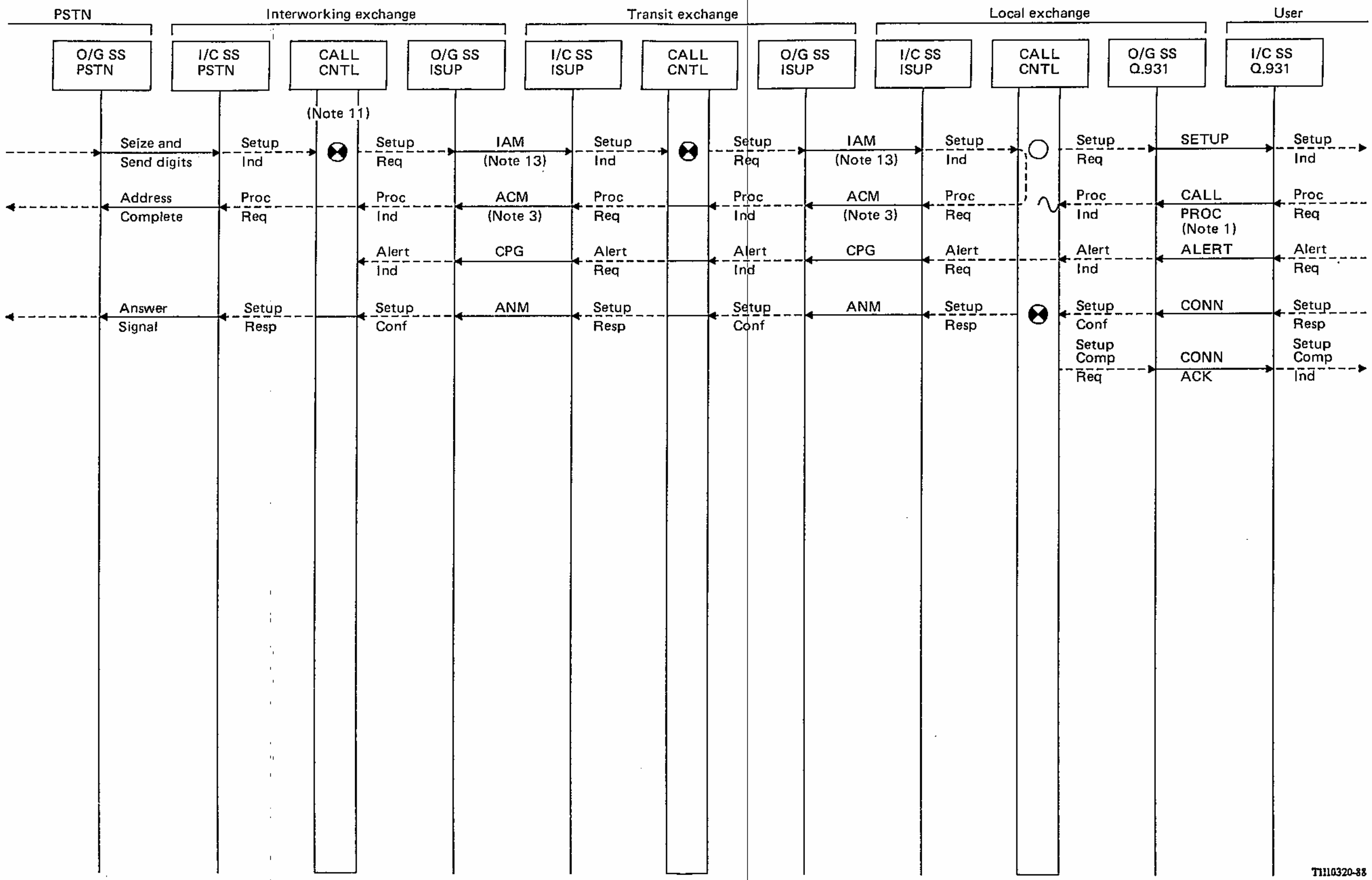
PSTN-ISDN interworking



(Notes are given in § 3.1.18)

FIGURE 16/Q.699

ISDN-PSTN interworking, PSTN supports address complete indication



(Notes are given in § 3.1.18)

FIGURE 17/Q.699

PSTN-ISDN interworking, PSTN supports address complete indication

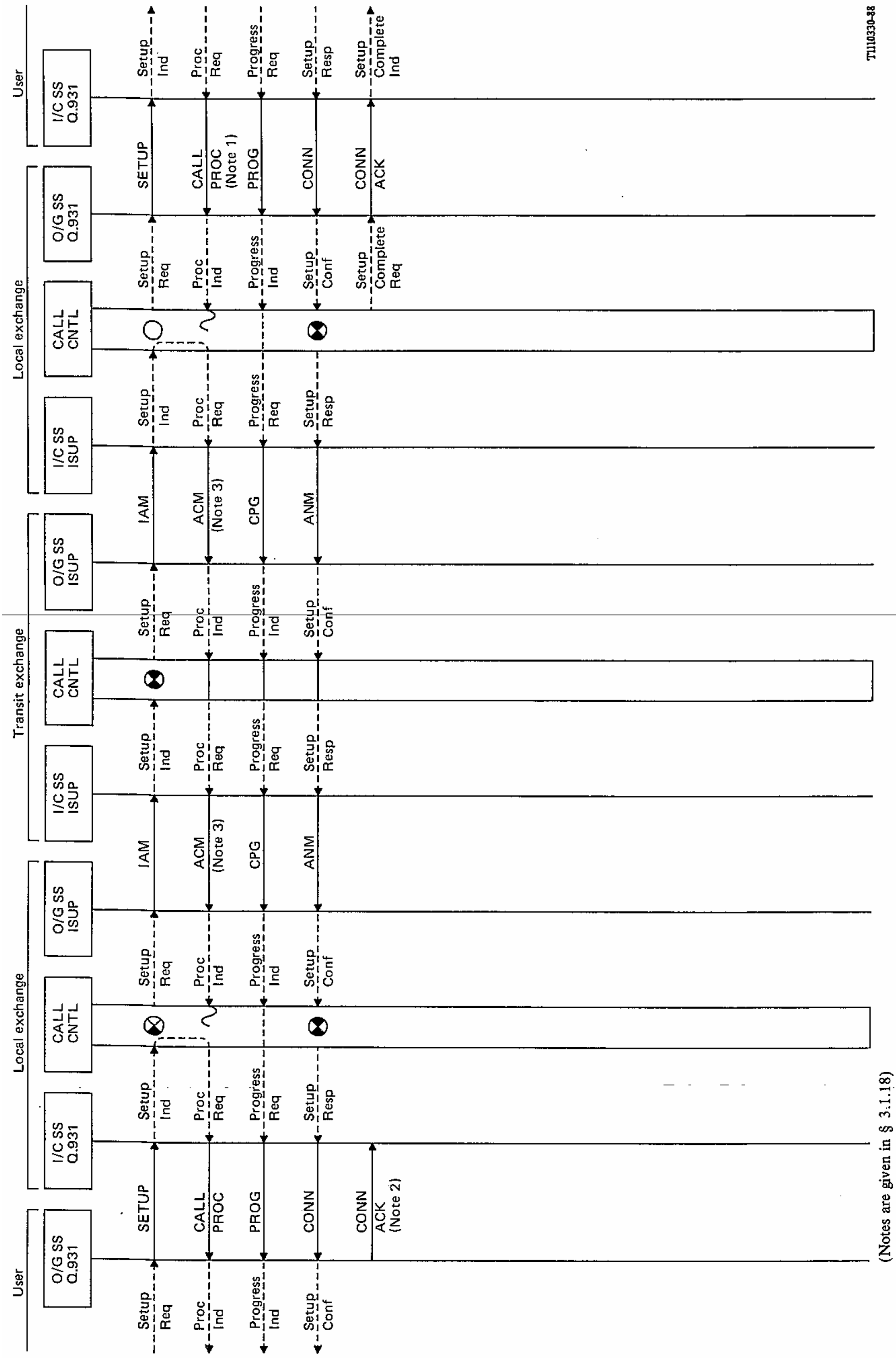
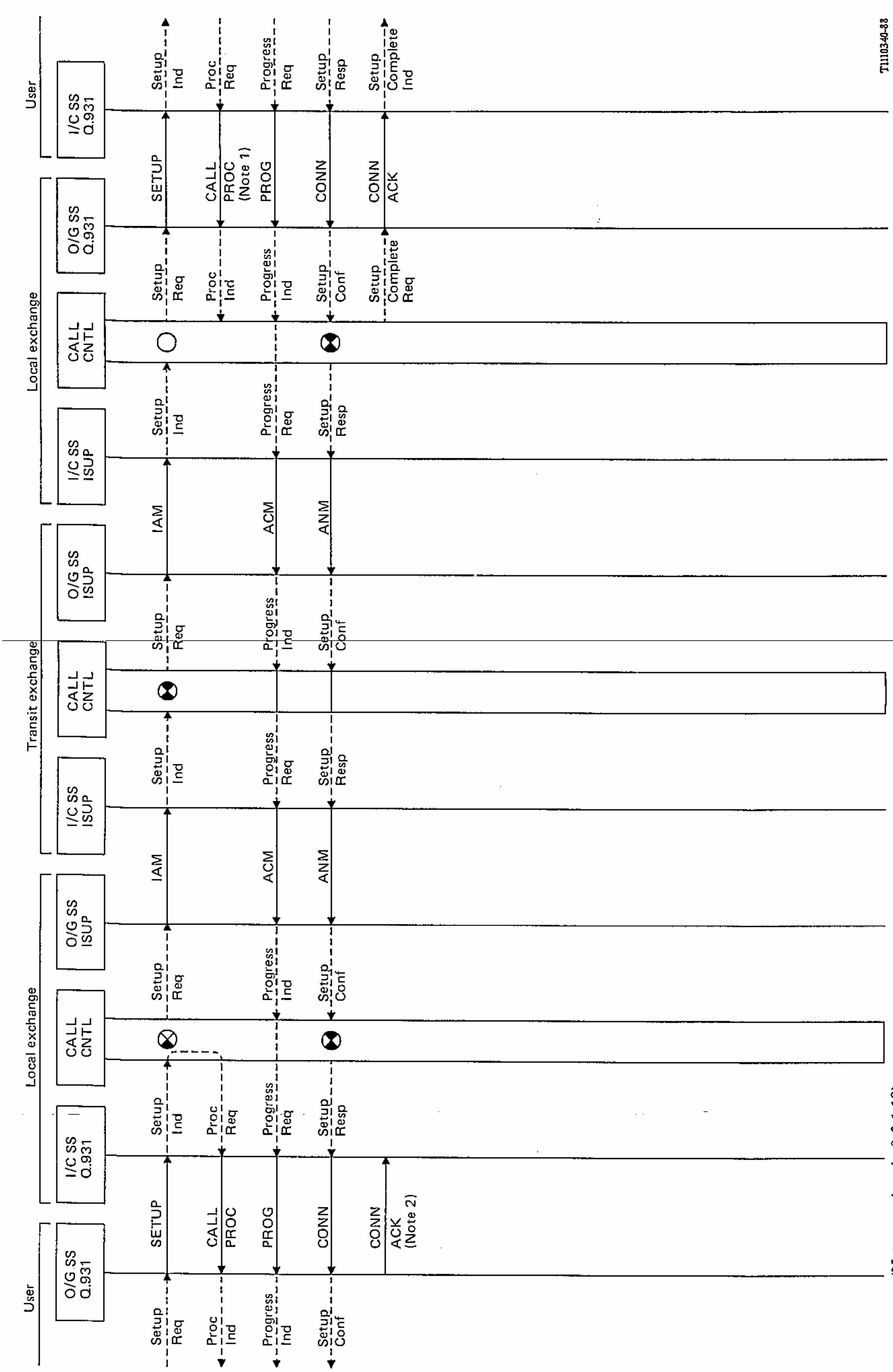


FIGURE 18/Q.699

User-generated PROGress message, ACM generated independent of access



(Notes are given in § 3.1.18)

FIGURE 19/Q.699

User-generated PROGress message, ACM dependent on access, enbloc sending

3.2 *Mapping of Parameters*

This section contains the mapping tables of successful call set-up messages and associated parameters and information elements.

TABLE 1/Q.699

Mapping of set-up procedure parameters for ISDN call

	Originating User/Network	Network	Terminating User/Network
Message	SETUP →	IAM →	SETUP
Contents	Bearer capability	User service information Trans. med. reqts (Note 1)	Bearer capability
	No mapping	Forward call indicator	No mapping
	Progress indicator	Access transport (Note 2)	Progress indicator
	Calling party number (Note 6)	Calling party number (Note 3)	Calling party number
	Calling party subaddress	Access transport	Calling party subaddress
	Called party number (Note 4)	Called party number	Called party number
	Setup complete	ST digit (Note 5)	No mapping
	Called party subaddress	Access transport	Called party subaddress
	Transit network sel.	Transit network sel.	No mapping
	Low layer compatibility	Access transport	Low layer compatibility
	High layer compatibility	Access transport	High layer compatibility

Note 1 – The User Service Information parameter carries the customer's bearer service request unchanged through the network, and is mapped at the terminating exchange. Transmission Medium Requirements maps from the service request to a network connection type. It is not mapped at the terminating exchange in an ISDN call. For calls between networks (e.g. international gateways), the contents of the Bearer Capability information element carried within the User Service Information parameter may be changed, e.g. where A-law to mu-law conversion applies.

Note 2 – The access Transport parameter carries information elements transparently from one User/Network interface to the other User/Network interface.

Note 3 – The calling party number is recommended to be carried in the IAM, however it may optionally be delayed until a subsequent end-to-end request in the network. Number and subaddress should be carried in the same message.

Note 4 – The Keypad Facility information element may be used to carry called party number information in the user-to-network direction (described in § 5.1 of Recommendation Q.921) rather than the Called Party Number information element. This is then mapped to the Called Party Number parameter within the network.

Note 5 – The ST digit is an address signal carried within the Called Party Number parameter.

Note 6 – The calling party number may be provided solely to indicate calling line identity restriction.

TABLE 2/Q.699

Mapping of set-up parameters for PSTN-ISDN call

	Not Applicable	Network	Terminating User/Network
Message		IAM ⟶	SETUP
		Transmission medium requirements	Bearer capability
		Forward call indicators (interworking)	Progress indicator

TABLE 3/Q.699

Mapping of subsequent address information for overlap sending

	Originating User/Network	Network	Terminating User/Network
Message	INFO ⟶	SAM ⟶	INFO
Contents	Called party number of Keypad (Note)	Subsequent number	Called party number (Note)

Note – Sending complete may be included at both User/Network interfaces in the INFORMATION message.

TABLE 4/Q.699

Mapping of interworking with PSTN inband

	Originating User/Network	Network	Terminating User/Network
Message	PROGress (Note) ⟵	ACM ⟵	Not applicable
Contents	Progress indicator	Backward call indicator (interworking)	

Note – The ACM may also map to the CALL PROCEEDING message if this has not already been sent.

TABLE 5/Q.699

Mapping of alerting, independent ACM

	Originating User/Network	Network	Terminating User/Network
Message	ALERTing ◄—	CPG ◄—	ALERTing
Contents	alerting (implicit)	Event information (alerting)	alerting (implicit)
	Progress indicator	Access transport	Progress indicator

TABLE 6/Q.699

Mapping of alerting

	Originating User/Network	Network	Terminating User/Network
Message	ALERTing ◄—	ACM ◄—	ALERTing
Contents	alerting (implicit)	Backward call indicators (subscriber free)	alerting (implicit)
	Progress indicator	Access transport	Progress indicator

TABLE 7/Q.699

Mapping of answer indication, non-automatic answering terminal

	Originating User/Network	Network	Terminating User/Network
Message	CONNect ◄—	ANM ◄—	CONNect
Contents	Progress indicator	Access transport	Progress indicator

TABLE 8/Q.699

Mapping of answer indication, automatic answering terminal

	Originating User/Network	Network	Terminating User/Network
Message	CONNect ←	CON ←	CONNect
Contents	Progress indicator	Access Transport	Progress indicator

TABLE 8a/Q.699

Mapping of progress indication

	Originating User/Network	Network	Terminating User/Network
Message	CONNect ←	CON ←	CONNect
Contents	Progress indicator	Access Transport	Progress indicator

TABLE 8b/Q.699

Mapping of progress indication

	Originating User/Network	Network	Terminating User/Network
Message	PROGress ←	ACM ←	PROGress
Contents	Progress (implicit)	Backward call indicators (no indication)	Progress (implicit)
	Progress indicator	Access transport	Progress indicator

3.3 *Mapping of the parameter fields*

This section contains the mapping tables of parameter subfields and values for the Progress Indicator of Recommendation Q.931 and the associated fields in ISUP.

The following notes apply to all mapping tables in this attachment:

– The mapping of the Backward Call Indicator in the Answer Mesage only applies when this indicator is included in the Answer Message.

– For simplicity, these diagrams assume the case where the ACM is not sent independently, and a non-automatic answering terminal is the called party. Other configurations are possible as shown in the arrow diagrams, but do not affect parameter mapping rules.

3.3.1 *Scenario 1*

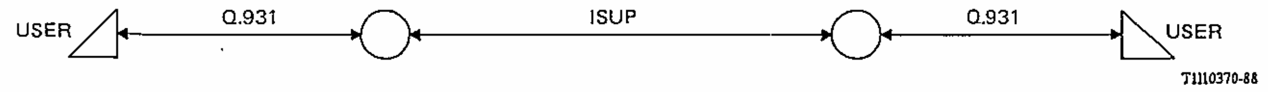


TABLE 9/Q.699

Parameter fields mapping for Q.931-ISUP-Q.931

	Originating User/Network	Network	Terminating User/Network
Message	SETUP →	IAM →	SETUP
Content	no Progress ind.	Forward call ind. Bit D = 0, no interworking encountered F = 1, ISUP used all the way I = 1, originating access ISDN	no Progress ind.
Message	ALERTing ←	ACM ←	ALERTing
Content	no Progress ind.	Backward call ind. Bit I = 0, no interworking encountered K = 1, ISUP used all the way M = 1, terminating access ISDN	no Progress ind.
Message	CONNect ←	ANM ←	CONNect
Content	no Progress ind.	Backward call ind. Bit I = 0, no interworking encountered K = 1, ISUP used all the way M = 1, terminating access ISDN	no Progress ind.

3.3.2 *Scenario 2*

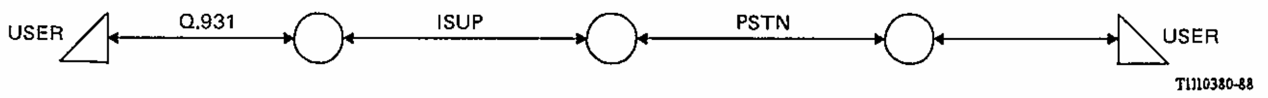


TABLE 10/Q.699

Parameter fields mapping for Q.931-ISUP-PSTN

	Originating User/Network	Network	Terminating User/Network
Message	SETUP →	IAM	N/A
Content	no Progress ind.	Forward call ind. Bit D = 0, no interworking encountered F = 1, ISUP used all the way I = 1, originating access ISDN	no mapping applied
Message	PROGress ←	ACM	N/A
Content	Progress ind. progress description = # 1, call is not end-to-end ISDN	Backward call ind. Bit I = 1, interworking encountered K = 0, ISUP not used all the way M = 0, terminating access ISDN	no mapping applied
Message	CONNect ←	ANM	N/A
Content	Progress ind. progress description = # 1, call is not end-to-end ISDN	Backward call ind. Bit I = 1, interworking encountered K = 0, ISUP not used all the way M = 0, terminating access ISDN	no mapping applied

3.3.3 *Scenario 3*

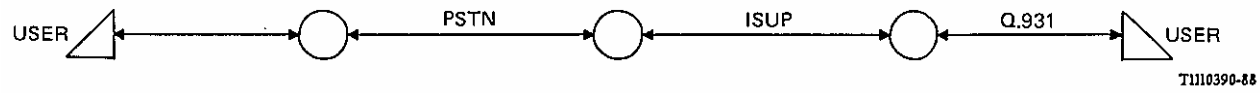


TABLE 11/Q.699

Parameter fields mapping for PSTN-ISUP-Q.931

	Originating User/Network	Network	Terminating User/Network
Message	N/A	IAM →	SETUP
Content	no mapping applied	Forward call ind. Bit D = 1, interworking encountered F = 0, ISUP not used all the way I = 0, originating access non-ISDN	Progress ind. progress description = # 1, call is not end-to-end ISDN
Message	N/A	ACM ←	ALERTing
Content	no mapping applied	Backward call ind. Bit I = 0, no interworking encountered K = 1, ISUP used all the way M = 1, terminating access ISDN	no Progress ind.
Message	N/A	ANM ←	CONNect
Content	no mapping applied	Backward call ind. Bit I = 0, no interworking encountered K = 1, ISUP used all the way M = 1, terminating access ISDN	no mapping applied

3.3.4 *Scenario 4*

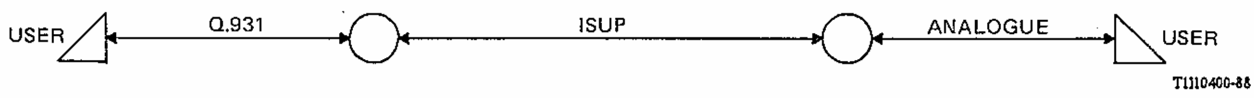


TABLE 12/Q.699

Parameter fields mapping for ISUP-Q.931-ANALOGUE

	Originating User/Network	Network	Terminating User/Network
Message	SETUP ⟶	IAM	N/A
Content	no Progress ind.	Forward call ind. Bit D = 0, no interworking encountered F = 1, ISUP used all the way I = 1, originating access ISDN	no Progress ind.
Message	ALERTing ⟵	ACM	N/A
Content	Progress ind. progress description = # 2, destination address is non-ISDN	Backward call ind. Bit I = 0, no interworking encountered K = 1, ISUP used all the way M = 1, terminating access non-ISDN	no mapping applied
Message	CONNect ⟵	ANM	N/A
Content	Progress ind. progress description = # 2, destination address is non-ISDN	Backward call ind. Bit I = 0, no interworking encountered K = 1, ISUP used all the way M = 1, terminating access non-ISDN	no mapping applied

3.3.5 *Scenario 5*

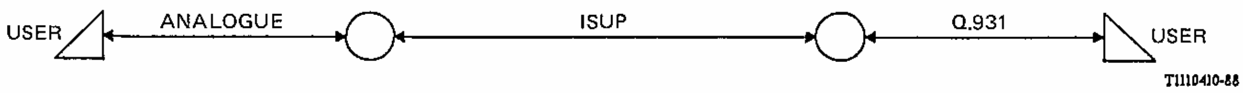


TABLE 13/Q.699

Parameter fields mapping for ANALOGUE-ISUP-Q.931

	Originating User/Network	Network	Terminating User/Network
Message	N/A	IAM ——→	SETUP
Content	no mapping applied	Forward call ind. Bit D = 0, no interworking encountered F = 1, ISUP used all the way I = 0, originating access non-ISDN	Progress ind. progress description = # 3, originating address is non-ISDN
Message	N/A	ACM ←——	ALERTing
Content	no mapping applied	Backward call ind. Bit I = 0, no interworking encountered K = 1, ISUP used all the way M = 1, terminating access ISDN	no Progress ind.
Message	N/A	ANM ——→	CONNect
Content	no mapping applied	Backward call ind. Bit I = 0, no interworking encountered K = 1, ISUP used all the way M = 1, terminating access ISDN	no Progress ind.

3.3.6 *Scenario 6*

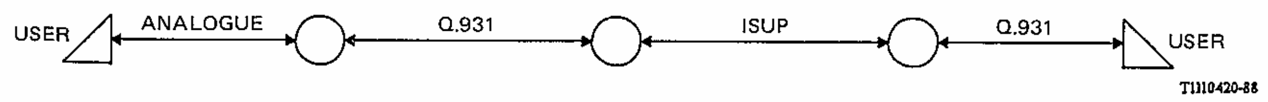


TABLE 14/Q.699

Parameter fields mapping for ANALOGUE-Q.931-ISUP-Q.931

	Originating User/Network	Network	Terminating User/Network
Message	SETUP →	IAM →	SETUP
Content	Progress ind. progress description = # 3, originating address in non-ISDN location = private network	Forward call ind. Bit D = 0, no interworking encountered F = 1, ISUP used all the way I = 1, originating access ISDN Access transport carries Progress ind.	Progress ind. as received from the ATP
Message	ALERTing ←	ACM ←	ALERTing
Content	no Progress ind.	Backward call ind. Bit I = 0, no interworking encountered K = 1, ISUP used all the way M = 1, terminating access ISDN	no Progress ind.
Message	CONNect ←	ANM ←	CONNect
Content	no Progress ind.	Backward call ind. Bit I = 0, no interworking encountered K = 1, ISUP used all the way M = 1, terminating access ISDN	no Progress ind.

3.3.7 *Scenario 7*

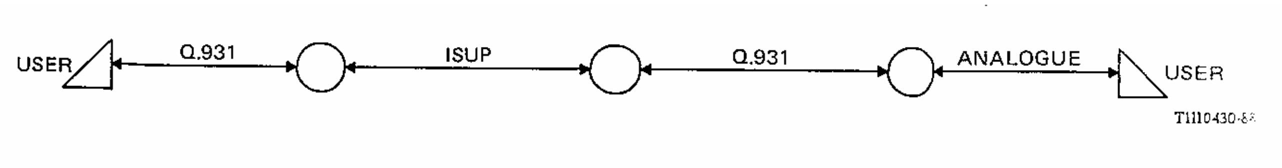


TABLE 15/Q.699

Parameter fields mapping for Q.931-ISUP-Q.931-ANALOGUE

	Originating User/Network	Network	Terminating User/Network
Message	SETUP →	IAM →	SETUP
Content	no Progress ind.	Forward call ind. Bit D = 0, no interworking encountered F = 1, ISUP used all the way I = 1, originating access ISDN	no Progress ind.
Message	ALERTing ←	ACM ←	ALERTing
Content	Progress ind. as received in the ATP	Backward call ind. Bit I = 0, no interworking encountered K = 1, ISUP used all the way M = 1, terminating access ISDN ATP carries Progress indicator	Progress ind. progress description = # 2, destination address in non-ISDN location = private network
Message	CONNect ←	ANM ←	CONNect
Content	Progress. ind. as received in the ATP	Backward call ind. Bit I = 0, no interworking encountered K = 1, ISUP used all the way M = 1, terminating access ISDN ATP carries Progress indicator	Progress ind. (Note) progress description = # 2, destination address in non-ISDN location = private network

Note – The Progress indicator is not necessarily repeated in the CONNECT message if it has already appeared in the ALERTING message.

4 Release procedures

4.1 *Arrow diagram*

This section contains the arrow diagrams for the Q.931/Q.764 interworking release procedures.

4.1.1 *End-to-end ISDN scenario*

The following normal call release procedures are indicated.

Case 1: This case shows the normal call release interworking procedure without tone provision (Figure 20/Q.699).

A DISConnect message from the originating user is mapped via the Disconnect Indication and Release Request primitives into a RELease message in the network.

At the destination end, a RELease message from the network is mapped into a DISConnect message sent to the terminating user via Release Indication and Disconnect Request primitives.

The tone/announcement option is not applied in the terminating exchange.

Case 2: This case shows the normal call release interworking procedure with tone provision (Figure 21/Q.699).

The tone/announcement option is applied in the terminating exchange.

A RELease message from the network is mapped into a DISConnect message with progress indicator (# 8, in-band information or appropriate pattern is now available) sent to the terminating user.

4.1.2 *PSTN/ISDN interworking scenario*

The following normal release procedures in PSTN to ISDN interworking scenario are indicated.

Case 1: Clear forward (Figure 22/Q.699, Case 1)

This case shows the normal call release procedure being initiated from the originating PSTN by means of a clear forward signal.

At the ISDN/PSTN interworking exchange, the clear forward signal is mapped into a RELease message to the ISDN exchange.

Case 2: Clear backward (Figure 22/Q.699, Case 2)

This case shows the normal call release procedure being initiated from the terminating ISDN user by means of a DISConnect message.

At the ISDN-PSTN interworking exchange, a RELease message is mapped into an appropriate backward signal in PSTN.

4.1.3 ISDN/PSTN interworking scenario

The following normal release procedures in the ISDN to PSTN interworking scenario are indicated.

Case 1: Clear forward (Figure 23/Q.699, Case 1)

This case shows the normal call release procedure being initiated from the originating ISDN user by means of a DISConnect message.

At the ISDN/PSTN interworking exchange, a RELease message is mapped into an appropriate clear forward signal in PSTN.

Case 2: Clear backward (Figure 23/Q.699, Case 2)

This case shows the normal call release procedure being initiated from the terminating PSTN by means of a clear backward signal.

At the ISDN/PSTN interworking exchange, the clear backward signal is mapped into a SUSpend message with suspend/resume indicator (network initiated).

The terminating ISDN exchange starts the time. Upon expiry of the timer, if the terminating exchange has not received a RESume message, the terminating exchange initiates clearing by sending a DISConnect message to the user, and sending a RELease message to the preceding exchange.

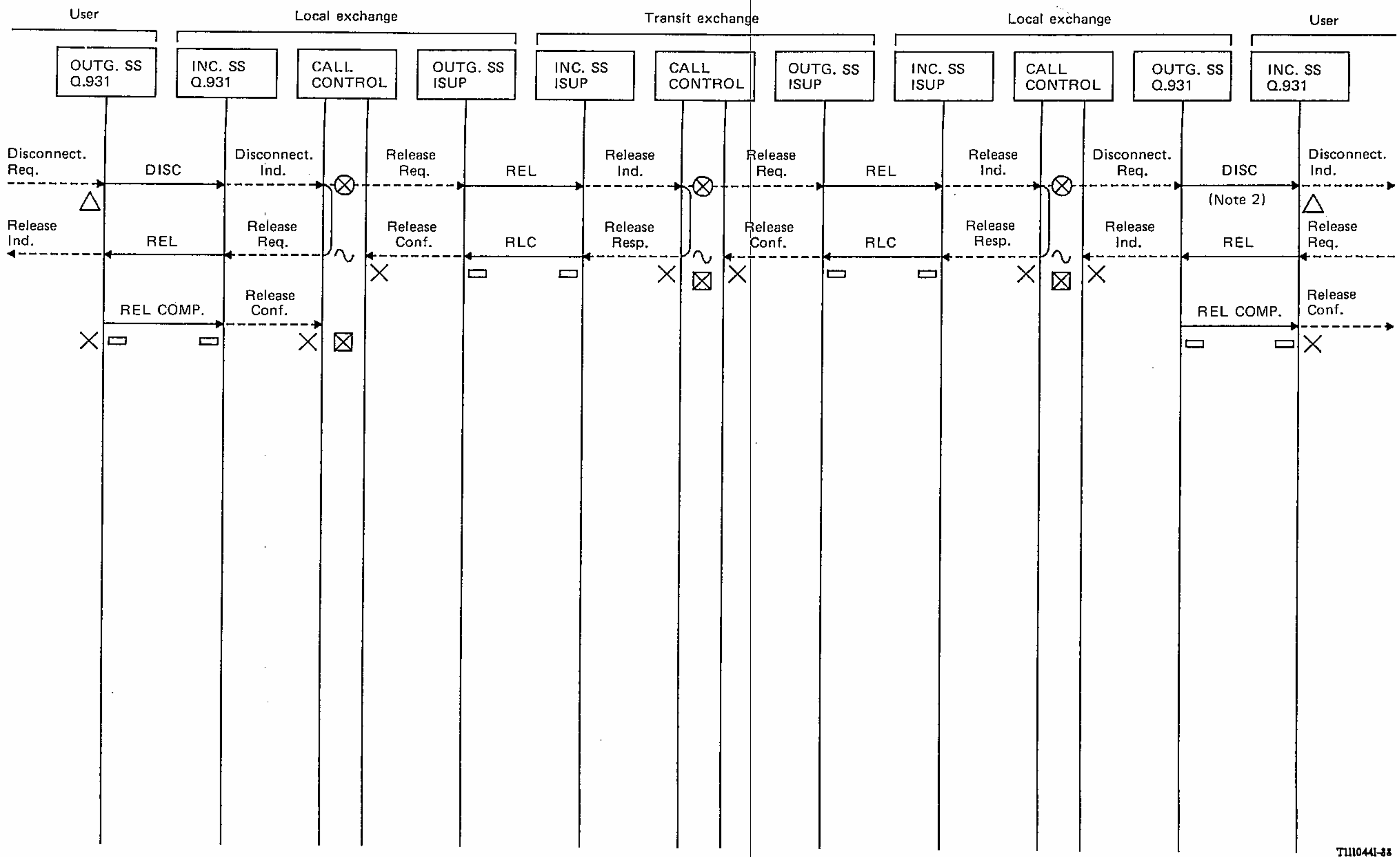
4.1.4 *Notes for Figures 20/Q.699-23/Q.699*

Note 1 – This procedure is applicable to those basic services where in-band tone/announcement is not provided, e.g. 64 kbit/s unrestricted bearer service.

Note 2 – The DISC message should not include the progress indicator ##8.

Note 3 – This procedure is applicable to both speech and 3.1 kHz audio bearer services.

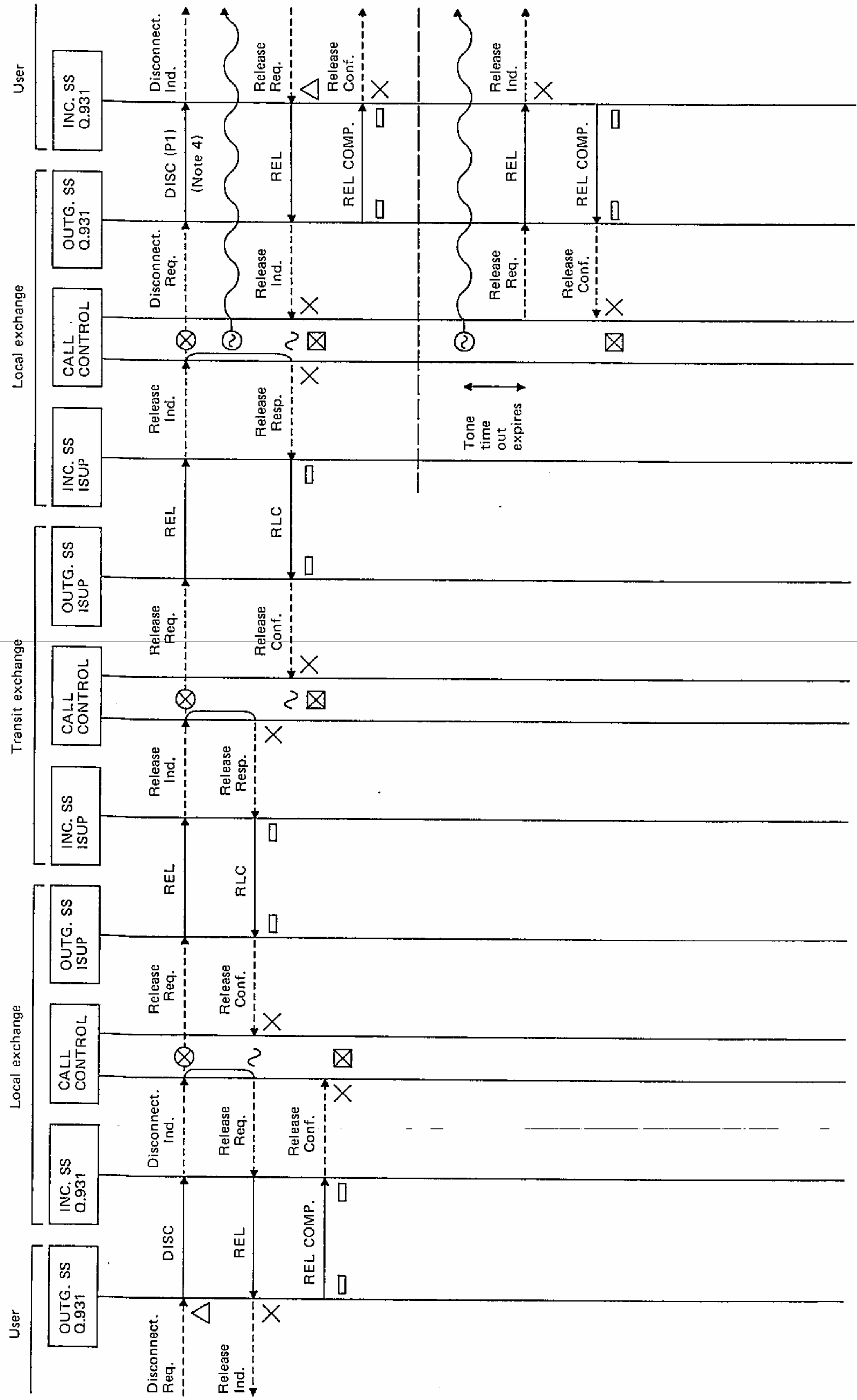
Note 4 – The provision of tone is optional. If tone is provided, progress indicator ##8 should be included in the DISC message. If tone is not provided, progress indicator ##8 should not be included.



(Notes are given in § 4.1.4)

FIGURE 20/Q.699

Normal call release procedure without tone provision (Note 1)



(Notes are given in § 4.1.4)

FIGURE 21/Q.699

Normal release procedure with tone provision (Note 3)

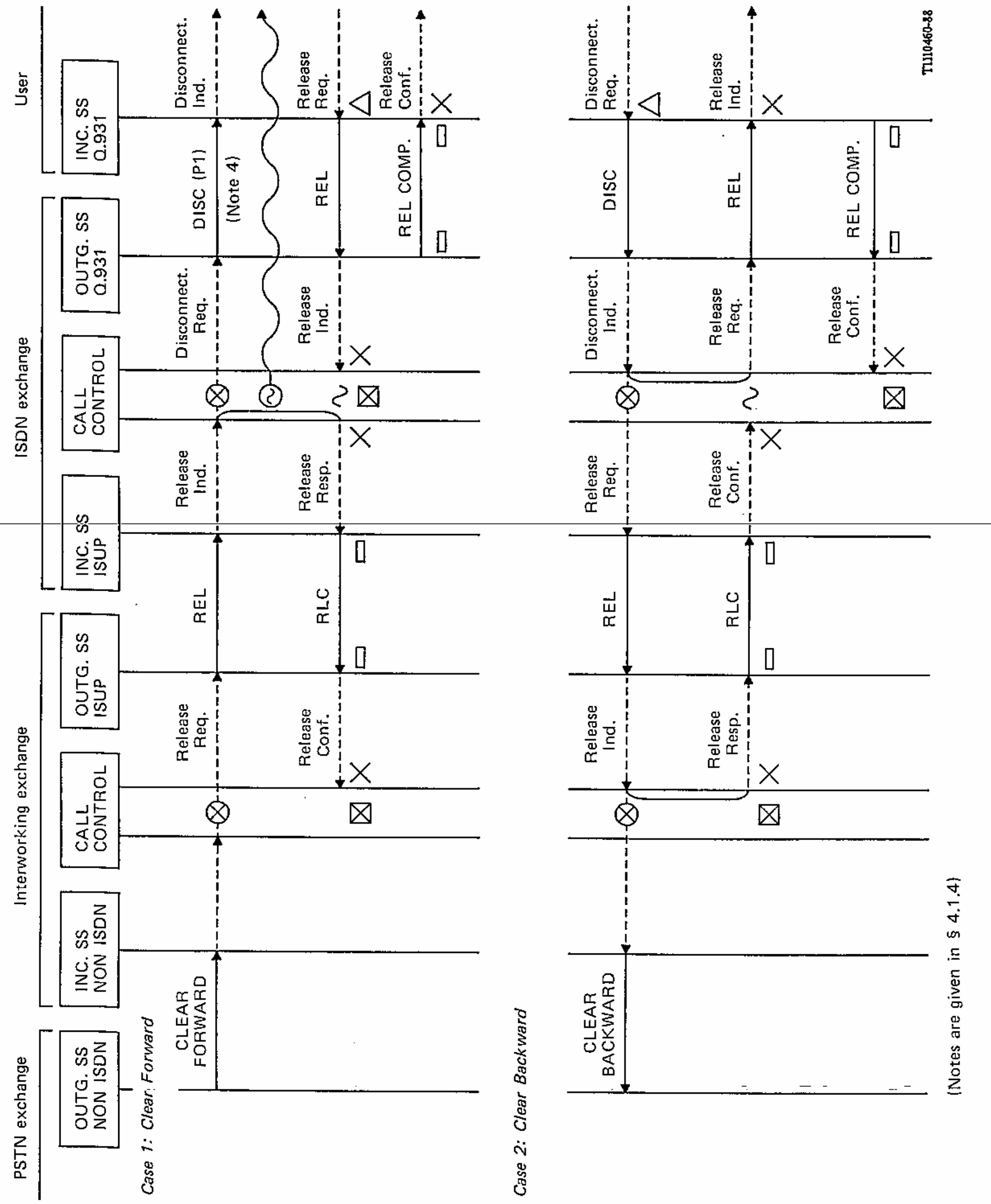


FIGURE 22/Q.699

Normal release procedure for PSTN to ISDN interworking

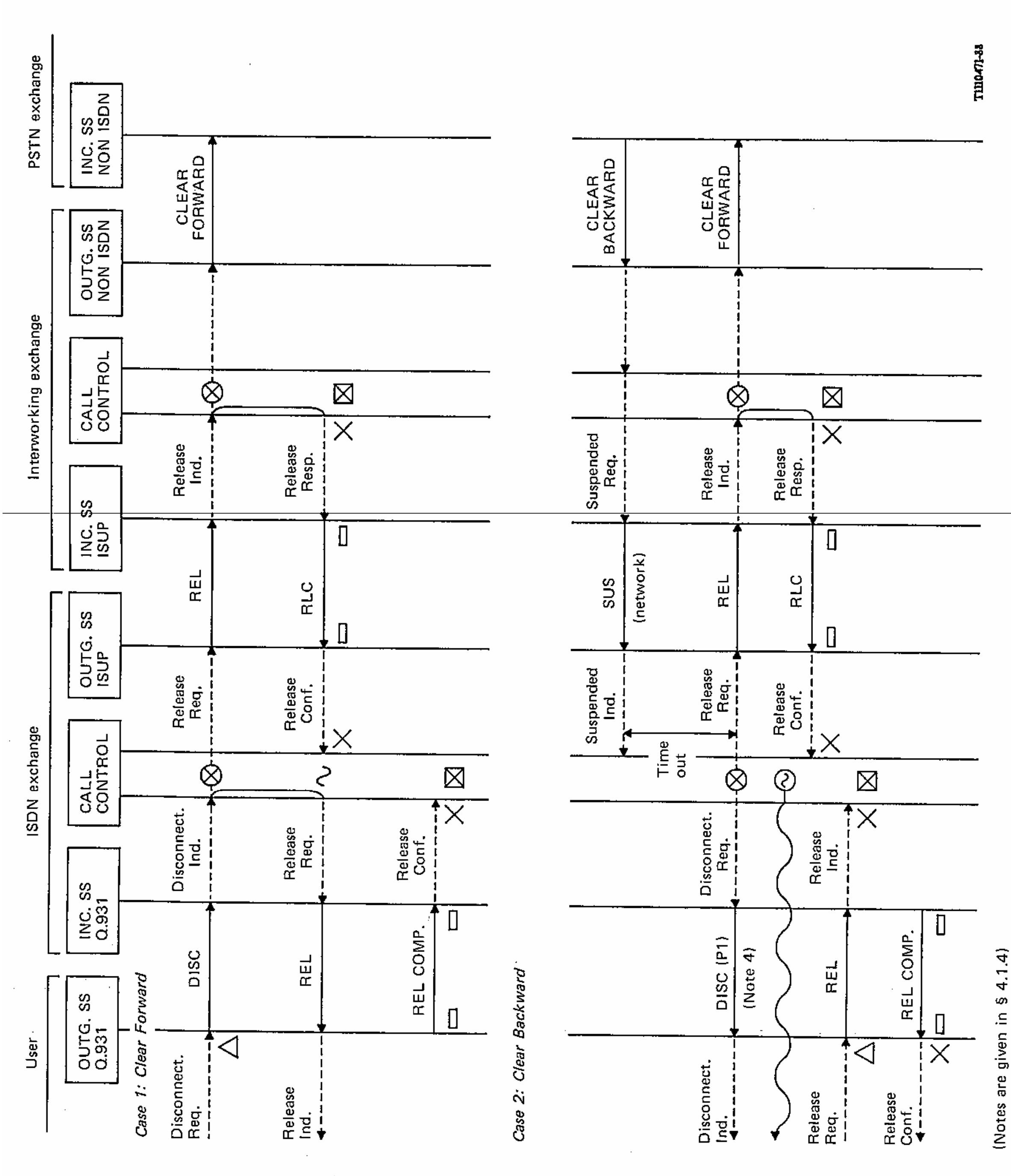


FIGURE 23/Q.699

Normal release procedure for ISDN to PSTN interworking

4.2 *Mapping of parameters*

This section contains the mapping table of Q.763/Q.931 messages and associated parameters.

TABLE 16/Q.699

Mapping of release procedure parameters for ISDN call

	User/Network	Network	User/Network
Message	DISConnect ←	→ RELease ←	→ DISConnect
Contents	*Cause	*Cause	*Cause

TABLE 17/Q.699

Mapping of release procedure parameters for PSTN-ISDN call (Called party clears)

	PSTN	Network	User/Network
Message	Clear Backward Signal ←	— RELease ←	— DISConnected
Contents		*Cause	*Cause

TABLE 18/Q.699

Mapping of release procedure parameters for PSTN-ISDN call (Called party clears)

	PSTN	Network	User/Network
Message	Clear forward signal ←	— RELease ←	— DISConnect
Contents		*Cause # 16, Normal call clearing	*Cause # 16, Normal call clearing

TABLE 19/Q.699

Mapping of release procedure parameters for ISDN-PSTN call (Calling party clears)

	User/Network →	Network →	PSTN
Message	DISConnect	RELease	Clear forward signal
Contents	*Cause	*Cause	

5 Interworking specification for unsuccessful set-up procedure

5.1 *Arrow diagram*

This section contains the arrow diagrams for the unsuccessful call set-up procedures.

5.1.1 *Unsuccessful call set-up, point-to-point data link*

Figure 24/Q.699 shows the unsuccessful call set-up procedure, where inband tones/announcements are not provided (e.g. 64 kbit/s unrestricted bearer service). The RELease COMPlete message at the destination exchange is mapped into the RELease message via the Reject Indication and Release Request primitives. At the originating exchange the RELease message is mapped via the Release Indication and Disconnect Request primitives into the DISConnect message.

5.1.2 *Unsuccessful call – Broadcast data link*

Figure 25/Q.699 shows the unsuccessful call set-up procedure, where inband tones/announcements are not provided (e.g. 64 kbit/s unrestricted bearer service), in the case where the called party is addressed via a broadcast data link. The returning of the RELease COMPlete message via a broadcast data link is optional. In the case shown, on receipt of the RELease COMPlete message at the destination exchange the cause value is retained, and to allow for the possibility of another terminal accepting the call, the Reject Indication primitive is not generated until the expiry of timer T303.

Note – Where the network does not receive any response to the initial SETUP message before the expiry of timer T303, the SETUP message is retransmitted and T303 is restarted. If no further response is received by the network on the second expiry of timer T303, the Reject Indication primitive is generated.

The RELease message is then mapped from the Reject Ind and Release Request primitives. At the originating exchange the RELease message is mapped via the Release Indication and Disconnect Request primitives into the DISConnect message.

5.1.3 *Unsuccessful call – Tone/announcement applied at the originating exchange*

Figure 26/Q.699 shows the unsuccessful set-up procedure where tones or announcements are generated in the originating exchange towards the ISDN user as a result of receiving a RELease message.

Timer T306 is started after the appropriate tone/announcement is sent. Figure 26/Q.699 shows the originating ISDN user releasing before timer T306 expires.

5.1.4 *Unsuccessful call – Tone applied by terminating exchange*

Figure 27/Q.699 shows an unsuccessful call where certain tones and announcements can only be generated in the terminating exchange (or transit exchange) during call establishment. This is a typical case, for example, for a changed number announcement where the changed number information is only available at the terminating local exchange. Alternatively, a specific announcement may be applied at a transit exchange to indicate, for example, that all circuits to a particular destination are busy.

The originating exchange sends a DISconnect message to the calling user with progress indicator # 8, thus indicating that in-band information is available. Normal release procedures apply after the in-band information has been connected.

5.1.5 *Unsuccessful call – Originating exchange tone/announcement time-out expires*

Figure 28/Q.699 shows the case of tone time-out expiry at the local exchange. This is very similar to § 5.1.3 above except that the caller fails to clear the call following the application of the tone. Timer T306 then expires.

5.1.6 *ISDN-PSTN interworking – Tone/announcements applied by terminating exchange within PSTN*

Figure 29/Q.699 shows an unsuccessful call where the sending of tones and announcements is generated by the terminating exchange during the call set-up phase. In this case, an Address Complete Message is returned from the interworking point with indicators set as shown in Note 8 (see § 5.1.8). This is mapped to a PROGress Message at the originating local exchange, with the progress indicator set to value 1, to indicate that in-band information may be available. The sequence applies to failure occurring at any point within the PSTN.

5.1.7 *Premature release – Point-to-point data link*

Figure 30/Q.699 shows a premature release situation where release is received at the terminating local exchange prior to any terminal response. In this situation a DISConnect message is sent to the called user and the normal clearing procedure is initiated.

5.1.8 *Notes for Figures 24/Q.699-30/Q.699*

Note 1 – This procedure is applicable in those cases where in-band tone/announcements are not provided, e.g. 64 kbit/s unrestricted bearer service.

Note 2 – This message is delivered by a point-to-point data link.

Note 3 – This message is sent by a broadcast data link.

Note 4 – Timer T306 is started in the Q.931 protocol block.

Note 5 – If tones/announcements are applied, a DISConnect message may be sent containing progress indicator # 8. As an alternative, a PROGress message may also be sent containing progress indicator ##8.

Note 6 – Customized announcements can only be provided by this exchange.

Note 7 – Tone/announcement time-out expires.

Note 8 – Backward call indicators in the Address Complete Message set as follows:

ISDN access indicator = non-ISDN
Protocol control indicators = interworking encountered
Called party's status indicator = no indication.

Note 9 – See § 2.1.9.1 of Recommendation Q.764 for through-connect timing.

Note 10 – If the clearing ISDN user is the called party, this message becomes a clear back.

Note 11 – In the case of point-to-multipoint, the DISConnect message is not sent. Terminals are released as they respond.

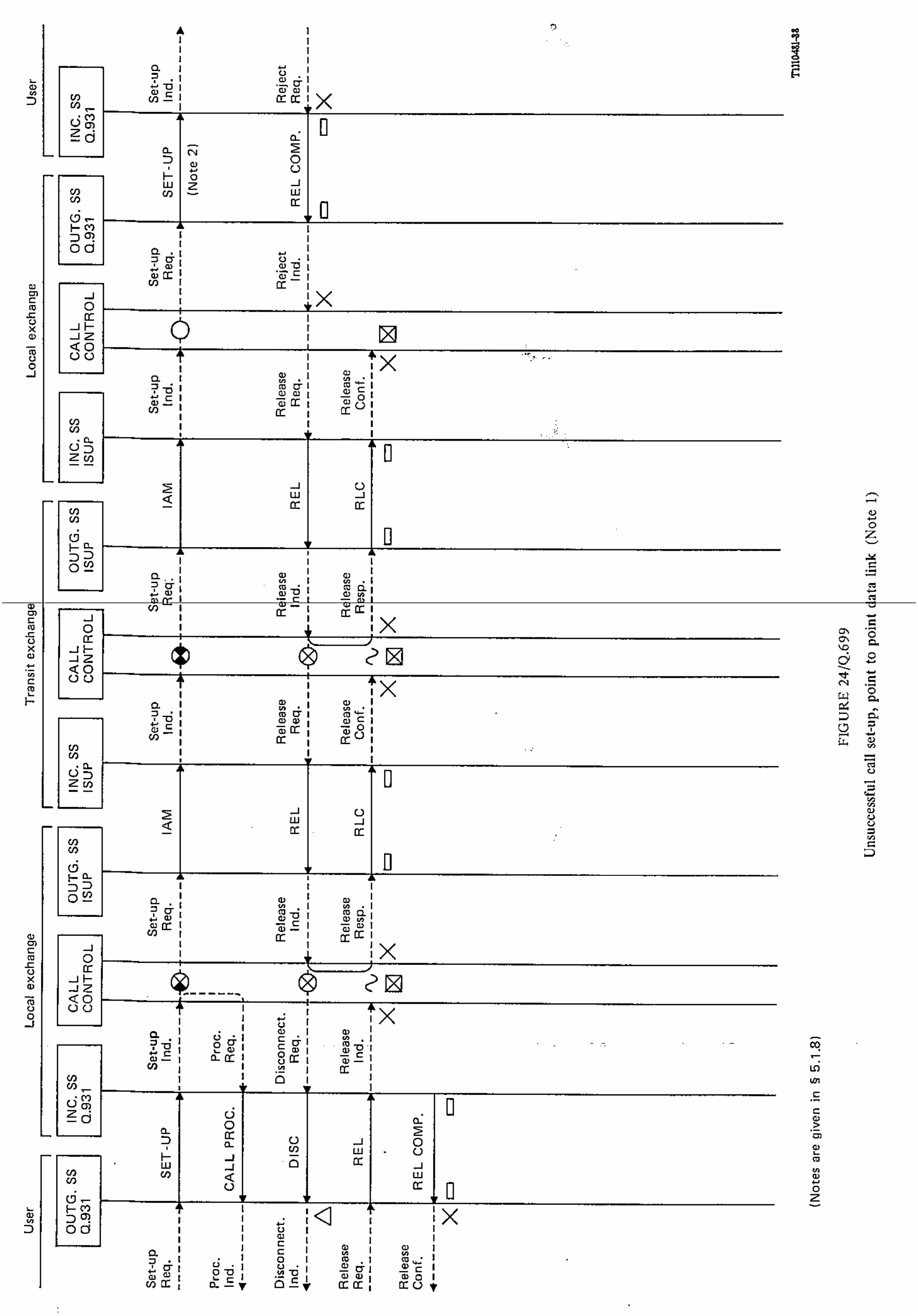
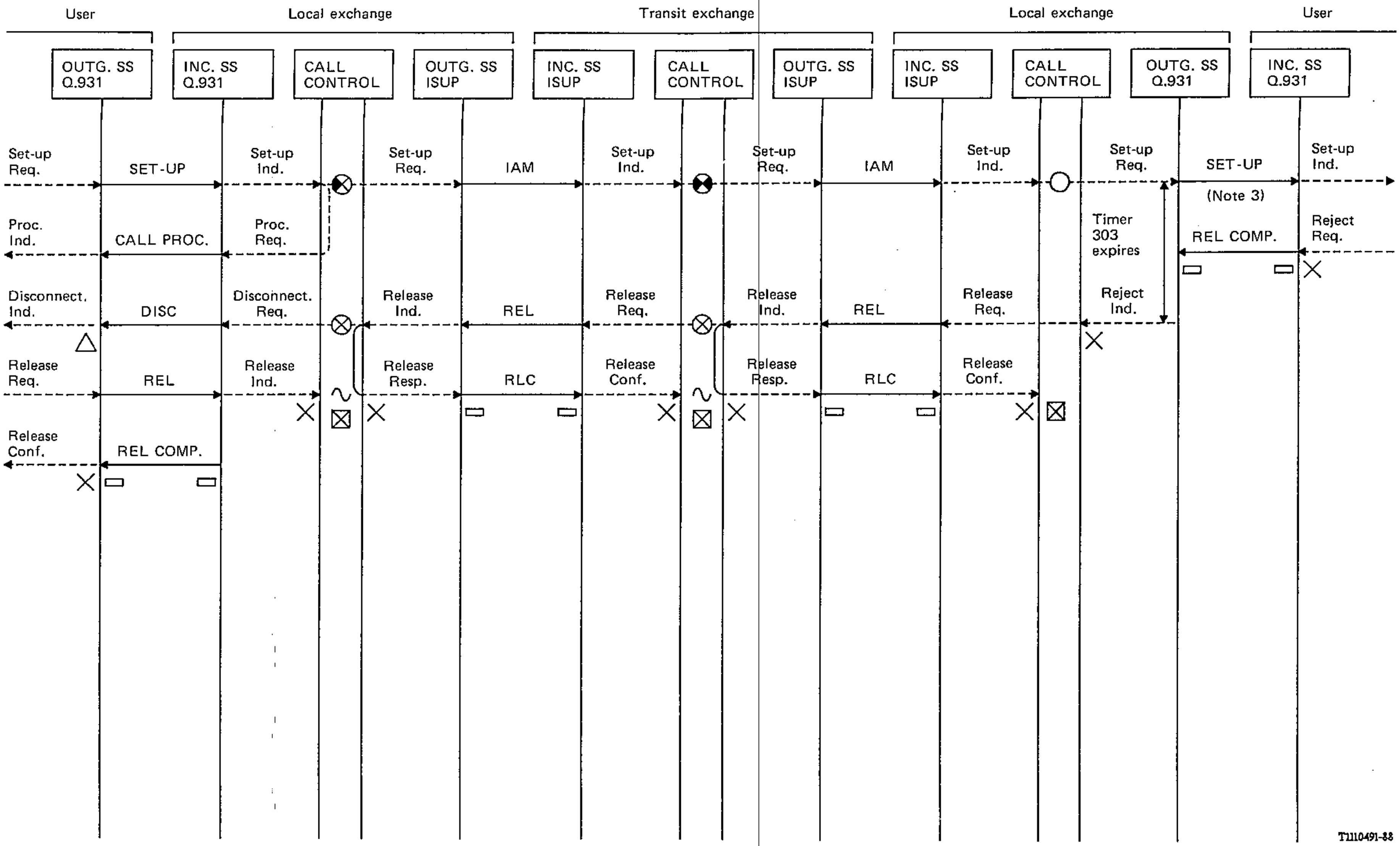


FIGURE 24/Q.699

Unsuccessful call set-up, point to point data link (Note 1)

(Notes are given in § 5.1.8)



(Notes are given in § 5.1.8)

FIGURE 25/Q.699

Unsuccessful call set-up, broadcast data link (Note 1)

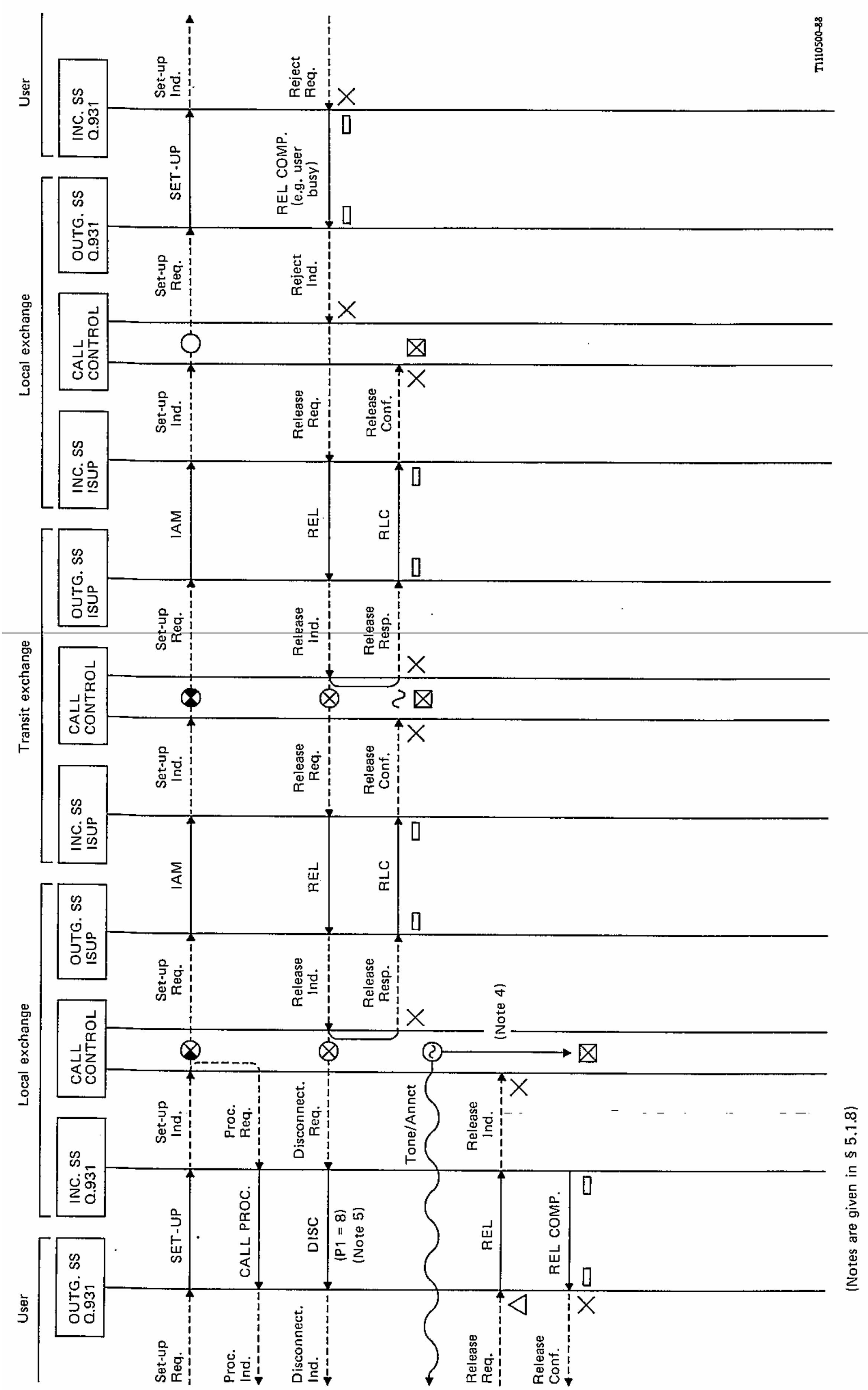
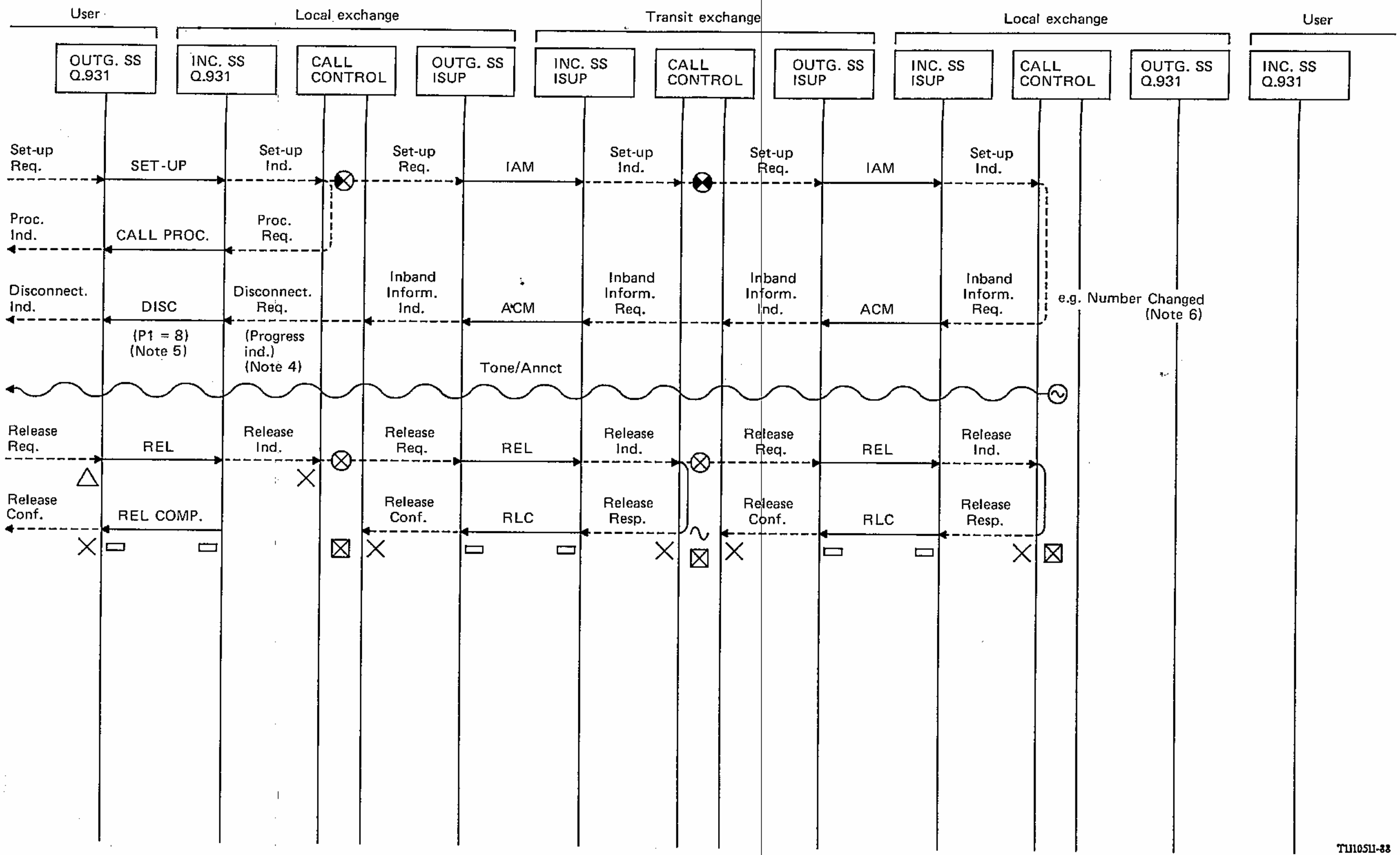


FIGURE 26/Q.699

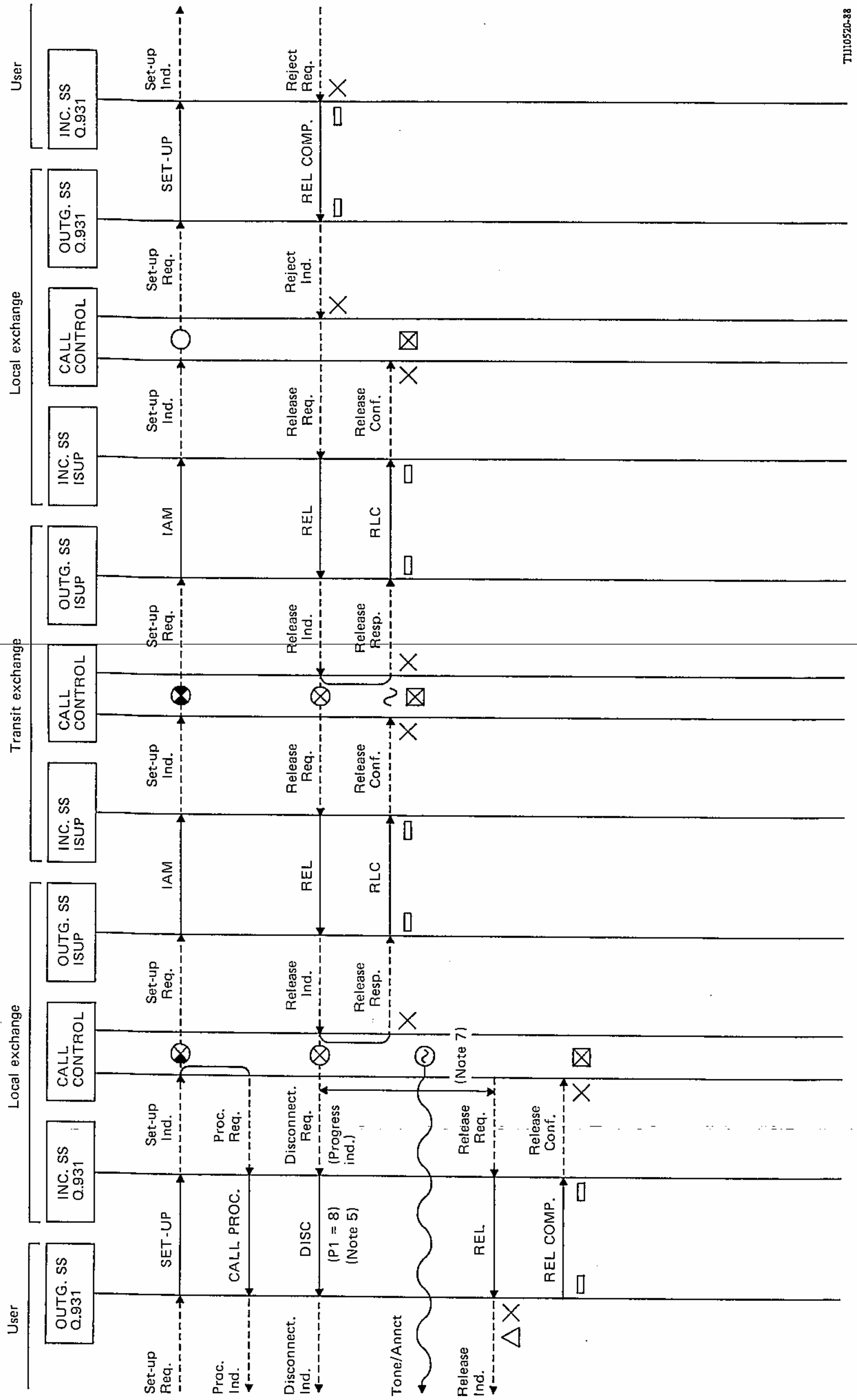
Unsuccessful call set-up tone/announcement applied at originating exchange



(Notes are given in § 5.1.8)

FIGURE 27/Q.699

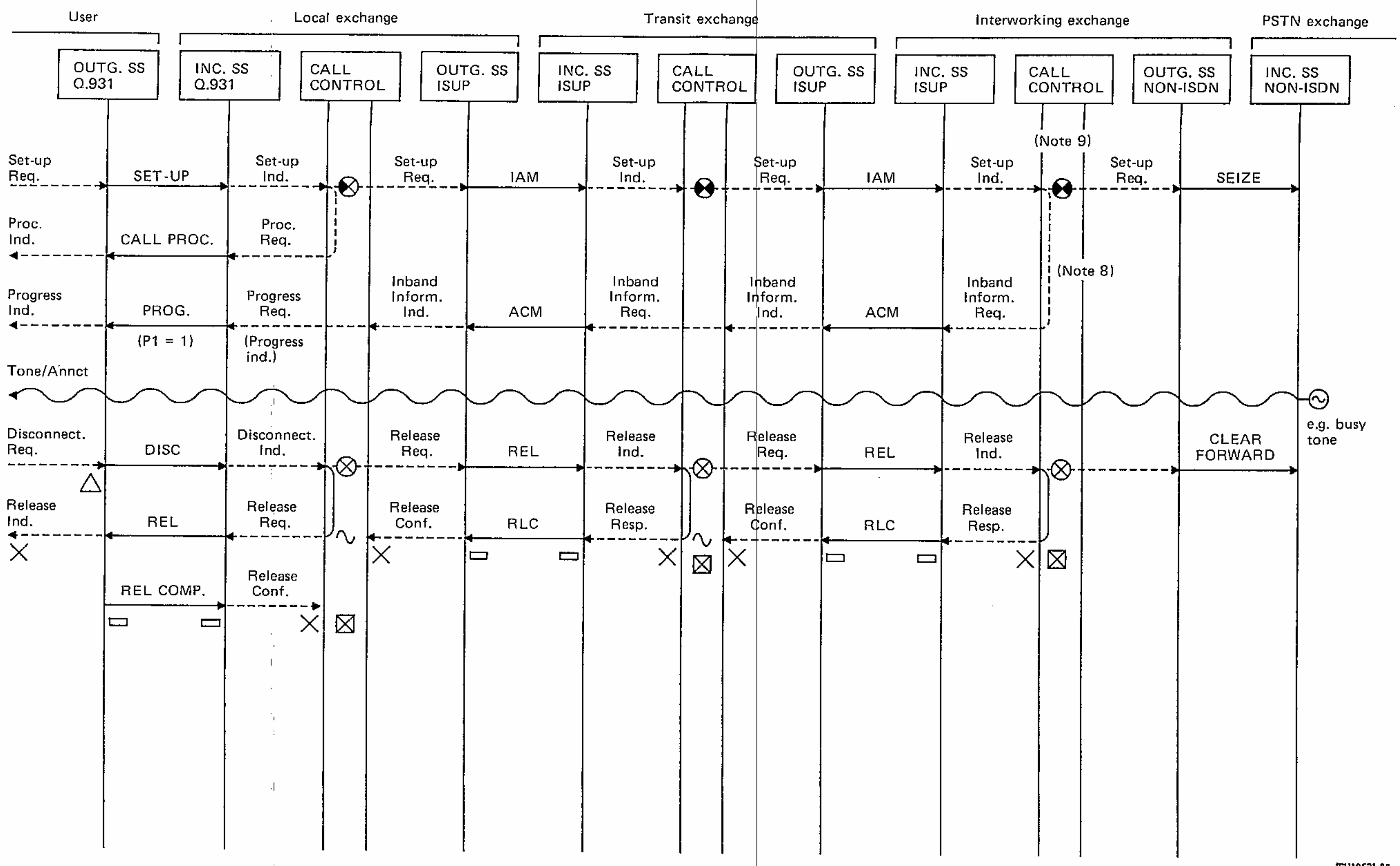
Unsuccessful call set-up tone/announcement applied by terminating exchange



(Notes are given in § 5.1.8)

FIGURE 28/Q.699

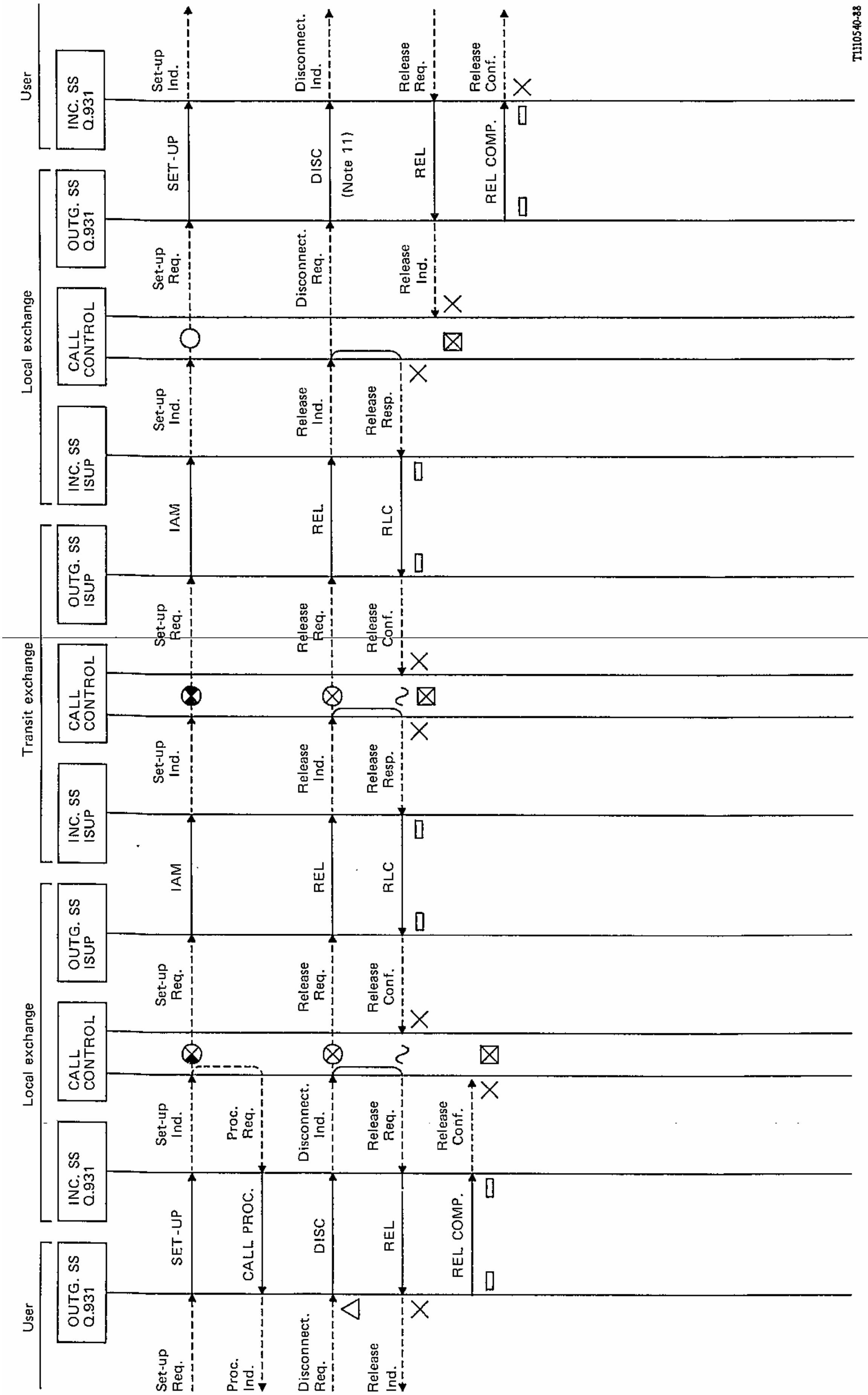
Unsuccessful call set-up originating exchange tone/announcement time-out expires



(Notes are given in § 5.1.8)

FIGURE 29/Q.699

ISDN-PSTN interworking tones/announcements applied by terminating exchange within PSTN



(Notes are given in § 5.1.8)

FIGURE 30/Q.699

Premature release point-to-point data link

5.2 *Mapping of parameters*

This section contains the mapping of Q.763/Q.931 messages and associated parameters.

TABLE 20/Q.699

Mapping of ISDN user part address complete message parameters

	Originating user/network	Network
Message	DISCONNECT (Q.931) ←	ADDRESS COMPLETE MESSAGE (ISUP)
Contents	Cause Progress indicator	Cause Inband information indicator (Network tone or announcement applied)

Note – In this case the inclusion of a Progress Indicator is mandatory.

TABLE 21/Q.699

Mapping of ISUP Call Progress parameters

	Originating user/network	Network
Message	(Q.931) PROGRESS	ADDRESS COMPLETE MESSAGE (ISUP)
Contents	Cause Progress indicator	Cause Inband information indicator (Network Tone/Announcement applied)

Note – In this case the inclusion of a Progress Indicator is mandatory.

TABLE 22/Q.699

Mapping of Q.931 RELease COMPlete message information elements

	Originating user/network	Network	Terminating user/network
Message	(Q.931) DISC ←	(ISUP) RELEASE ←	(Q.931) REL COMP
Contents	Cause	Cause	Cause

Note – The Progress Indicator is included when Tones/Announcements are provided at the originating local exchange when the Bearer Capability = speech or 3.1 kHz Audio (see Fig. 5.3).

TABLE 23/Q.699

Alternative mapping of Q.931 RELease COMPlete message information elements

	Originating user/network ←	Network ←	Terminating user/network
Message	(Q.931) PROGRESS	(ISUP) RELEASE	(Q.931) REL COMP
Contents	Cause	Cause	Cause

6 Interworking specifications for suspend/resume procedures

6.1 *Arrow diagrams*

This section contains the arrow diagrams for the Recommendation Q.931/Q.764 interworking suspend/resume procedures.

6.1.1 *Successful and unsuccessful suspend/resume procedures*

Figure 31/Q.699 indicates the successful and unsuccessful suspend and resume procedures.

Suspension control and supervision point is the originating local exchange and maybe a controlling exchange in the network.

The ISDN User Part protocol in the network is used to convey the notification to the remote end from the originating exchange.

6.1.2 *Suspend/resume – Control and supervision within NT2*

Figure 32/Q.699 illustrates the suspend and resume interworking procedures, where the control and supervision point is located within the NT2.

6.1.3 *Suspend/resume – ISDN/PSTN interworking*

Figure 33/Q.699 illustrates the suspend and resume procedures for ISDN-PSTN interworking.

6.1.4 *Suspend/resume – PSTN/ISDN interworking*

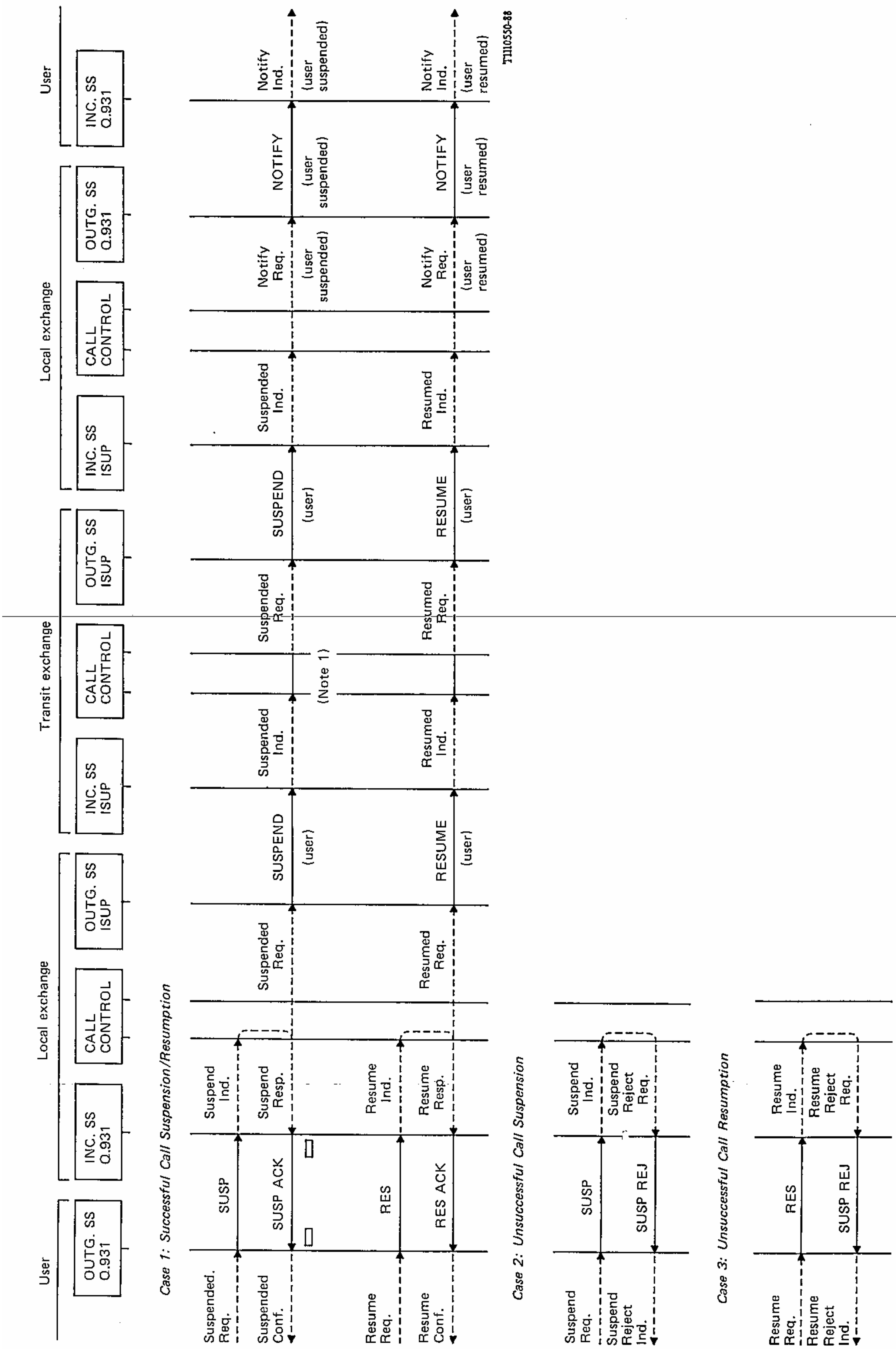
Figure 34/Q.699 illustrates the suspend and resume procedures for PSTN-ISDN interworking.

6.1.5 *Notes for Figures 31/Q.699-34/Q.699*

Note 1 – Supervision control in controlling exchange.

Note 2 – Supervision may be performed by the interworking exchange. In that case the clear-back and reanswer messages would not be sent.

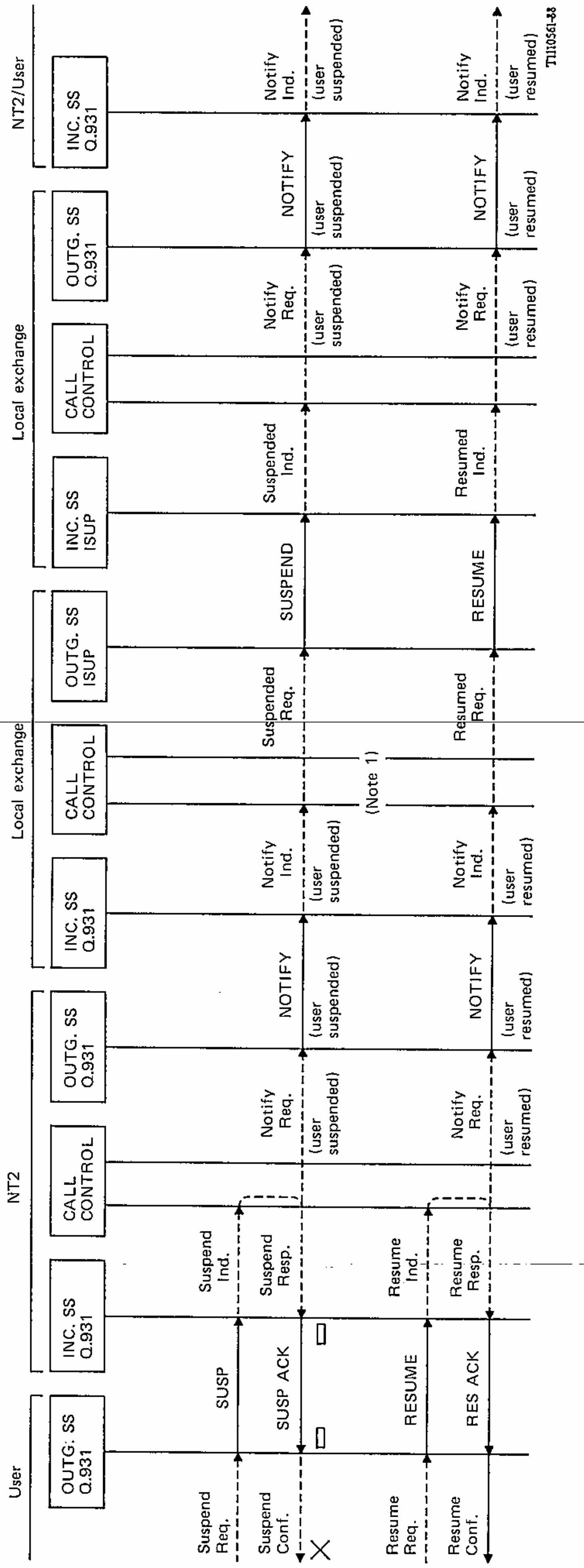
Note 3 – When a DISConnect message is sent by the terminating subscriber, the release procedures in accordance with § 4 apply.



(Notes are given in § 6.1.5)

FIGURE 31/Q.699

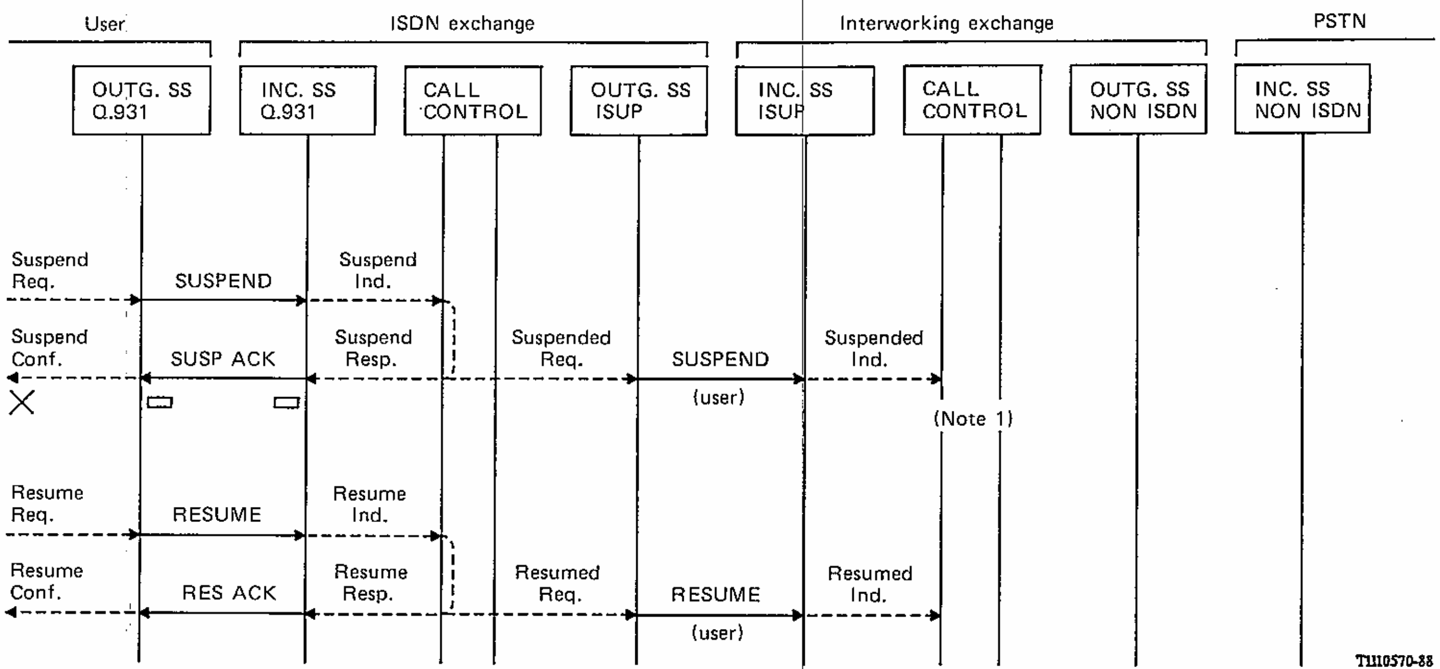
Suspend/resume interworking



(Notes are given in § 6.1.5)

FIGURE 32/Q.699

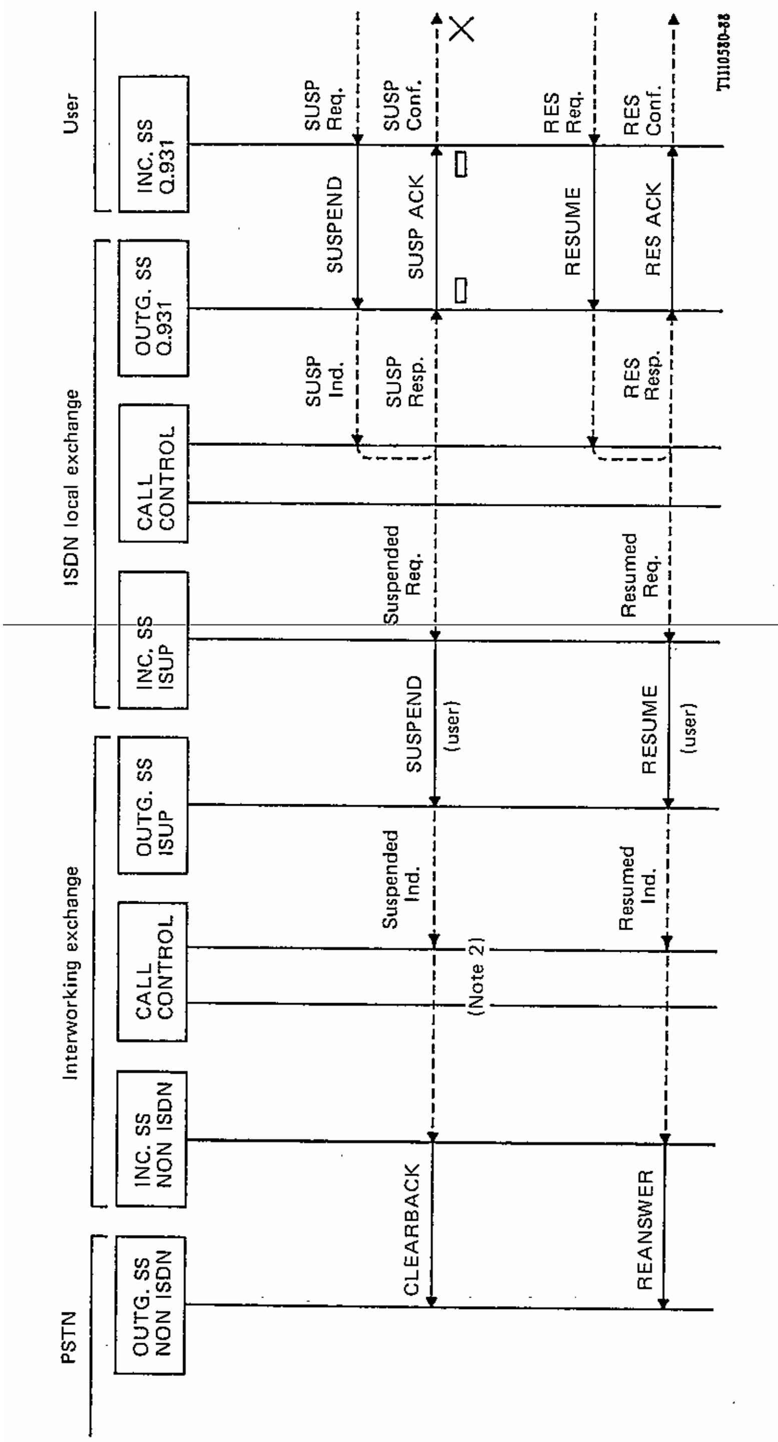
Suspend/resume interworking
Where the control point is located in the NT2



(Notes are given in § 6.1.5)

FIGURE 33/Q.699

Suspend/Resume ISDN-PSTN interworking arrow diagram



(Notes are given in § 6.1.5)

FIGURE 34/Q.699

Suspend/Resume PSTN-ISDN interworking arrow diagram

6.2 *Mapping of parameters*

This section contains the mapping of Q.763/Q.931 messages and associated parameters.

TABLE 24/Q.699

Mapping of SUSPEND/RESUME parameters

	User/Network →	Network →	Network/User
Message/information element parameter	SUSPEND	SUSPEND Suspend/Resume indicator (Note)	NOTIFY Notification indicator (set to user suspended)
	RESUME	RESUME Suspend/Resume indicator (Note)	NOTIFY Notification indicator (set to user resumed)

Note – The values of the SUSPEND/RESUME indicator in Q.763 are respectively "ISDN subscriber initiated" and "network initiated". This SUSPEND/RESUME message is only mapped into the Q.931 NOTIFY message when the SUSPEND/RESUME indicator is set to "ISDN subscriber initiated".

TABLE 25/Q.699

Mapping of SUSPEND/RESUME parameters for interworking with NT2

User/NT2	NT2/Network	Network	Network/NT2	NT2/User
SUSPEND	NOTIFY Notification indicator (user suspended) (Note 2)	SUSPEND SUSPEND/Resume indicator (Note 1)	NOTIFY Notification indicator (set to user suspended)	NOTIFY Notification indicator (set to user suspended)
RESUME	NOTIFY Notification indicator (user resumed) (Note 2)	RESUME Suspend/Resume indicator (Note 1)	NOTIFY Notification indicator (set to user resumed)	NOTIFY Notification indicator (set to user resumed)

Note 1 – The values of the SUSPEND/RESUME Indicator in Q.763 are respectively "ISDN subscriber initiated" and "network initiated". This SUSPEND/RESUME message is only mapped into the Q.931 NOTIFY message when the SUSPEND/RESUME Indicator is set to "ISDN subscriber initiated".

Note 2 – Only when the NOTIFY message indicates a SUSPEND/RESUME is this message mapped into the ISUP messages SUSPEND and RESUME.

ANNEX A

(to Recommendation Q.699)

Source of busy tone generation

A.1 *Introduction*

A.1.1 This annex provides a set of rules by which the location of the busy signal tone generation point could be determined for signalling interworking cases.

A.1.2 It is important to recognize that for those cases where a busy tone is generated at a location other than the originating exchange, an end-to-end path between the busy tone source and the user must exist.

A.2 *Terminology*

A.2.1 The terms originating exchange and terminating exchange refer to the public network exchange that is closest to the respective end user.

Note 1 – When an exchange of a public network has no appropriate pre-arrangement with the calling or the called user, it assumes that the exchange is closest to the end user, and therefore serves as an originating or a terminating exchange in this terminology.

Note 2 – Some networks may, as a network option, permit NT2s to generate busy tone (e.g. according to Annex C/Q.931 or Annex O/Q.931). In these cases, the following rules shall also be applied, using the terminology “NT2” to replace “originating exchange” or “terminating exchange” as appropriate.

A.2.2 There are three types of signalling to be considered in these discussions viz.:

i) ISDN signalling systems, i.e. Signalling System No. 7 ISDN User Part (SS7 ISUP) and ISDN user-network interface;

ii) Type 1 PSTN signalling systems which can convey a clearing message (e.g. a subscriber busy signal) for an unsuccessful call, e.g. SS7 TUP, SS6, R2; and

iii) Type 2 PSTN signalling systems which cannot convey a clearing message (e.g. the subscriber busy signal) for an unsuccessful call, e.g. R1, and in this signalling system, busy tone is used to indicate that the called user interface is busy.

A.3 *Rules*

This section presents the set of rules for speech and 3.1 kHz audio bearer services.

A.3.1 *Rule No. 1*

For ISDN to ISDN connections, the in-band busy tones shall normally be generated at the originating exchange. The terminating exchange shall originate a clearing message to the originating exchange upon notification or identification that the user interface is busy.

A.3.2 *Rule No. 2*

For non-ISDN to ISDN connections, the in-band busy tone shall normally be generated at the interworking exchange. The terminating exchange shall originate a clearing message towards the originating exchange. The first exchange that cannot originate, or convey, the clearing message (or subscriber busy signal) towards the originating exchange shall be defined as the interworking exchange and shall generate the busy tone. This interworking exchange serves as an interworking exchange either between ISDN signalling system and Type 2 PSTN signalling system or between Type 1 PSTN signalling system and Type 2 PSTN signalling system. A network containing both the terminating and the interworking exchange shall have the option of providing the busy tone from anywhere inside its network.

A.3.3 *Rule No. 3*

For ISDN to non-ISDN connections, the in-band busy tone shall be generated at either the originating exchange or in the non-ISDN network. The source of busy will depend on the connection configuration and shall be determined uniquely by the following:

– For ISDN to non-ISDN connections:

  a) in which ISDN signalling exists from the originating exchange to the terminating exchange, or

b) in which ISDN signalling and Type 1 signalling exists from the originating to the terminating exchange, then the in-band busy tone shall be generated at the originating exchange.

– For all other ISDN to non-ISDN connections, the in-band busy signal shall be generated in the non-ISDN network.

Note – In cases where special call handling, upon user busy, is offered, the exchange(s) other than specified by the above three rules can have the option of providing the busy tone and causing the appropriate message to be sent to the originator, and retain the connection for subsequent user requests.

ANNEX B

(to Recommendation Q.699)

Usage of "Cause" in Recommendations Q.931, Q.763 and Q.730

B.1 *Format*

Format of Q.931 Cause information element or Q.763/Q.730 Cause indicators parameters *contents* is shown in Figure B-1/Q.699.

8	7	6	5	4	3	2	1
0/1 Ext	Coding standard		0 Spare	Location			
1 Ext	Recommendation						
1 Ext	Cause value						
Diagnostic(s) (if any)							

Note – If the default applies for the Recommendation field, octet including this field shall be omitted.

FIGURE B-1/Q.699

Format of "Cause"

B.2 *Codes used in the sub-field of the "Cause"*

B.2.1 *Extension indicator (ext)*

Bit
8
0 octet continues through the next octet (e.g. octet 1 to 1a)
1 last octet

B.2.2 *Coding standard*

Bits
7 6
0 0 CCITT standardized coding, as described below
0 1 reserved for other international standards (Note)
1 0 national standard (Note)
1 1 standard specific to identified location (Note)

Note – These other coding standards should be used only when the desired cause can not be represented with the CCITT-standardized coding.

B.2.3 *Location*

Bits 4 3 2 1	
0 0 0 0	user
0 0 0 1	private network serving the local user
0 0 1 0	public network serving the local user
0 0 1 1	transit network
0 1 0 0	public network serving the remote user
0 1 0 1	private network serving the remote user
0 1 1 1	international network
1 0 1 0	network beyond interworking point

All other values are reserved.

Note 1 – Depending on the location of the users, the local public network and remote public network may be the same network.

Note 2 – Examples of location values to be used for various busy/congestion conditions appear in Annex J to Recommendation Q.931.

B.2.4 *Recommendation*

Bits 7 6 5 4 3 2 1	
0 0 0 0 0 0 0	Q.931/Q.763 (Note 2)
0 0 0 0 0 1 1	X.21
0 0 0 0 1 0 0	X.25
0 0 0 0 1 0 1	public land mobile networks, Q.1031/Q.1051 (Q.763)

All other values are reserved.

Note 1 – If octet including this field is omitted, Recommendation Q.931/Q.763 is assumed.

Note 2 – This value is used only when the preceding octet is extended and the cause in octet 4 is from Table B-1/Q.699.

B.2.5 *Cause value*

The cause value is divided into two fields, a class (bits 5 through 7) and a value within the class (bits 1 through 4).

(1) The class indicates the general nature of the event.

Class (000) : normal event
Class (001) : normal event
Class (010) : resource unavailable
Class (011) : service or option not available
Class (100) : service or option not implemented
Class (101) : invalid message (e.g. parameter out of range)
Class (110) : protocol error (e.g. unknown message)
Class (111) : interworking

(2) The cause values are listed in Table B-1/Q.699.

TABLE B-1/Q.699

Cause values

Cause value		Cause number	Cause	Recommendations
Class	Value			
7 6 5	4 3 2 1			
0 0 0	0 0 0 1	1	Unallocated (unassigned) number (Note 1)	Q.931, Q.763
0 0 0	0 0 1 0	2	No route to specified transit network	Q.931, Q.763
0 0 0	0 0 1 1	3	No route to destination	Q.931, Q.763
0 0 0	0 1 0 0	4	Send special information tone	Q.763
0 0 0	0 1 0 1	5	Misdialled trunk prefix	Q.763
0 0 0	0 1 1 0	6	Channel unacceptable	Q.931
0 0 0	0 1 1 1	7	Call awarded and being delivered in an established channel	Q.931
0 0 1	0 0 0 0	16	Normal call clearing	Q.931, Q.763
0 0 1	0 0 0 1	17	User busy	Q.931, Q.763
0 0 1	0 0 1 0	18	No user responding	Q.931, Q.763
0 0 1	0 0 1 1	19	No answer from user (user alerted)	Q.931, Q.763
0 0 1	0 1 0 1	21	Call rejected	Q.931, Q.763
0 0 1	0 1 1 0	22	Number changed	Q.931, Q.763
0 0 1	1 0 1 0	26	Non-selected user clearing	Q.931
0 0 1	1 0 1 1	27	Destination out of order	Q.931, Q.763
0 0 1	1 1 0 0	28	Invalid number format	Q.931, Q.763
0 0 1	1 1 0 1	29	Facility rejected	Q.931, Q.730
0 0 1	1 1 1 0	30	Response to STATUS ENQUIRY	Q.931
0 0 1	1 1 1 1	31	Normal, unspecified	Q.931, Q.763
0 1 0	0 0 1 0	34	No circuit/channel available	Q.931, Q.763
0 1 0	0 1 1 0	38	Network out of order	Q.931, Q.763
0 1 0	1 0 0 1	41	Temporary failure	Q.931, Q.763
0 1 0	1 0 1 0	42	Switching equipment congestion	Q.931, Q.763
0 1 0	1 0 1 1	43	Access information discarded	Q.931
0 1 0	1 1 0 0	44	Requested circuit/channel not available	Q.931, Q.763
0 1 0	1 1 1 1	47	Resources unavailable, unspecified	Q.931, Q.763
0 1 1	0 0 0 1	49	Quality of service unavailable	Q.931
0 1 1	0 0 1 0	50	Requested facility not subscribed	Q.931, Q.730
0 1 1	0 1 0 1	53	Outgoing calls barred within CUG	Q.730
0 1 1	0 1 1 1	55	Incoming calls barred within CUG	Q.730
0 1 1	1 0 0 1	57	Bearer capability not authorized	Q.931, Q.763
0 1 1	1 0 1 0	58	Bearer capability not presently available	Q.931, Q.763
0 1 1	1 1 1 0	62	Inconsistency in designated outgoing access information and subscriber class	Q.730
0 1 1	1 1 1 1	63	Service or option not available, unspecified	Q.931, Q.763

TABLE B-1/Q.699 *(cont.)*

Cause value		Cause number	Cause	Recommendations
Class	Value			
7 6 5	4 3 2 1			
1 0 0	0 0 0 1	65	Bearer capability not implemented	Q.931, Q.763
1 0 0	0 0 1 0	66	Channel type not implemented	Q.931
1 0 0	0 1 0 1	69	Requested facility not implemented	Q.931, Q.730
1 0 0	0 1 1 0	70	Only restricted digital information bearer capability is available	Q.931, Q.763
1 0 0	1 1 1 1	79	Service or option not implemented, unspecified	Q.931, Q.763
1 0 1	0 0 0 1	81	Invalid call reference value	Q.931
1 0 1	0 0 1 0	82	Identified channel does not exist	Q.931
1 0 1	0 0 1 1	83	A suspended call exists, but this call identity does not	Q.931
1 0 1	0 1 0 0	84	Call identity in use	Q.931
1 0 1	0 1 0 1	85	No call suspended	Q.931
1 0 1	0 1 1 0	86	Call having the requested call identity has been cleared	Q.931
1 0 1	0 1 1 1	87	Called user not member of CUG	Q.730
1 0 1	1 0 0 0	88	Incompatible destination	Q.931, Q.763
1 0 1	1 0 1 0	90	Non-existent CUG	Q.730
~~1 0 1~~	~~1 0 1 1~~	~~91~~	~~Invalid transit network selection (Note 1)~~	~~Q.931, Q.763~~
1 0 1	1 1 1 1	95	Invalid message, unspecified	Q.931, Q.763
1 1 0	0 0 0 0	96	Mandatory information element is missing	Q.931
1 1 0	0 0 0 1	97	Message type non-existent or not implemented	Q.931, Q.763
1 1 0	0 0 1 0	98	Message not compatible with call state or message type non-existent or not implemented	Q.931
1 1 0	0 0 1 1	99	Information element non-existent or not implemented (Note 2)	Q.931, Q.763
1 1 0	0 1 0 0	100	Invalid information element contents	Q.931
1 1 0	0 1 0 1	101	Message not compatible with call state	Q.931
1 1 0	0 1 1 0	102	Recovery on timer expiry	Q.931
1 1 0	0 1 0 1	103	Parameter non-existent or not implemented – passed on	Q.763
1 1 0	1 1 1 0	110	Inconsistency in data	Q.730
1 1 0	1 1 1 1	111	Protocol error, unspecified	Q.931, Q.763
1 1 1	1 1 1 1	127	Interworking, unspecified	Q.931, Q.763

All other values are reserved.

Note 1 – In Recommendation Q.763, the words “(national use)” are added.

Note 2 – In Recommendation Q.763, the name of this cause value is “parameter non-existent or not implemented-discard”. Further alignment of definition for this cause may be required.

B.2.6 *Diagnostic(s)*

TABLE B-2/Q.699

Cause	Diagnostic(s)	Recommendations
1	Condition (Note 1)	Q.931, Q.763
2	Transit Network identity	Q.931, Q.763
3	Condition (Note 1)	Q.931, Q.763
16	Condition (Note 1)	Q.931, Q.763
21	Condition (Note 1), User supplied diagnostics	Q.931, Q.763
22	New Destination [Q.931]/Called party number (new) [Q.763]	Q.931, Q.763
29	Facility identification [Q.931]/Rejected parameter [Q.763]	Q.931, Q.730
43	Discarded information element identifier(s)	Q.931
49	Condition (Note 2)	Q.931
50	Facility identification [Q.931]/Rejected parameter [Q.763]	Q.931, Q.730
57	Attribute identity (Note 2)	Q.931, Q.763
58	Attribute identity (Note 2)	Q.931, Q.763
65	Attribute identity (Note 2)	Q.931, Q.763
66	Channel type	Q.931
69	Facility identification [Q.931]/Rejected parameter [Q.763]	Q.931, Q.730
82	Channel identity	Q.931
86	Clearing cause	Q.931
88	Incompatible parameter [Q.931]	Q.931, Q.763
96	Information element identifier	Q.931
97	Message type	Q.931, Q.763
98	Message type	Q.931
99	Information element identifier(s) [Q.931]/Parameter name(s) [Q.763]	Q.931, Q.763
100	Information element identifier(s)	Q.931
101	Message type	Q.931
102	Timer number	Q.931
103	Parameter name(s)	Q.763

Note 1 – The following coding is used:

Bit 8: 1
Bits 7-3: 00000
Bits 2-1: Condition as follows:
00 – Unknown
01 – Permanent
10 – Transient.

Note 2 – The format of the diagnostic field for causes number 57, 58 and 65 is as shown in Figure B-2/Q.699 and Table B-2a/Q.699 to B-2b/Q.699.

Note 3 – Description in [ ] indicates current difference in description among Recommendations Q.931 and Q.763. Further alignment may be required for those cause values, i.e., # 22, # 29, # 50, # 69 and # 99.

8	7 6 5 4 3 2 1	
0/1 ext	Attribute number	Octet 5
0/1 ext	Rejected attribute	5a
1 ext	Available attribute	5b*

Note 1 – When diagnostics information is provided, octet 5 and 5a shall be present. Octet 5b is optional.

Note 2 – Octets 5-5b may be repeated to report multiple rejected attributes.

FIGURE B-2/Q.699

Coding of the diagnostic field for causes number 57, 58 and 65

TABLE B-2a/Q.699

Coding of the diagnostic field for causes number 57, 58 and 65

Attribute number (octet 5)

Bits 7 6 5 4 3 2 1	No.	
0 1 1 0 0 0 1	1	Information transfer capability
0 1 1 0 0 1 0	2	Information transfer mode
0 1 1 0 0 1 1	3	Information transfer rate
0 1 1 0 1 0 0	4	Structure
0 1 1 0 1 0 1	5	Configuration
0 1 1 0 1 1 0	6	Establishment
0 1 1 0 1 1 1	7	Symmetry
0 1 1 1 0 0 0	8	Information transfer rate (dest. → orig.)
0 1 1 1 0 0 1	9	Layer identification

TABLE B-2b/Q.699

Coding of the diagnostic field for causes number 57, 58 and 65

Rejected attribute (octet 5a)

Attribute No.

1. *Information transfer capability:*
   Bits 7-6 : 00
   Bits 5-1 according to Table 4-6, octet 3.

2. *Information transfer mode:*

   Bits 7-6 according to Table 4-6, octet 4.
   Bits 5-1 : 00000

3. *Information transfer rate:*

   Bits 7-6 : 00
   Bits 5-1 according to Table 4-6, octet 4.

4. *Structure:*

   Bits 7-5 according to Table 4-6, octet 4a.
   Bits 4-1 : 0000

5. *Configuration:*

   Bits 7-5 : 000
   Bits 4-3 according to Table 4-6, octet 4a.
   Bits 2-1 : 00

6. *Establishment:*

   Bits 7-3 : 00000
   Bits 2-1 according to Table 4-6, octet 4a.

7. *Symmetry:*

   Bits 7-6 according to Table 4-6, octet 4b.
   Bits 5-1 : 00000

8. *Information transfer rate (dest. → orig.):*

   Bits 7-6 : 00
   Bits 5-1 according to Table 4-6, octet 4b.

9. *Layer identification:*

   Bits

   7 6

   0 1 (layer 1) Bits 5-1 according to Table 4-6, octet 5.
   1 0 (layer 2) Bits 5-1 according to Table 4-6, octet 6.
   1 1 (layer 3) Bits 5-1 according to Table 4-6, octet 7.

Available attributes (octet 5b)

The same coding as octet 5a.

Note – Table 4-6 referred to above is found in Recommendation Q.931. The relevant description is found in § 3.36 of Recommendation Q.763.

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