INTERNATIONAL TELECOMMUNICATION UNION

ITU-T

TELECOMMUNICATION
STANDARDIZATION SECTOR
OF ITU

Q.2955.1

(06/97)

SERIES Q: SWITCHING AND SIGNALLING

Broadband ISDN – B-ISDN application protocols for access signalling

---

Stage 3 description for community of interest supplementary services using B-ISDN Digital Subscriber Signalling System No. 2 (DSS 2): Closed User Group (CUG)

ITU-T Recommendation Q.2955.1

(Previously CCITT Recommendation)

ITU-T Q-SERIES RECOMMENDATIONS

SWITCHING AND SIGNALLING

SIGNALLING IN THE INTERNATIONAL MANUAL SERVICE	Q.1–Q.3
INTERNATIONAL AUTOMATIC AND SEMI-AUTOMATIC WORKING	Q.4–Q.59
FUNCTIONS AND INFORMATION FLOWS FOR SERVICES IN THE ISDN	Q.60–Q.99
CLAUSES APPLICABLE TO ITU-T STANDARD SYSTEMS	Q.100–Q.119
SPECIFICATIONS OF SIGNALLING SYSTEMS No. 4 AND No. 5	Q.120–Q.249
SPECIFICATIONS OF SIGNALLING SYSTEM No. 6	Q.250–Q.309
SPECIFICATIONS OF SIGNALLING SYSTEM R1	Q.310–Q.399
SPECIFICATIONS OF SIGNALLING SYSTEM R2	Q.400–Q.499
DIGITAL EXCHANGES	Q.500–Q.599
INTERWORKING OF SIGNALLING SYSTEMS	Q.600–Q.699
SPECIFICATIONS OF SIGNALLING SYSTEM No. 7	Q.700–Q.849
DIGITAL SUBSCRIBER SIGNALLING SYSTEM No. 1	Q.850–Q.999
PUBLIC LAND MOBILE NETWORK	Q.1000–Q.1099
INTERWORKING WITH SATELLITE MOBILE SYSTEMS	Q.1100–Q.1199
INTELLIGENT NETWORK	Q.1200–Q.1999
BROADBAND ISDN	Q.2000–Q.2999
General aspects	Q.2000–Q.2099
Signalling ATM adaptation layer (SAAL)	Q.2100–Q.2199
Signalling network protocols	Q.2200–Q.2299
Common aspects of B-ISDN application protocols for access signalling and network signalling and interworking	Q.2600–Q.2699
B-ISDN application protocols for the network signalling	Q.2700–Q.2899
B-ISDN application protocols for access signalling	**Q.2900–Q.2999**

For further details, please refer to ITU-T List of Recommendations.

ITU-T RECOMMENDATION Q.2955.1

STAGE 3 DESCRIPTION FOR COMMUNITY OF INTEREST SUPPLEMENTARY SERVICES USING B-ISDN DIGITAL SUBSCRIBER SIGNALLING SYSTEM No. 2 (DSS 2): CLOSED USER GROUP (CUG)

Summary

This Recommendation specifies the DSS 2 signalling protocol for the support of the CUG supplementary service in B-ISDN. The protocol can be used at the T_B and at the coincident S_B and T_B reference point.

The CUG supplementary service enables users to form groups, to and from which access is restricted. Members of a specific closed user group can communicate among themselves but not, in general, with users outside the group. Specific CUG members can have additional capabilities that allow them to originate calls to destinations outside the group, and/or to receive calls from outside the group. Specific CUG members can have additional restrictions that prevent them from originating calls to other members of the CUG or from receiving calls from other members of the CUG. A specific user may be a member of one or more closed user groups.

Source

ITU-T Recommendation Q.2955.1 was prepared by ITU-T Study Group 11 (1997-2000) and was approved under the WTSC Resolution No. 1 procedure on the 5th of June 1997.

FOREWORD

ITU (International Telecommunication Union) is the United Nations Specialized Agency in the field of telecommunications. The ITU Telecommunication Standardization Sector (ITU-T) is a permanent organ of the ITU. The ITU-T is responsible for studying technical, operating and tariff questions and issuing Recommendations on them with a view to standardizing telecommunications on a worldwide basis.

The World Telecommunication Standardization Conference (WTSC), which meets every four years, establishes the topics for study by the ITU-T Study Groups which, in their turn, produce Recommendations on these topics.

The approval of Recommendations by the Members of the ITU-T is covered by the procedure laid down in WTSC Resolution No. 1.

In some areas of information technology which fall within ITU-T's purview, the necessary standards are prepared on a collaborative basis with ISO and IEC.

NOTE

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

INTELLECTUAL PROPERTY RIGHTS

The ITU draws attention to the possibility that the practice or implementation of this Recommendation may involve the use of a claimed Intellectual Property Right. The ITU takes no position concerning the evidence, validity or applicability of claimed Intellectual Property Rights, whether asserted by ITU members or others outside of the Recommendation development process.

As of the date of approval of this Recommendation, the ITU had/had not received notice of intellectual property, protected by patents, which may be required to implement this Recommendation. However, implementors are cautioned that this may not represent the latest information and are therefore strongly urged to consult the TSB patent database.

CONTENTS

Page

Recommendation Q.2955.1

STAGE 3 DESCRIPTION FOR COMMUNITY OF INTEREST SUPPLEMENTARY SERVICES USING B-ISDN DIGITAL SUBSCRIBER SIGNALLING SYSTEM No. 2 (DSS 2): CLOSED USER GROUP (CUG)

(Geneva, 1997)

1 Closed User Group (CUG)

1.1 Scope

This Recommendation specifies the stage 3 of the Closed User Group (CUG) supplementary services for the Broadband Integrated Services Digital Network (B-ISDN) at the T_B reference point or coincident S_B and T_B reference point (as defined in Recommendation I.413 [1]) by means of the Digital Subscriber Signalling System No. 2 (DSS 2) protocol. Stage 3 identifies the protocol procedures and switching functions needed to support a telecommunications service (see Recommendation I.130 [2]).

In addition, this Recommendation specifies the protocol requirements at the T_B reference point where the service is provided to the user via an intermediate private B-ISDN.

This Recommendation does not specify the additional protocol requirements where the service is provided to the user via a telecommunications network that is not a B-ISDN.

The CUG supplementary service enables users to form groups, to and from which access is restricted. A specific user may be a member of one or more closed user groups. Members of a specific closed user group can communicate among themselves but not, in general, with users outside the group. Specific CUG members can have additional capabilities that allow them to originate calls to destinations outside the group, and/or to receive calls from outside the group. Specific CUG members can have additional restrictions that prevent them from originating calls to other members of the CUG, or from receiving calls from other members of the CUG.

The CUG supplementary service is applicable to all telecommunication services.

Further part(s) of this Recommendation shall specify the method of testing required to identify conformance to this Recommendation.

This Recommendation is applicable to equipment, supporting the CUG supplementary service, to be attached at either side of a T_B reference point or coincident S_B and T_B reference point when used as an access to the public B-ISDN.

The main part of this Recommendation specifies the protocol to support the CUG supplementary service in association with point-to-point connections using the procedures described in Recommendation Q.2931 [7]. To support CUG also in other connection configurations, the modifications required are specified in annexes to this Recommendation. Annex B, for example, specifies the CUG-protocol for point-to-multipoint connections using the procedures of Recommendation Q.2971 [13].

The protocol specified in this Recommendation distinguishes two different types of CUG calls:

– Type 1 considers CUG calls with emulated N-ISDN services. These services can be identified by the presence of the N-BC information element.

  NOTE – The exact basic telecommunications service is specified by the content of the N-BC and, if present, of the N-HLC information elements [7].

For these services, the control of the CUG supplementary service depends on the ISDN numbers (calling and called party) **and** on the basic telecommunications service involved in the call. This service dependency is required in order to guarantee CUG integrity in the same manner as in N-ISDN.

– Type 2 considers CUG calls with B-ISDN applications for which CUG is provided without basic service dependence. No emulated N-ISDN services are involved, and no B-ISDN service type has been specified for these applications. These calls can be identified by the absence of the N-BC information element [7] and by the absence of a coding specifying a B-ISDN service type in the SETUP message (see the paragraph below). For these applications, the control of the CUG supplementary service depends only on the ISDN numbers (calling and called party) involved in the call.

In future, the necessity may be given to distinguish a third type of CUG call. This type will cover connections with B-ISDN basic services for which a service type is defined (see Recommendation I.371 [12]). This type of CUG call is not supported by this Recommendation.

In this Recommendation, the control of the CUG supplementary service is based on the usage of a CUG specific information element. In order to ease interworking with N-ISDN, some networks may wish to support the control of CUG also by the ROSE components specified in CCITT clause 1/Q.955 [6]. If this additional feature is offered, then the CUG supplementary service shall be provided on the basis of Recommendation Q.955.1 [6] with the following additions:

– the service types as listed above have to be taken into account;

– Note 8 against Table 3 of this Recommendation has to be respected;

– the facility information element shall be coded as specified in Recommendation Q.2932 [9];

– in the case of interworking with the N-ISDN, the facility information element shall be mapped in accordance with 6.3 and 6.4/Q.2931 [7]. The content of the components remains unchanged; and

– the mapping of return error and cause values shall be in alignment with 1.11.

1.2 References

The following ITU-T Recommendations and other references contain provisions which, through reference in this text, constitute provisions of this Recommendation. At the time of publication, the editions indicated were valid. All Recommendations and other references are subject to revision; all users of this Recommendation are therefore encouraged to investigate the possibility of applying the most recent edition of the Recommendations and other references listed below. A list of the currently valid ITU-T Recommendations is regularly published.

[1] ITU-T Recommendation I.413 (1993), *B-ISDN user-network interfaces.*

[2] CCITT Recommendation I.130 (1988), *Method for the characterization of telecommunication services supported by an ISDN and network capabilities of an ISDN.*

[3] ITU-T Recommendation I.112 (1993), *Vocabulary and terms for ISDNs.*

[4] ITU-T Recommendation I.210 (1993), *Principles of telecommunication services supported by an ISDN and the means used to describe them.*

[5] CCITT Recommendation E.164 (1991), *Numbering plan for the ISDN era.*

[6] CCITT Recommendation Q.955.1 (1992), *Stage 3 description for community of interest supplementary services using DSS 1: Closed user group.*

[7] ITU-T Recommendation Q.2931.1 (1995), *Digital Subscriber Signalling System No. 2 – User-Network Interface (UNI) layer 3 specification for basic call/connection control.*

[8] CCITT Recommendation Z.100 (1988), *Functional specification and description language (SDL).*

[9] ITU-T Recommendation Q.2932.1 (1996), *Digital subscriber Signalling System No. 2 – Generic functional protocol: Core functions.*

[10] CCITT Recommendation Q.85.1 (1992), *Stage 3 description for community of interest supplementary services using DSS 1: Closed user group.*

[11] ITU-T Recommendation Q.2610 (1995), *Usage of cause and location in B-ISDN user part and DSS 2.*

[12] ITU-T Recommendation I.371 (1996), *Traffic control and congestion control in B-ISDN.*

[13] See Annex B of this Recommendation.

[14] CCITT Recommendation X.180 (1988), *Administrative arrangements for international Closed User Groups (CUGs).*

[15] ITU-T Recommendation Q.932 (1993), *Generic procedures for the control of ISDN supplementary services.*

1.3 Definitions

This Recommendation defines the following terms:

1.3.1 basic telecommunications service: A bearer service or teleservice. The terms "bearer service" and "teleservice" are defined in 2.2/I.112 [3], definitions 202 and 203.

1.3.2 CUG call: A CUG call is a call which is restricted to a predefined group of users.

1.3.3 CUG index: The closed user group index is a parameter used by the calling user to select a particular closed user group when originating a call. The index is also used by the network to indicate to the called user the closed user group from which an incoming call has originated. This index has only local significance, i.e. the index used by the calling user is, in general, different from the index used by the called user to identify the same closed user group.

1.3.4 CUG interlock code: This is a means of identifying closed user group membership within the network. At the calling side, if a closed user group match exists, the CUG index identifying a closed user group maps to the closed user group interlock code for that closed user group. If a closed user group match exists at the called side, the closed user group interlock code identifying a closed user group maps to the CUG index representing that closed user group. Closed user group interlock code is not an access concept, but is used to uniquely identify a CUG inside a given network.

1.3.5 CUG-only service: A user with CUG-only service is limited to making calls to, and receiving calls from, members of those CUGs of which the user is a member.

1.3.6 default number: An ISDN number registered within the public ISDN following prior agreement between the user and the public ISDN.

1.3.7 emulated N-ISDN service: A basic telecommunications service originally defined for N-ISDN, but supported in a B-ISDN environment.

1.3.8 incoming access: Incoming access allows a CUG user, in addition to the CUG only service (with or without incoming calls barred within the CUG), to receive calls from all other non-CUG users and also from those other CUG users that allow outgoing access. An incoming access arrangement applies to an ISDN number and not to a specific CUG.

1.3.9 incoming calls barred within a closed user group: This restriction means that a CUG member cannot receive CUG calls from other members of that group.

1.3.10 ISDN number: A number conforming to the numbering plan and structure specified in CCITT Recommendation E.164 [5].

1.3.11 network: The DSS 2 protocol entity at the network side of the user-network interface.

1.3.12 outgoing access: An arrangement which allows a member of a CUG to make calls to other non-CUG members and also to those other CUG members that allow incoming access. An outgoing access arrangement applies to an ISDN number and not to a specific CUG.

1.3.13 outgoing calls barred within a closed user group: This restriction means that a CUG member cannot make CUG calls to other members of that group.

1.3.14 preferential CUG: A closed user group user subscribing to preferential closed user group nominates a CUG index which the network uses as a default to identify the required closed user group in the absence of any closed user group information in the outgoing call request. A preferential closed user group applies to an ISDN number and not to a specific closed user group.

1.3.15 supplementary service: see 2.4/I.210 [4].

1.3.16 user: The DSS 2 protocol entity at the user side of the user-network interface.

1.4 Abbreviations

This Recommendation uses the following abbreviations:

B-BC	Broadband bearer capability (information element)
B-ISDN	Broadband Integrated Services Digital Network
CUG	Closed User Group
DDI	Direct-Dialling-in
DSS 1	Digital Subscriber Signalling System No. 1
DSS 2	Digital Subscriber Signalling System No. 2
IA	Incoming Access
IC	Interlock Code
ICB	Incoming Calls Barred within a closed user group
MSN	Multiple Subscriber Number
N-BC	Narrow-band Bearer Capability (information element)
N-HLC	Narrow-band High Layer Compatibility (information element)
N-ISDN	Narrow-band (64 kbit/s-based) Integrated Services Digital Network
OA	Outgoing Access
OCB	Outgoing Calls Barred within a closed user group

1.5 Description

Essentially, normal call/connection establishment procedures shall apply but, additionally, to provide the CUG supplementary service, the network shall analyse the call request from the calling user in conjunction with the closed user group attributes associated with both the calling and called users

(as identified by their ISDN numbers). As a result of this analysis, the call can either fail for CUG supplementary service reasons or be allowed to proceed.

NOTE – In the case where a user has subscribed to the DDI supplementary service, attributes are associated with that part of the ISDN number which the network can recognize or with the default number valid for that access.

The network provider may define the maximum number of closed user groups of which a user can be a member.

Since the fundamental purpose of the CUG supplementary service is to prevent certain connections, the network shall strictly control interactions with some other supplementary services to protect closed user group integrity.

1.6 Operational requirements

1.6.1 Provision and withdrawal

The provision of the CUG supplementary service to a new member and also the assignment of the various CUG supplementary service options to a new or existing member, shall require a prior arrangement between the member and the network provider.

The assignment of a CUG index value to be associated with the CUG and also the assignment of any preferential CUG requires prior arrangement between the (new) member and the network provider. However, when a CUG spans over several networks, e.g. an international CUG, then some administrative arrangements concerning the interlock code used between the networks are required. Guidelines for such arrangements are contained in Recommendation X.180 [14].

The CUG supplementary service shall be provided on a subscription basis. As a network provider option, the CUG supplementary service may be offered with subscription options.

The options can be divided into two groups:

a) For applications other than emulated N-ISDN services, the options shown in Table 1 shall apply per ISDN number.

   For emulated N-ISDN services, the option values may be assigned individually for each emulated N-ISDN service available at the ISDN number with the CUG supplementary service.

b) The option shown in Table 2 shall apply per closed user group provided at the ISDN number with the CUG supplementary service.

Table 1/Q.2955.1 – Options available per ISDN number, or, in case of emulated N-ISDN services, for an individual emulated N-ISDN service at that ISDN number (Note 1)

Option	Values
1) Preferential CUG	Nominated CUG index or none designated.
2) Outgoing access (Note 2)	Allowed permanently, allowed per call or not allowed.
3) Incoming access	Allowed or not allowed.

NOTE 1 – The following statements are valid for ISDN numbers at which emulated N-ISDN services are used.

If, for a user with the CUG supplementary service, an emulated N-ISDN service is not included in at least one closed user group, then:

– preferential CUG shall have the "none designated" option value;

– outgoing access shall have the "allowed permanently" option value if normal outgoing calls using that emulated N-ISDN service are required;

– incoming access shall have the "allowed" option value if incoming calls using that emulated N-ISDN service are required.

NOTE 2 – The "allowed per call" outgoing access option is alternatively known as "outgoing access (explicit)" and the "allowed permanently" outgoing access option is alternatively known as "outgoing access (implicit)".

Table 2/Q.2955.1 – Options available per closed user group

Option	Values
Barring within the closed user group	None, incoming calls or outgoing calls.

The options assigned to a closed user group member shall be stored in the network.

NOTE – Whether or not the storage of these options for CUG are centralized or decentralized is beyond the scope of this Recommendation and is defined in the stage 2 Recommendation on the CUG supplementary service (see Recommendation Q.85.1 [10]).

Withdrawal of the CUG supplementary service shall be as a result of a network provider action either at the request of a particular member, or for administrative reasons.

1.6.2 Requirements on the originating network side

For correct interactions with certain other supplementary services, the originating network side shall store, for the duration of the call, details of whether a normal or a CUG call (with or without outgoing access) was requested in the information sent to the destination network side. The CUG interlock code (if any) of the call request to the destination network side shall also be retained.

1.6.3 Requirements on the destination network side

For correct interactions with certain other supplementary services, the destination network side shall store, for the duration of the call, details of whether a normal or a CUG call (with or without

outgoing access) request was passed to the called user. The CUG interlock code (if any) of the call request shall also be retained.

1.7 Coding requirements

1.7.1 Messages and closed user group information element

The following messages are applicable to the invocation and control of the CUG supplementary service:

a) RELEASE (Note 1);

b) RELEASE COMPLETE (Note 1);

c) SETUP (Note 2).

These messages are defined in Recommendation Q.2931 [7].

NOTE 1 – The cause information element with CUG-related information may be included in a clearing message sent in the network-to-user direction if the calling user requests the CUG supplementary service, and if the network cannot allow the call to proceed. In the user-to-network direction, the cause information element may be included in the first clearing message if the called user cannot allow the call to proceed.

NOTE 2 – In the user-to-network direction, the closed user group information element will be included if the calling user explicitly requests the CUG supplementary service. In the network-to-user direction, the closed user group information element will be included if a CUG call is requested.

The following information element is applicable to the invocation and control of the CUG supplementary service:

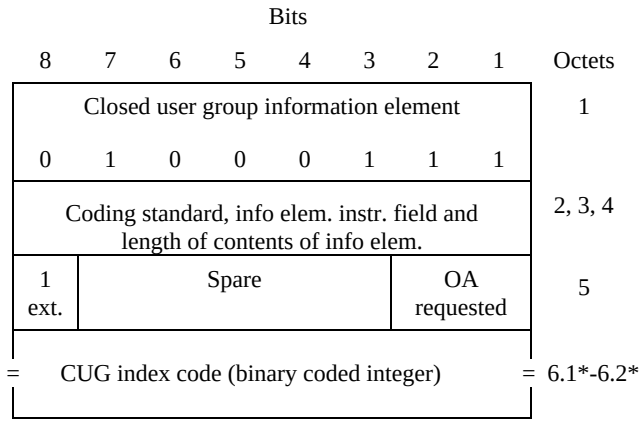

Figure 1/Q.2955.1 – Closed user group information element

OA requested (octet 5)

Bits

2 1

0 0 OA not requested

0 1 OA requested

All other values are reserved.

CUG index code (octets 6.1-6.2): The CUG index code can be omitted. If omitted, the preferential CUG is assumed. For details, see Table 3.

1.7.2 Cause information element

The cause information element is specified in Recommendation Q.2610 [11].

The cause values for use in the cause information element in certain CUG service related circumstances are listed in 1.9.2.1.1.2 and 1.9.2.1.2.2.

1.8 Primitive and state definitions

1.8.1 Primitive definitions

The primitives used for communication between the call/connection control process and the closed user group process are specified in 1.15.1.

1.8.2 State definitions

No specific call/connection states in addition to those defined in Recommendation Q.2931 [7] as protocol control states shall apply for the CUG supplementary service.

To facilitate understanding of the supplementary service, the following closed user group process states are used in the dynamic description (SDL):

– CUG idle;

– outgoing CUG;

– incoming CUG.

These states are specified for the purpose of the protocol definition; they need not be provided in an implementation.

1.9 Signalling procedures at the coincident S_B and T_B reference point

1.9.1 Activation, deactivation and registration

No signalling procedure is necessary for activation, deactivation and registration of the CUG supplementary service.

1.9.2 Invocation and operation

The CUG supplementary service shall be invoked by:

– a call originating from a CUG supplementary service user. The user may explicitly request the CUG supplementary service, but in the absence of an explicit request the CUG supplementary service default procedures shall be automatically applied;

– a call terminating at a CUG supplementary service user.

1.9.2.1 Actions at the originating local exchange

1.9.2.1.1 Call originating from a user with the CUG supplementary service (explicit request)

1.9.2.1.1.1 Normal operation

To establish a CUG call, the calling user shall include in the SETUP message the CUG information element specifying the CUG index of the requested CUG. The CUG information shall indicate also whether outgoing access is requested or not.

If the user does not provide a calling party number, provides an invalid number or provides a number the network cannot screen, then the default number stored in the originating network shall be used for the assignment of the closed user group.

The network shall perform internal checks appropriate to the originating network based on the contents of the CUG information element, the calling party number information element, the narrow-band bearer capability information element (if present) and the CUG attributes of the calling user. The outcome of these checks are defined in Table 3 (including Notes).

NOTE – The network may respond to the SETUP message with a SETUP ACKNOWLEDGE or CALL PROCEEDING message or the call may be cleared for some reason unrelated to the CUG supplementary service before the checks are completed.

If the result of the checks relevant to the originating network side allows the call to proceed, then the destination network shall perform further internal checks based on the CUG attributes (if any) of the called user. The outcomes of these checks are defined in Table 4 (including Notes).

If the call is successfully offered to the called user, an ALERTING or CONNECT message according to basic call/connection control procedures shall be returned to the calling user.

1.9.2.1.1.2 Exceptional procedures

If, as a result of the checks relevant to either the originating or destination network, the network cannot allow the call to proceed for a CUG supplementary service related reason, then the network shall fail the call attempt and include in the clearing message returned to the user a cause information element with the appropriate cause value as defined by Tables 3 and 4 (including Notes). The following cause values may be returned in the clearing message:

– No. 29 – Facility rejected.
– No. 50 – Requested facility not subscribed.
– No. 53 – Outgoing calls barred within CUG.
– No. 55 – Incoming calls barred within CUG.
– No. 62 – Inconsistency in designated outgoing access information and subscriber class.
– No. 87 – User not member of CUG.
– No. 90 – Non-existent CUG.

If the call attempt fails for a reason unrelated to the CUG supplementary service, then a cause information element with the appropriate cause value related to the event causing the failure shall be returned to the calling user.

The possibility of "simultaneous" failure for a CUG supplementary service-related reason and a reason unrelated to the CUG supplementary service is not precluded. In this case the cause shall be determined by the event not related to the CUG supplementary service which caused the call failure.

1.9.2.1.2 Call originating from a user with the CUG supplementary service (implicit request)

1.9.2.1.2.1 Normal operation

If the calling user does not include in the outgoing SETUP message a CUG information element, then the network shall perform internal checks appropriate to the originating network only based on the CUG attributes of the preferential CUG of the calling user and the narrow-band bearer capability information element (if present). The outcome of these checks are defined in Table 3 (including Notes).

If no calling party number information element is included by the calling user in the SETUP message, the default number stored in the originating network shall be used for the assignment of the CUG.

1.9.2.1.2.2 Exceptional procedures

If, as a result of the checks relevant to either the originating or destination network, the network cannot allow the call to proceed for a reason related to the CUG supplementary service, then the network shall initiate call clearing using one of the following causes:

– No. 29 – Facility rejected;

– No. 55 – Incoming calls barred within CUG;

– No. 87 – User not member of CUG.

When a call fails for a reason unrelated to the CUG supplementary service, then no CUG supplementary service related procedures shall apply.

1.9.2.1.3 Call originating from a user without the CUG supplementary service

1.9.2.1.3.1 Normal operation

A user without the CUG supplementary service can make a call to a user with the CUG supplementary service. If such a calling user does not include a CUG information element, then the checks in Table 3 (including Notes) shall apply.

The destination network shall then perform further checks based on the CUG attributes (if any) of the called user. The outcomes of these checks are defined in Table 4 (including Notes).

1.9.2.1.3.2 Exceptional procedures

If the calling user includes in the outgoing SETUP message a CUG information element and if the network can recognize it, then the network shall fail the call and initiate clearing with cause No. 50 "Requested facility not allowed".

If the network cannot recognize the CUG information element, then the exceptional procedures of Recommendation Q.2931 for unrecognized information elements shall apply.

If the calling user does not include a CUG information element in the outgoing SETUP message and the call fails as a result of the checks relevant to the destination network, then the network shall fail the call attempt and initiate clearing with cause No. 87 "User not member of CUG".

1.9.2.2 Actions at the destination local exchange

1.9.2.2.1 Call terminating at a user with the CUG supplementary service

1.9.2.2.1.1 Normal operation

At the destination network side, the internal checks will have to determine the type of CUG call. This Recommendation supports CUG calls of types 1 and 2 (see 1.1).

If the internal checks defined in Table 4 (including Notes) result in a requirement for a CUG call (with or without outgoing access) to the called user, then the incoming SETUP message shall include a CUG information element to convey the necessary CUG call information.

The network shall then expect either:

– an ALERTING or CONNECT message according to basic call/connection control received from the user if the call is successfully offered to the called user; or

– a clearing message with a cause information element indicating the reason of the clearing. The cause value received from the called user shall be relayed by the destination network to the originating network and an appropriate indication shall be delivered in the first clearing message to the calling user.

1.9.2.2.1.2 Exceptional procedures

If the cause information element is absent in the clearing message received from the called user, the destination network shall continue clearing by indicating a cause unrelated to the CUG supplementary service and clear the call towards the calling user.

When a user receives a SETUP message with a CUG information element it does not understand, it shall follow the CUG information element instruction indicator. The destination network shall code the CUG information element instruction indicator as "discard information element and proceed".

1.9.2.3 CUG checks at the originating and destination network

Table 3 shall be used to determine the type of call request sent to the destination network or rejection indication returned to the calling user.

NOTE – The type of call request derived from Table 3 shall determine the linkage to Table 4.

Table 4 shall be used to determine the type of call request sent to the destination user or the type of rejection indication returned to the calling user.

Table 3/Q.2955.1 – Closed user group checks at the originating network

CUG attributes of calling user for requested B-ISDN service		**CUG information received from calling user in SETUP**				
		CUG call request received				**No CUG call request received**
		OA not requested, CUG index	**OA requested, CUG index**	**OA not requested, no CUG index**	**OA requested, no CUG index**	
No preferential CUG, OA not allowed	Not OCB	CUG call IC = specific CUG (Note 1)	CUG call IC = specific CUG (Note 1)	Rejected with cause value = 62 (Note 4)	Rejected with cause value = 62 (Note 4)	Rejected with cause value = 29 (Note 4)
	OCB	Rejected with cause value = 53	Rejected with cause value = 53			
No preferential CUG, OA allowed per call	Not OCB	CUG call IC = specific CUG (Note 1)	CUG + OA call IC = specific CUG (Note 1)	Rejected with cause value = 62 (Note 4)	Normal call (Note 4)	Rejected with cause value = 29 (Note 4)
	OCB	Rejected with cause value = 53	Normal call			
No preferential CUG, OA allowed permanently	Not OCB	CUG + OA call IC = specific CUG (Note 1)	CUG + OA call IC = specific CUG (Note 1)	Normal call (Note 4)	Normal call (Note 4)	Normal call (Note 4)
	OCB	Normal call	Normal call			
Preferential CUG nominated, OA not allowed	Not OCB	CUG call IC = specific CUG (Note 2)	CUG call IC = specific CUG (Note 2)	CUG call IC = preferential CUG	Rejected with cause value = 62	CUG call IC = preferential CUG
	OCB	Rejected (Note 3) with cause value = 53	Rejected (Note 3) with cause value = 53	Combination barred (Note 5)	Combination barred (Note 5)	Combination barred (Note 5)

Table 3/Q.2955.1 – Closed user group checks at the originating network *(concluded)*

CUG attributes of calling user for requested B-ISDN service		CUG information received from calling user in SETUP				
		CUG call request received				No CUG call request received
		OA not requested, CUG index	OA requested, CUG index	OA not requested, no CUG index	OA requested, no CUG index	
Preferential CUG nominated, OA allowed per call	Not OCB	CUG call IC = specific CUG (Note 2)	CUG + OA call IC = specific CUG (Note 2)	CUG call IC = preferential CUG	Normal call	CUG call IC = preferential CUG
	OCB	Rejected (Note 3) cause value = 53	Normal call (Note 3)	Combination barred (Note 5)	Combination barred (Note 5)	Combination barred (Note 5)
Preferential CUG nominated, OA allowed permanently	Not OCB	CUG + OA call IC = specific CUG (Note 2)	CUG + OA call IC = specific CUG (Note 2)	(Note 8)	CUG + OA call IC = preferential CUG	(Note 8)
	OCB	Normal call (Note 3)	Normal call (Note 3)	Combination barred (Note 5)	Combination barred (Note 5)	Combination barred (Note 5)
Not a CUG user		Rejected with cause value = 50	Rejected with cause value = 50	Rejected with cause value = 50	Rejected with cause value = 50	Normal call (Note 6)

IC CUG interlock code

OA Outgoing Access

OCB Outgoing Calls Barred within a closed user group

NOTE 1 – Assumes that the match between CUG index and IC exists.

If no match exists, then:

– if the CUG index exists but is not appropriate to the requested emulated N-ISDN service, then the call shall be rejected with cause value = 29. This includes the case when the requested emulated N-ISDN service is not included in any closed user group;

– if the CUG index does not exist, the call shall be rejected with cause value = 90.

NOTE 2 – Assumes that the match between CUG index and IC exists for the requested emulated N-ISDN service. If no match exists, then:

– if the CUG index exists but is not appropriate to the requested emulated N-ISDN service, the call shall be rejected with cause value = 29;

– if the CUG index does not exist, the call shall be rejected with cause value = 90.

NOTE 3 – If the CUG index identifies the preferential CUG, then this combination is barred in the options data, i.e. the preferential CUG cannot be assigned to the "outgoing calls" barring within the CUG option.

NOTE 4 – This includes the case when the requested emulated N-ISDN service is not included in any CUG.

NOTE 5 – This combination is barred in the options data, i.e. the preferential CUG cannot be assigned to the "outgoing calls" barring within the CUG option.

NOTE 6 – This represents the normal case of a user without the CUG supplementary service making a normal call.

NOTE 7 – Not used.

NOTE 8 – Both "preferential CUG" and "allowed permanently" outgoing access options imply that either of them can be requested without including a closed user group information element in the outgoing SETUP message. When a user subscribes to both options, the originating network shall send a call request of the type CUG + OA (IC = preferential CUG) to the destination network.

Table 4/Q.2955.1 – Closed user group checks at the destination network

Type of CUG indication from the network	M or NM	CUG attributes of the called user for the requested ISDN number, or, in case of an emulated N-ISDN service, the attributes for this requested service at the ISDN number				Not a CUG user
		IA not allowed		IA allowed		
		Not ICB	ICB	Not ICB	ICB	
CUG call with no OA indication	M	CUG call	Rejected with cause value = 55	CUG call	Rejected with cause value = 55	Rejected with cause value = 87
	NM	Rejected with cause value = 87 (Note 1)		Rejected with cause value = 87 (Note 1)		
CUG call with OA indication	M	CUG call with OA request	Rejected with cause value = 55	CUG call with OA request	Normal call	Normal call
	NM	Rejected with cause value = 87 (Note 1)		Normal call (Note 2)		
Normal call	–	Rejected with cause value = 87		Normal call (Note 2)		Normal call (Note 3)

M	Match between IC and CUG index exists
NM	No match between IC and CUG index exists
CUG call	The closed user group information element in the SETUP message identifies CUG index but does not request outgoing access
Normal call	No closed user group information element in the SETUP message
IC	CUG interlock code
IA	Incoming Access
ICB	Incoming Calls Barred within a closed user group

NOTE 1 – Assumes that the match between the CUG index and IC fails because the IC does not exist for the called user. If the IC exists but is not appropriate to the requested emulated N-ISDN service, then this call shall be rejected with cause value = 29.

NOTE 2 – This includes the case when the requested emulated N-ISDN service is not included in any closed user group.

NOTE 3 – This represents the normal case of a user without the CUG supplementary service receiving a normal call.

1.10 Procedures at the T_B reference point for interworking with private B-ISDNs

When a public network CUG interacts with a private CUG by way of an access, it is possible, by mapping between the two CUG domains in the gateway (e.g. in the PBX), to arrange for CUG users to perceive the concatenated CUG domains as a single CUG.

Under these circumstances the access must behave for CUG purposes as an internodal link.

If the private network with a private network CUG domain is the originating network, a public CUG index shall be indicated in a SETUP message whenever the CUG supplementary service is requested so that the private network can receive proper indications of public CUG failures or destination private CUG failures.

Therefore, when the private network anticipates interaction with a public CUG domain at the originating side, it shall use only the explicit request of CUG service.

If the private network is the destination network, no special procedures are required.

1.11 Procedures for interworking between the DSS 1 and the DSS 2 protocol

For the closed user group information element, the principles specified in 6.3 and 6.4/Q.2931 [7] shall apply with the following additions:

a) In the direction B-ISDN → N-ISDN:

– Mapping of the SETUP message:

A facility information element and a cUGCallOperation invoke component have to be generated by the interworking unit. The facility information element is specified in Recommendation Q.932 [15]. The cUGCallOperation invoke component is specified in Recommendation Q.955.1 [6]. The values of the parameters "CUGIndex" and "OARequested" shall be set according to the content of the "OA requested" and "CUG index code" fields of the closed user group information element.

– Mapping of RELEASE, RELEASE COMPLETE message:

The cause values contained in the DSS 2 messages RELEASE or RELEASE COMPLETE shall be mapped to the same messages of the DSS 1 protocol as follows in Table 5:

Table 5/Q.2955.1 – Mapping in the direction DSS 2 → DSS 1

Cause value received from the DSS 2 user	Type of CUG request at the calling DSS 1 user	Information sent to the calling DSS 1 user	
		Cause value	Return error
No. 29	Explicit request	No. 29	Note 2
	Default request	No. 87	None
	Not a CUG request	No. 87	None
No. 55	Explicit request	No. 29	Note 1
	Default request	No. 29	None
No. 87	Explicit request	No. 29	Note 2
	Default request	No. 87	None
	Not a CUG request	No. 87	None
Other	Explicit request	According to basic call	Note 3
	Default request		None
	Not a CUG request		None

NOTE 1 – Error value "incomingCallsBarredWithinCUG".

NOTE 2 – Error value "userNotMemberOfCUG".

NOTE 3 – Error value "basicServiceNotProvided".

Cause No. 29 – "Facility rejected".

Cause No. 55 – "Incoming calls barred within CUG".

Cause No. 87 – "User not member of CUG".

b) In the direction N-ISDN → B-ISDN:

– Mapping of SETUP message:

A closed user group information element has to be generated by the interworking unit. The values of the "OA requested" and "CUG index code" fields have to be set according to the values of the parameters "OARequested" and "CUGIndex" of the cUGCallOperation invoke component.

– Mapping of DISCONNECT, RELEASE and RELEASE COMPLETE messages:

These messages may carry a return error component which shall be mapped as follows in Table 6:

Table 6/Q.2955.1 – Mapping in the direction DSS 1 → DSS 2

Information received from the DSS 1 side		Cause value used in the DSS 2 protocol
Return error	**Cause value**	
Notes 1, 3	X	No. 87
Note 2	X	No. 90
Note 4	X	As received from DSS 1
Note 5	X	No. 55
Note 6	X	As received from DSS 1
None	X	As received from DSS 1
NOTE 1 – Error value "userNotMemberOfCUG". NOTE 2 – Error value "invalidOrUnregisteredCUGIndex". NOTE 3 – Error value "requestedBasicServiceViolatesCUGConstraints". NOTE 4 – Error value "inconsistencyInDesignatedFacilityAndSubscriberClass". NOTE 5 – Error value "incomingCallsBarredWithinCUG". NOTE 6 – Error value "basicServiceNotProvided". X – Any basic call cause value unrelated to CUG. Cause No. 55 – "Incoming calls barred within CUG". Cause No. 87 – "User not member of CUG". Cause No. 90 – "Non-existent CUG".		

For the setting of the information element instruction indicator, see 1.9.2.2.1.2.

1.12 Interactions with other networks

When a CUG fails at a gateway to a network that does not support the CUG supplementary service, then, if the CUG supplementary service was explicitly invoked, cause No. 29 "Facility rejected" should be returned to the calling user.

1.13 Interactions with (other) supplementary services

1.13.1 Connected line identification presentation

No interaction.

1.13.2 Connected line identification restriction

No interaction.

1.13.3 Calling line identification presentation

No interaction.

1.13.4 Calling line identification restriction

No interaction.

1.13.5 Closed User Group

Not relevant.

1.13.6 Direct-Dialling-In

When the user has also subscribed to the DDI supplementary service, the CUG supplementary service is provided on the basis of that part of the ISDN number which the network can recognize or with the default number valid for that access. However, CUG membership shall not be available on a per DDI number basis, but instead shall be on the basis of the entire range of DDI numbers applicable at an access or group of accesses.

1.13.7 User-to-user signalling

1.13.7.1 Service 1

No interaction.

1.13.8 Multiple subscriber number

It shall be possible to provide separate CUG supplementary services for each ISDN number both at the calling and called sides.

If the calling user does not identify his MSN, then the CUG attributes assigned to the default number shall be applied at the originating network side.

1.13.9 Sub-addressing

No interaction.

1.14 Parameter values

No additional timers are defined for the CUG supplementary service.

1.15 Dynamic description (SDL)

The SDL description in Figures 2 and 3 is based on the model of protocol control and call/connection control as defined in Recommendation Q.2931 [7]. Where there is an ambiguity in the text description, then the SDL should be used to resolve the conflict. Where the text description and SDL are in disagreement, then the text shall be used as the definitive source. The SDL is not intended to constrain implementations.

The dynamic description is specified according to Recommendation Z.100 [8].

1.15.1 The closed user group process

Figures 2 and 3 provide the SDL description of the closed user group process at the originating and destination network sides, respectively. No user side SDL diagrams are provided.

The closed user group process is modelled as an extension of the call/connection control process. Information can pass between the call/connection control and closed user group process by means of primitives.

The call/connection control process communicates certain call/connection control events and parameters to the closed user group process and then waits for instructions to proceed from the closed user group process. The primitives from the closed user group process fall into two categories:

a) Continue – The continue primitive shall prompt the call/connection control process to proceed but shall not change the course of call/connection control in establishing or clearing

the call attempt. It may provide additional instructions from the closed user group process to call/connection control, e.g.:

– Normal – no additional instructions to call/connection control;

– Apply checks – call/connection control required to perform the appropriate closed user group checks and then proceed (note that the stage 2 description functional entities FE3 "outgoing closed user group control", and FE5 "incoming closed user group control", are not modelled as part of the stage 3 description "closed user group process");

– Cause value – call/connection control required to include a cause information element with the indicated value in the first clearing message to the calling user.

b) Clear call – The clear call primitive shall cause call/connection control to move from call establishment to appropriate call clearing procedures using the additional information provided by the closed user group process.

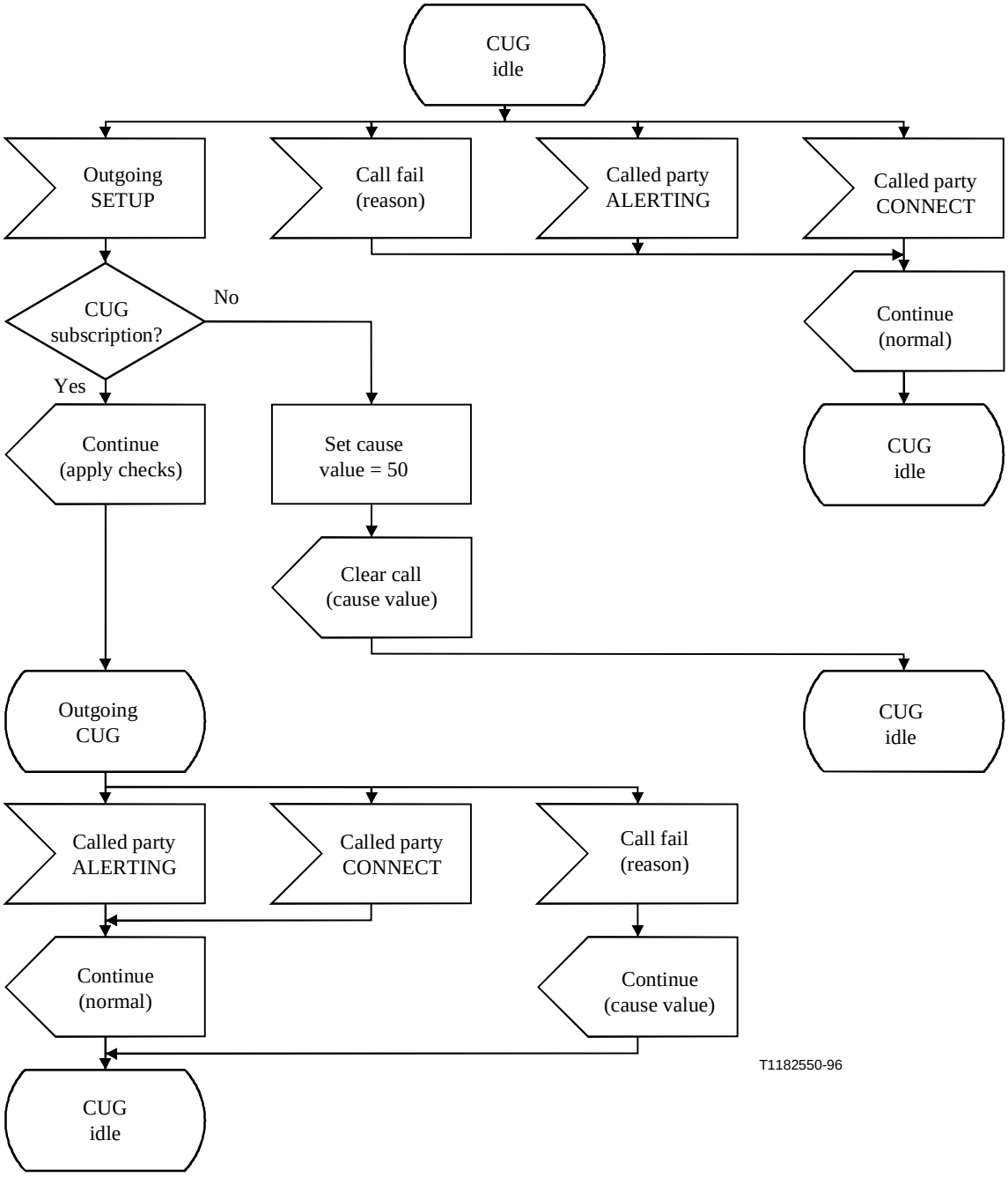

Figure 2/Q.2955.1 – Closed user group process – Outgoing call (network side)

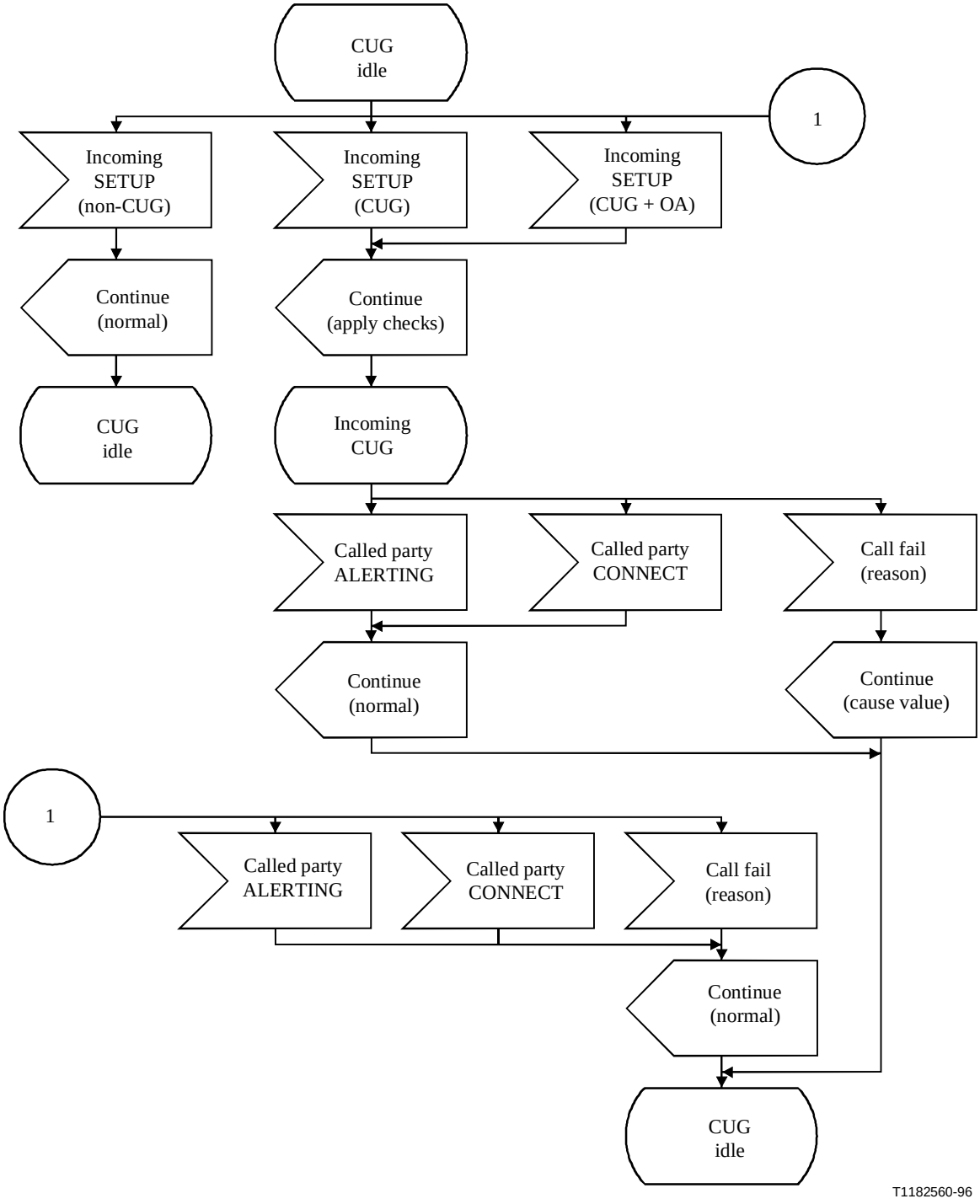

Figure 3/Q.2955.1 – Closed user group process – Incoming call (network side)

1.15.2 Relation to basic call/connection control

The basic call/connection control protocol as defined in Recommendation Q.2931 [7] shall apply with the enhancement that whenever the destination network receives a cause value from the called user, this error value shall be relayed by the network to the originating network and shall be delivered in the first clearing message to the calling user.

ANNEX A

Symmetric operation

The operation of the CUG supplementary service has no impact on symmetric call operation and vice versa.

ANNEX B

Protocol extensions to this Recommendation for calls/connections using the procedures of Recommendation Q.2971 [13]

This annex contains the necessary protocol extensions to allow the CUG supplementary service to be used in association with point-to-multipoint calls/connections.

Subclause 1.2 of this Recommendation

Add to the end of 1.2:

"[13] ITU-T Recommendation Q.2971 (1995), *Broadband Integrated Services Digital Network (B-ISDN) – Digital Subscriber Signalling System No. 2 (DSS 2) – User-network interface layer 3 specification for point-to-multipoint call/connection control*."

Subclause 1.5 of this Recommendation

Include as a new paragraph after the first paragraph:

"If the CUG supplementary service is applied for point-to-multipoint connections, then the same CUG shall be used for all parties of the call."

Subclause 1.6.2 of this Recommendation

Add to the end of 1.6.2:

"In the case of a point-to-multipoint call, the CUG interlock code of the original call request shall be included in each add party request."

Subclause 1.7.1 of this Recommendation

Add to the end of the first paragraph of 1.7.1:

d) ADD PARTY (Note 3)

NOTE 3 – The closed user group information element shall be included in the network-to-user direction if CUG was invoked by the calling user.

In the user-to-network direction (originating side), the ADD PARTY message shall not include CUG related information.

e) ADD PARTY REJECT (Note 4)

NOTE 4 – The cause information element with the appropriate cause number shall be included in the user-to-network direction if the customer network cannot allow the call to proceed for CUG reasons.

In the network-to-user direction (originating side), the cause information element shall be included in accordance with 1.9.2.1.1.2, 1.9.2.1.2.2 and 1.11.

ITU-T RECOMMENDATIONS SERIES

Series A	Organization of the work of the ITU-T
Series B	Means of expression: definitions, symbols, classification
Series C	General telecommunication statistics
Series D	General tariff principles
Series E	Overall network operation, telephone service, service operation and human factors
Series F	Non-telephone telecommunication services
Series G	Transmission systems and media, digital systems and networks
Series H	Audiovisual and multimedia systems
Series I	Integrated services digital network
Series J	Transmission of television, sound programme and other multimedia signals
Series K	Protection against interference
Series L	Construction, installation and protection of cables and other elements of outside plant
Series M	TMN and network maintenance: international transmission systems, telephone circuits, telegraphy, facsimile and leased circuits
Series N	Maintenance: international sound programme and television transmission circuits
Series O	Specifications of measuring equipment
Series P	Telephone transmission quality, telephone installations, local line networks
Series Q	**Switching and signalling**
Series R	Telegraph transmission
Series S	Telegraph services terminal equipment
Series T	Terminals for telematic services
Series U	Telegraph switching
Series V	Data communication over the telephone network
Series X	Data networks and open system communication
Series Z	Programming languages