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**Integrated Services Digital Network (ISDN);
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Part 1: Protocol specification**

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Foreword

This second edition European Telecommunication Standard (ETS) has been produced by the Signalling Protocols and Switching (SPS) Technical Committee of the European Telecommunications Standards Institute (ETSI).

This ETS is part 1 of a multi-part standard covering the Digital Subscriber Signalling System No. one (DSS1) protocol specification for the Integrated Services Digital Network (ISDN) Closed User Group (CUG) supplementary service, as described below:

Part 1: "Protocol specification";

Part 2: "Protocol Implementation Conformance Statement (PICS) proforma specification";

Part 3: "Test Suite Structure and Test Purposes (TSS&TP) specification for the user";

Part 4: "Abstract Test Suite (ATS) and partial Protocol Implementation eXtra Information for Testing (PIXIT) proforma specification for the user";

Part 5: "TSS&TP specification for the network";

Part 6: "ATS and partial PIXIT proforma specification for the network".

This second edition contains alignments to ETS 300 356-9 (1995) concerning the procedures for informing the calling user in the case of call rejection.

In accordance with CCITT Recommendation I.130, the following three level structure is used to describe the supplementary telecommunication services as provided by European public telecommunications operators under the pan-European Integrated Services Digital Network (ISDN):

- Stage 1: is an overall service description, from the user's stand-point;
- Stage 2: identifies the functional capabilities and information flows needed to support the service described in stage 1; and
- Stage 3: defines the signalling system protocols and switching functions needed to implement the service described in stage 1.

This ETS details the stage 3 aspects (signalling system protocols and switching functions) needed to support the CUG supplementary service. The stage 1 and stage 2 aspects are detailed in ETS 300 136 (1992) and ETS 300 137 (1992), respectively.

Transposition dates	
Date of adoption:	2 May 1997
Date of latest announcement of this ETS (doa):	31 August 1997
Date of latest publication of new National Standard or endorsement of this ETS (dop/e):	28 February 1998
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1 Scope

This first part of ETS 300 138 specifies the stage three of the Closed User Group (CUG) supplementary service for the pan-European Integrated Services Digital Network (ISDN) as provided by European public telecommunications operators at the T reference point or coincident S and T reference point (as defined in ITU-T Recommendation I.411 [5]) by means of the Digital Subscriber Signalling System No. one (DSS1) protocol. Stage three identifies the protocol procedures and switching functions needed to support a telecommunication service (see CCITT Recommendation I.130 [3]).

In addition, this ETS specifies the protocol requirements at the T reference point where the service is provided to the user via a private ISDN.

This ETS does not specify the additional protocol requirements where the service is provided to the user via a telecommunications network that is not an 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 CUGs. Members of a specific CUG can communicate among themselves but not, in general, with users outside the group.

The CUG supplementary service is applicable to all telecommunication services.

Further parts of this ETS specify the method of testing required to identify conformance to this ETS.

This ETS is applicable to equipment, supporting the CUG supplementary service, to be attached at either side of a T reference point or coincident S and T reference points when used as an access to the public ISDN.

2 Normative references

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

- [1] CCITT Recommendation E.164 (1991): "Numbering plan for the ISDN era".
- [2] ITU-T Recommendation I.112 (1993): "Vocabulary of terms for ISDNs".
- [3] CCITT Recommendation I.130 (1988): "Method for the characterization of telecommunication services supported by an ISDN and network capabilities of an ISDN".
- [4] ITU-T Recommendation I.210 (1993): "Principles of telecommunication services supported by an ISDN and the means used to describe them".
- [5] ITU-T Recommendation I.411 (1993): "ISDN user-network interfaces - Reference configurations".
- [6] CCITT Recommendation X.208 (1988): "Open Systems Interconnection (OSI); Model and Notation: Service definition: Specification of Abstract Syntax Notation One (ASN.1)".
- [7] CCITT Recommendation X.209 (1988): "Open Systems Interconnection (OSI); Model and Notation: Service definition: Specification of basic encoding rules for Abstract Syntax Notation One (ASN.1)".
- [8] CCITT Recommendation X.219 (1988): "Remote Operations: Notation and Service Definition".
- [9] CCITT Recommendation Z.100 (1988): "Functional Specification and Description Language (SDL)".

- [10] ETS 300 136 (1992): "Integrated Services Digital Network (ISDN); Closed User Group (CUG) supplementary service; Service description".
- [11] ETS 300 195-1: "Integrated Services Digital Network (ISDN); Supplementary service interactions; Digital Subscriber Signalling System No. one (DSS1) protocol; Part 1: Protocol specification".
- [12] ETS 300 196-1: "Integrated Services Digital Network (ISDN); Generic functional protocol for the support of supplementary services; Digital Subscriber Signalling System No. one (DSS1) protocol; Part 1: Protocol specification".
- [13] ETS 300 403-1 (1995): "Integrated Services Digital Network (ISDN); Digital Subscriber Signalling System No. one (DSS1) protocol; Signalling network layer for circuit-mode basic call control; Part 1: Protocol specification [ITU-T Recommendation Q.931 (1993), modified]".
- [14] ETS 300 403-2 (1995): "Integrated Services Digital Network (ISDN); Digital Subscriber Signalling System No. one (DSS1) protocol; Signalling network layer for circuit-mode basic call control; Part 2: Specification and Description Language (SDL) diagrams".
- [15] ETS 300 485 (1995): "Integrated Services Digital Network (ISDN); Definition and usage of cause and location in Digital Subscriber Signalling System No. one (DSS1) and Signalling System No.7 ISDN User Part (ISUP) [ITU-T Recommendation Q.850 (1993), modified]".

3 Definitions

For the purposes of this ETS, the following definitions apply:

basic telecommunication service: A bearer service or teleservice. The terms "bearer service" and "teleservice" are defined in ITU-T Recommendation I.112 [2], definitions 202 and 203.

CUG call: See ETS 300 136 [10], clause 3.

CUG index: The CUG index is a parameter used by the calling user to select a particular CUG when originating a call. The index is also used by the network to indicate to the called user the CUG 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 CUG.

CUG interlock code: This is a means of identifying CUG membership within the network. At the calling side, if a CUG match exists, the CUG index identifying a CUG maps to the CUG interlock code for that CUG. If a CUG match exists at the called side the CUG interlock code identifying a CUG maps to the CUG index representing that CUG. CUG interlock code is not an access concept, but is used for clarity during the descriptions of signalling procedures and flows.

default number: An agreed ISDN number between the user at the calling side and the network provider.

incoming access: See ETS 300 136 [10], clause 3.

incoming calls barred within a CUG: See ETS 300 136 [10], clause 3.

Integrated Services Digital Network (ISDN): See ITU-T Recommendation I.112 [2], definition 308.

ISDN number: A number conforming to the numbering plan and structure specified in CCITT Recommendation E.164 [1].

network: The DSS1 protocol entity at the network side of the user-network interface.

outgoing access: See ETS 300 136 [10], clause 3.

outgoing calls barred within a CUG: See ETS 300 136 [10], clause 3.

preferential CUG: A CUG user subscribing to preferential CUG nominates a CUG index which the network uses as a default to identify the required CUG in the absence of any CUG information in the outgoing call request. A preferential CUG applies to an ISDN number (or to an ISDN number/service - see subclause 6.1) and not to a specific CUG.

service; telecommunication service: See ITU-T Recommendation I.112 [2], definition 201.

supplementary service: See ITU-T Recommendation I.210 [4], subclause 2.4.

user: The DSS1 protocol entity at the user side of the user-network interface.

4 Abbreviations

For the purposes of this ETS, the following abbreviations apply:

CES	Connection Endpoint Suffix
CUG	Closed User Group
DSS1	Digital Subscriber Signalling System No. one
IA	Incoming Access
ICB	Incoming Calls Barred within a CUG
ISDN	Integrated Services Digital Network
ISUP	Integrated Services User Part
OA	Outgoing Access
OCB	Outgoing Calls Barred within a CUG
SDL	Specification and Description Language

5 Description

Essentially normal call 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 CUG 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.

The network provider may define the maximum number of CUGs 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 CUG integrity.

6 Operational requirements

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 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) the options shown in table 1 shall apply per ISDN number. The option values may be assigned individually for each basic service, or set of basic services, available at the ISDN number with the CUG supplementary service;
- b) the option shown in table 2 shall apply per CUG provided at the ISDN number with the CUG supplementary service.

Table 1: Options available per ISDN number

Option (note)	Values
1) Preferential CUG	Nominated CUG index, or none designated.
2) Outgoing access	Allowed, or not allowed.
3) Incoming access	Allowed, or not allowed.
NOTE:	If, for a user with the CUG supplementary service, a basic service, or set of basic services, is not included in at least one CUG, then: <ul style="list-style-type: none">- preferential CUG shall have the "none designated" option value;- outgoing access shall have the "allowed" option value if normal outgoing calls using that basic service, or set of basic services, are required;- incoming access shall have the "allowed" option value if incoming calls using that basic service, or set of basic services, are required.

Table 2: Options available per CUG

Option	Values
1) Barring within the CUG	None, incoming calls, or outgoing calls.

The options assigned to a CUG member shall be stored in the network.

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

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 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. However, if the network knows that such interactions are not possible (e.g. the user has only the CUG supplementary service) then the information may be discarded.

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 request was passed to the called user. The CUG interlock code (if any) of the call request shall also be retained. However, if the network knows that such interactions are not possible (e.g. the user has only the CUG supplementary service) then the information may be discarded.

7 Coding requirements

7.1 ASN.1 description of coding requirements

Table 3 provides an Abstract Syntax Notation one (ASN.1) description of the coding of the Facility information element components necessary to support this service in accordance with CCITT Recommendations X.208 [6] and X.209 [7] and uses the OPERATION and ERROR macro as defined in figure 4/X.219 of CCITT Recommendation X.219 [8].

Table 3: Definition of operations and errors for the CUG supplementary service

```

Closed-User-Group-Service-Operations {ccitt identified-organization etsi(0) 138
                                     operations-and-errors (1)}

DEFINITION ::=
BEGIN
EXPORTS
    CUGCall,
    InvalidOrUnregisteredCUGIndex,
    RequestedBasicServiceViolatesCUGConstraints,
    OutgoingCallsBarredWithinCUG,
    IncomingCallsBarredWithinCUG,
    UserNotMemeberOfCUG,
    InconsistencyInDesignatedFacilityAndSubscriberClass

IMPORTS
    OPERATION,
    ERROR
    FROM Remote-Operation-Notation
        {joint-iso-ccitt remote-operations(4) notation(0)}

    notSubscribed,
    basicServiceNotProvided
    FROM General-Errors
        {ccitt identified-organization etsi(0) 196 general-errors}
;

CUGcall ::= OPERATION
-- in Facility information element. Invoked from calling user to originating
-- network side. Also from destination network side to called user
ARGUMENT SEQUENCE {
    OARequested DEFAULT FALSE,
    CUGIndex OPTIONAL}
-- in SETUP message
ERRORS {
    invalidOrUnregisteredCUGIndex,
    requestedBasicServiceViolatesCUGConstraints,
    outgoingCallsBarredWithinCUG,
    incomingCallsBarredWithinCUG,
    userNotMemberOfCUG,
    basicServiceNotProvided,
    inconsistencyInDesignatedFacilityAndSubscriberClass,
    notSubscribed
}
-- in clearing message to calling user. Also to destination network side.

OARequested ::= [1] IMPLICIT BOOLEAN
CUGIndex ::= [2] IMPLICIT INTEGER (0..32767)

InvalidOrUnregisteredCUGIndex ::= ERROR
RequestedBasicServiceViolatesCUGConstraints ::= ERROR
OutgoingCallsBarredWithinCUG ::= ERROR
IncomingCallsBarredWithinCUG ::= ERROR
UserNotMemberOfCUG ::= ERROR
InconsistencyInDesignatedFacilityAndSubscriberClass ::= ERROR

cUGCall CUGCall ::= localValue 2

invalidOrUnregisteredCUGIndex InvalidOrUnregisteredCUGIndex ::= localValue 16
requestedBasicServiceViolatesCUGConstraints RequestedBasicServiceViolatesCUGConstraints ::= localValue 17
outgoingCallsBarredWithinCUG OutgoingCallsBarredWithinCUG ::= localValue 18
incomingCallsBarredWithinCUG IncomingCallsBarredWithinCUG ::= localValue 19
userNotMemberOfCUG UserNotMemberOfCUG ::= localValue 20
inconsistencyInDesignatedFacilityAndSubscriberClass InconsistencyInDesignatedFacilityAndSubscriberClass ::= localValue 21

END -- Closed-User-Group-Service-Operations

```

7.2 Coding of the Cause information element

The coding of cause #87 "User not a member of CUG" (for use in the Cause information element in certain CUG service related circumstances, as described in clauses 9 and 11) is defined in ETS 300 485 [15].

8 State definitions

No specifically defined ETS 300 403-1 [13] protocol control states shall be required for the CUG supplementary service.

To facilitate understanding of the service the following CUG process states are used in the dynamic description:

- CUG idle;
- outgoing CUG;
- incoming CUG.

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

9 Signalling procedures at the coincident S and T reference point

9.1 Activation, deactivation and registration

Not applicable.

9.2 Invocation and operation

NOTE: In a number of cases the procedures in the following subclauses specify that return error information shall be conveyed from the destination to the originating side. However, the current ISUP implementation (see ETS 300 356-9 (1995)) does not fully support the conveyance of the return error information to the originating network as cause values are the only means for conveyance of information. The mapping from return error information at the destination and vice versa at the origination is specified in annex C.

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.

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

9.2.1.1 Normal operation

To request explicitly the CUG supplementary service the calling user shall include in the outgoing SETUP message a Facility information element containing a cUGCall invoke component. 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.

The network shall perform internal checks appropriate to the originating network based on the contents of the cUGCall invoke component and the CUG attributes of the calling user. The outcomes of these checks are defined in table 4.

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 5.

If the call is successfully offered to the called user, then basic call control procedures shall apply at the calling user's interface.

9.2.1.2 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 first clearing message returned to the calling user (before the alerting phase) a Facility information element containing a cUGCall return error component with the appropriate indication as defined in tables 4 and 5.

The cause in the clearing message conveying the cUGCall return error component should be #29 "Facility rejected".

If the call attempt fails for a reason unrelated to the CUG supplementary service, then a Facility information element containing a cUGCall return error component indicating "basicServiceNotProvided" should be included in the first clearing message returned to the calling user (before the alerting phase). The cause cited shall be determined by the event causing the failure. If there is no cUGCall return error component present in the first clearing message, then the user shall abandon the CUG call operation and continue normal clearing.

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, if the cUGCall return error component can be sent, it shall contain an indication as defined by tables 4 and 5, but the cause shall be determined by the event not related to the CUG supplementary service which caused the call failure.

9.2.2 Call originating from a user with the CUG supplementary service (default request)

9.2.2.1 Normal operation

If the calling user does not include in the outgoing SETUP message a Facility information element containing a cUGCall invoke component, the network shall perform internal checks appropriate to the originating network based on the CUG attributes of the calling user. The outcomes of these checks are defined in table 4. 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.

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 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 5.

If the call is successfully offered to the called user then basic call control procedures shall apply at the calling user's interface.

9.2.2.2 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 CUG supplementary service related reason, then the network shall initiate call clearing using one of the following causes:

- #87 "User not a member of CUG" if the corresponding cUGCall return error component value would have been "userNotMemberOfCUG" using the explicit request procedures;
- #29 "Facility rejected" in the case of all other CUG supplementary service related reasons.

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

9.2.3 Call originating from a user without the CUG supplementary service

9.2.3.1 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 in the outgoing SETUP message a Facility information element containing a cUGCall invoke component, then table 4 shall apply.

The destination network shall then perform further internal checks based on the CUG attributes (if any) of the called user. The outcomes of these checks are defined in table 5.

9.2.3.2 Exceptional procedures

If the calling user includes in the outgoing SETUP message a Facility information element containing a cUGCall invoke component and if the network can recognize this cUGCall invoke component, then the network shall fail the call and initiate clearing with cause #50 "Requested facility not subscribed". The network shall include in the first clearing message returned to the calling user a Facility information element containing a cUGCall return error component with the appropriate indication as defined in table 4, i.e. "notSubscribed".

If the calling user includes in the outgoing SETUP message a Facility information element containing a cUGCall invoke component but the network cannot recognize this supplementary service request, then the procedures defined in subclause 8.4 of ETS 300 196-1 [12] shall apply.

If the calling user does not include in the outgoing SETUP message a Facility information element containing a cUGCall invoke component 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 #87 "User not a member of CUG". No other CUG supplementary service related indication shall be conveyed to the calling user.

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

9.2.4 Call terminating at a user with the CUG supplementary service

9.2.4.1 Normal operation

If the internal checks defined in table 5 result in a requirement for a CUG call to the called user, then the incoming SETUP message shall include a Facility information element containing a cUGCall invoke component to convey the necessary CUG call information (as defined in table 5).

The network shall then expect either:

- a) an ALERTING or CONNECT message according to basic call control received from a connection endpoint identifier if the call is successfully offered in the user's domain represented by that connection endpoint identifier; or
- b) a cUGCall return error component in a Facility information element in the first clearing message received from a connection endpoint identifier (before the alerting phase) if the call is failed by the terminal equipment represented by that connection endpoint identifier. The network shall continue clearing that connection endpoint identifier.

If the network knows that a point-to-point configuration exists then the error value shall be relayed by the network to the originating network and an appropriate indication (depending on the calling user's CUG supplementary service invocation being explicit or default) shall be delivered in the first clearing message to the calling user.

In case of a SETUP message sent via the broadcast datalink, the network may, as a network option, retain the return error component along with the Q.931 cause retained according to subclause 5.2.5.3 of ETS 300 403-1 [13]. If there are multiple clearing messages containing return error components, the indication in the return error component contained in the first received clearing message with the highest priority cause will be sent back to the calling user. If none of the clearing messages with the highest priority cause contains return error components and other clearing messages with lower priority causes do contain return error components, no indication in these return error components shall be sent back to the calling user.

In addition to the basic call procedures defined in ETS 300 403-1 [13], when a user receives a SETUP message with a Facility information element containing a cUGCall invoke component and the user can recognize CUG call invocation procedures, the user may:

- 1) initiate appropriate user domain closed user group procedures and, if the call fails for CUG supplementary service reasons, may include in the first clearing message returned to the network (before the alerting phase) a Facility information element containing a cUGCall return error component; or
- 2) include in the first clearing message returned to the network (before the alerting phase) a Facility information element containing a cUGCall return error component with value "inconsistency-InDesignatedFacilityAndSubscriberClass" if the call fails for a reason unrelated to the CUG supplementary service.

9.2.4.2 Exceptional procedures

If the cUGCall return error component is absent in the first clearing message received from a connection endpoint identifier the destination network shall continue clearing that connection endpoint identifier for reasons unrelated to the CUG supplementary service. In addition, if the destination network knows that a point-to-point configuration exists it shall abandon the CUG call operation and initiate normal call clearing towards the calling user including, if appropriate, a cUGCall return error component indicating "inconsistencyInDesignatedFacilityAndSubscriberClass".

If no cUGCall return error component is received by the destination network during an unsuccessful call offering process, then the destination network shall abandon the CUG call operation and initiate call clearing towards the calling user with the appropriate cause derived from basic call control (e.g. cause #18 "No user responding", or the highest priority cause saved) including, if appropriate, a cUGCall return error component indicating "inconsistencyInDesignatedFacilityAndSubscriberClass".

When a user receives a SETUP message with a Facility information element containing a cUGCall invoke component and the user cannot recognize this supplementary service request, then the procedures defined in subclause 8.4 of ETS 300 196-1 [12] shall apply.

9.2.5 CUG checks at the originating and destination network

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

Table 4: CUG checks at the originating network

CUG attributes of calling user for requested basic service		CUG information received from calling user in SETUP				
		CUG call invoke received				no CUG call invoke received
		OA not req. CUG index	OA req. CUG index	OA not req. no CUG index	OA req. no CUG index	
no preferential CUG OA not allowed	not OCB	CUG call IC = spec. CUG (note 1)	CUG call IC = spec. CUG (note 1)	rejected RE value = e (note 4)	rejected RE value = e (note 4)	rejected no RE (note 4)
	OCB	rejected RE value = d	rejected RE value = d			
no preferential CUG OA allowed	not OCB	CUG call IC = spec. CUG (note 1)	CUG call IC = spec. CUG (note 1)	normal call (note 4)	normal call (note 4)	normal call (note 4)
	OCB	rejected RE value = d	rejected RE value = d			
preferential CUG nominated OA not allowed	not OCB	CUG call IC = spec. CUG (note 2)	CUG call IC = spec. CUG (note 2)	CUG call IC = pref. CUG	rejected RE value = a	CUG call IC = pref. CUG
	OCB	rejected (note 3) RE value = d	rejected (note 3) RE value = d	rejected (note 5) RE value = d		rejected no RE (note 5)
preferential CUG nominated OA allowed	not OCB	CUG call IC = spec. CUG (note 2)	CUG call IC = spec. CUG (note 2)	CUG call IC = pref. CUG	normal call	CUG call IC = pref. CUG
	OCB	rejected (note 3) RE value = d	rejected (note 3) RE value = d	rejected (note 5) RE value = d		rejected no RE (note 5)
not a CUG user		rejected RE value = a	rejected RE value = a	rejected RE value = a	rejected RE value = a	normal call (note 6)

Key:

- IC: CUG interlock code
- RE: cUGCall return error component
- RE value a: "notSubscribed"
- RE value b: "invalidOrUnregisteredCUGIndex"
- RE value c: "requestedBasicServiceViolatesCUGConstraints"
- RE value d: "outgoingCallsBarredWithinCUG"
- RE value e: "inconsistencyInDesignatedFacilityAndSubscriberClass"

NOTE 1: Assumes match between CUG index and IC exists for the requested basic service. If no match exists then:

- if the CUG index exists but is not appropriate to the requested basic service the call shall be rejected with RE value = c. This includes the case when the requested basic service is not included in any CUG;
- if the CUG index does not exist the call shall be rejected with RE value = b.

NOTE 2: Assumes match between CUG index and IC exists for the requested basic service. If no match exists then:

- if the CUG index exists but is not appropriate to the requested basic service the call shall be rejected with RE value = c;
- if the CUG index does not exist the call shall be rejected with RE value = b.

NOTE 3: If the CUG index identifies the preferential CUG then this combination of CUG attribute values is not recommended.

NOTE 4: This includes the case when the requested basic service is not included in any CUG.

NOTE 5: This combination of CUG attribute values is not recommended.

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

NOTE 7: The type of call request derived from this table shall determine the linkage to table 5.

Table 5 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 5: CUG checks at the destination network

Type of CUG indication from the network	CUG match check	CUG attributes of called user for requested basic service				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 RE value = e	CUG call	rejected RE value = e	rejected
	NM	rejected RE value = f (note 1)		rejected RE value = f (note 1)		RE value = f
normal call	-	rejected RE value = f (note 2)		normal call (note 2)		normal call (note 3)

Key:

M: match between IC and CUG index exists for the requested basic service
 NM: no match between IC and CUG index exists for the requested basic service
 CUG call: cUGCall invoke component in SETUP message identifies CUG index but does not request outgoing access
 normal call: no cUGCall invoke component in SETUP message
 IC: CUG interlock code
 RE: cUGCall return error component returned to calling user. However, if the call requested at the originating side did not include an explicit invocation of the CUG supplementary service then the calling user shall only receive indications as conveyed by the cause in the clearing procedure
 RE value c: "requestedBasicServiceViolatesCUGConstraints"
 RE value e: "incomingCallsBarredWithinCUG"
 RE value f: "userNotMemberOfCUG"

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 basic service then the call shall be rejected with RE value = c. This includes the case when the requested basic service is not included in any CUG.
 NOTE 2: This includes the case when the requested basic service is not included in any CUG.
 NOTE 3: This represents the normal case of a user without the CUG supplementary service receiving a normal call.

10 Procedures for interworking with private ISDNs

Interworking with private ISDNs shall be according to the procedures of clause 9.

11 Interactions with other networks

When a CUG call fails at a gateway to a network that does not support the CUG supplementary service then if the CUG supplementary service was explicitly invoked the cUGCall return error component returned to the calling user shall indicate "userNotMemberOfCUG" and the cause should be #29 "Facility rejected". If the CUG supplementary service was invoked by default, normal clearing procedures shall apply using cause #87 "User not a member of CUG".

12 Interactions with other supplementary services

The interactions of the CUG supplementary service with other supplementary services shall be as specified in ETS 300 195-1 [11].

13 Parameter values (timers)

No additional timers are defined for the CUG supplementary service.

14 Dynamic description (SDL diagrams)

The SDL description in figures 1 and 2 is based on the model of ETS 300 403-1 [13] protocol control and call control as defined in ETS 300 403-2 [14]. 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 CCITT Recommendation Z.100 [9].

14.1 The CUG process

Figures 1 and 2 provide the SDL description of the CUG process at the originating and destination network sides, respectively. No user side SDL diagrams are provided.

The CUG process is modelled as an extension of the call control process. Information can pass between the call control and CUG processes by means of primitives.

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

- a) **continue**: the continue primitive shall prompt the call control process to proceed but shall not change the course of call control in establishing or clearing the call attempt. It may provide additional instructions from the CUG process to call control, e.g.:
 - **normal**: no additional instructions to call control;
 - **apply checks**: call control required to perform the appropriate CUG checks and then proceed (note that the stage 2 description functional entities; FE3 "outgoing CUG control", and FE5 "incoming CUG control", are not modelled as part of the stage 3 description "CUG process");
 - **RE value**: call control required to include a cUGCall return error component with the indicated value in the first clearing message to the calling user.
- b) **clear call**: the clear call primitive shall cause call control to move from call establishment to appropriate call clearing procedures using the additional information provided by the CUG process.

14.2 Relation to basic call control

The basic call control protocol as defined in ETS 300 403-2 [14] shall apply with the enhancement that whenever the "save cause" task is performed an additional task shall be performed which shall save any cUGCall return error component value according to the strategy described in subclause 9.2.4.1, item b).

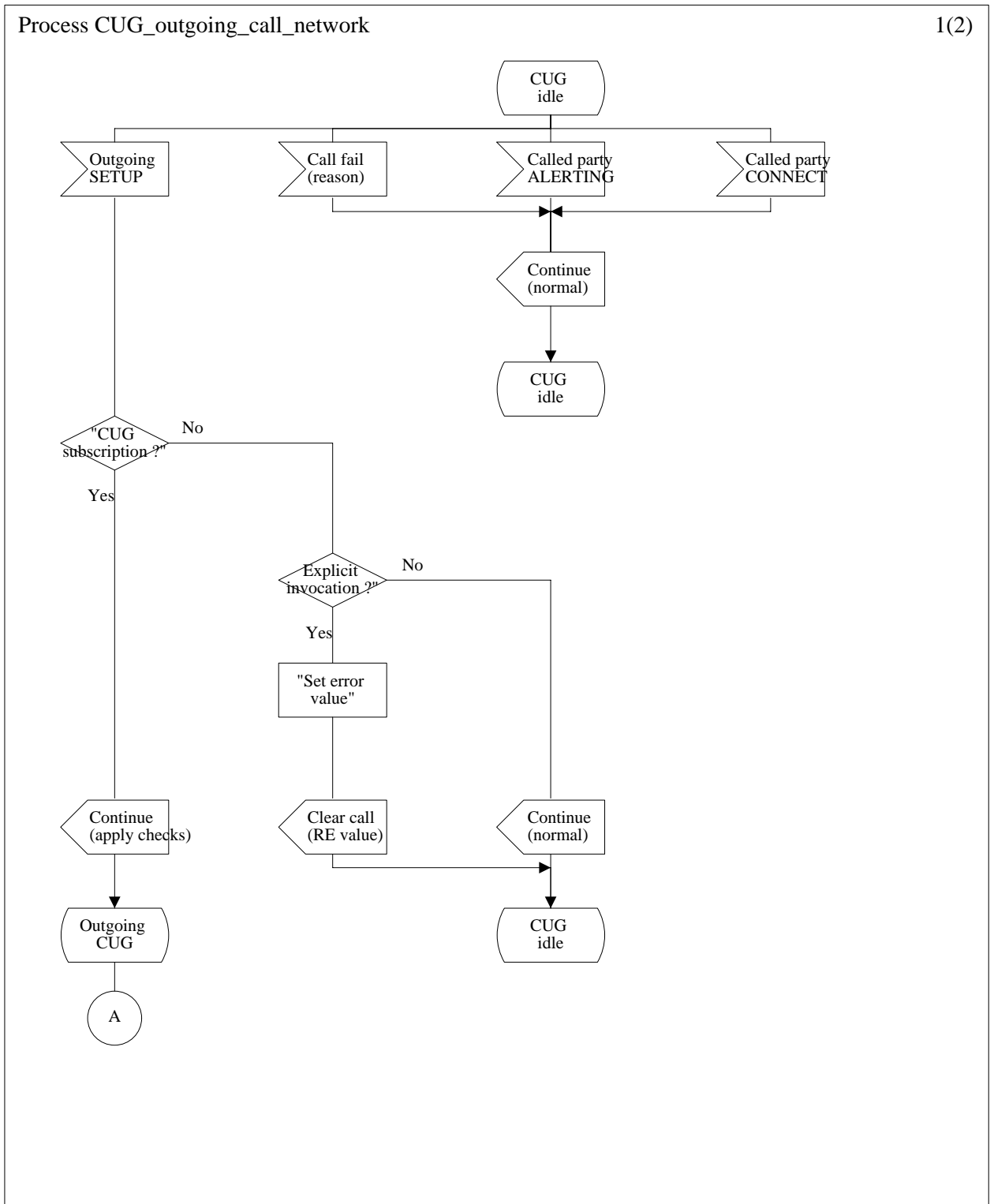


Figure 1 (sheet 1 of 2): CUG process - outgoing call (network side)

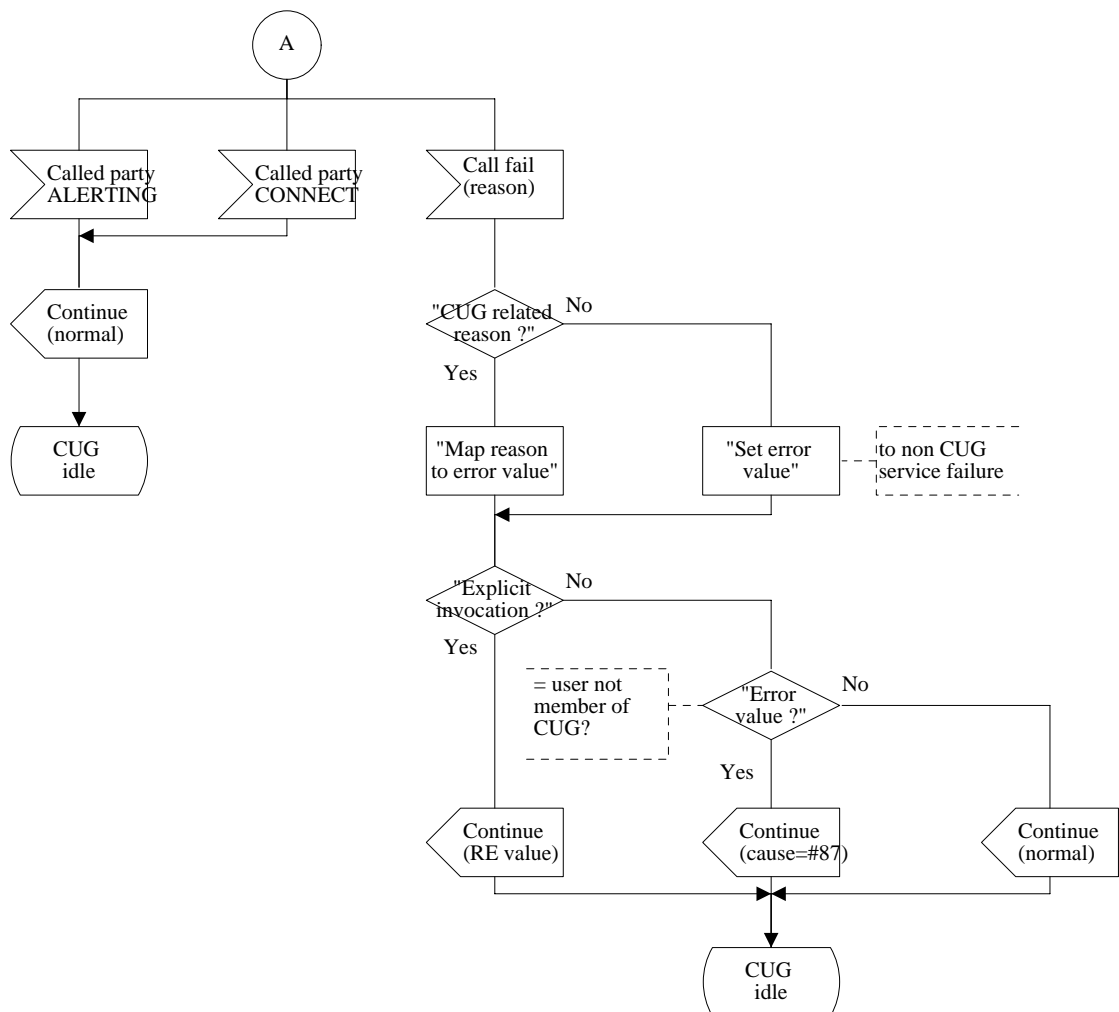


Figure 1 (sheet 2 of 2): CUG process - outgoing call (network side)

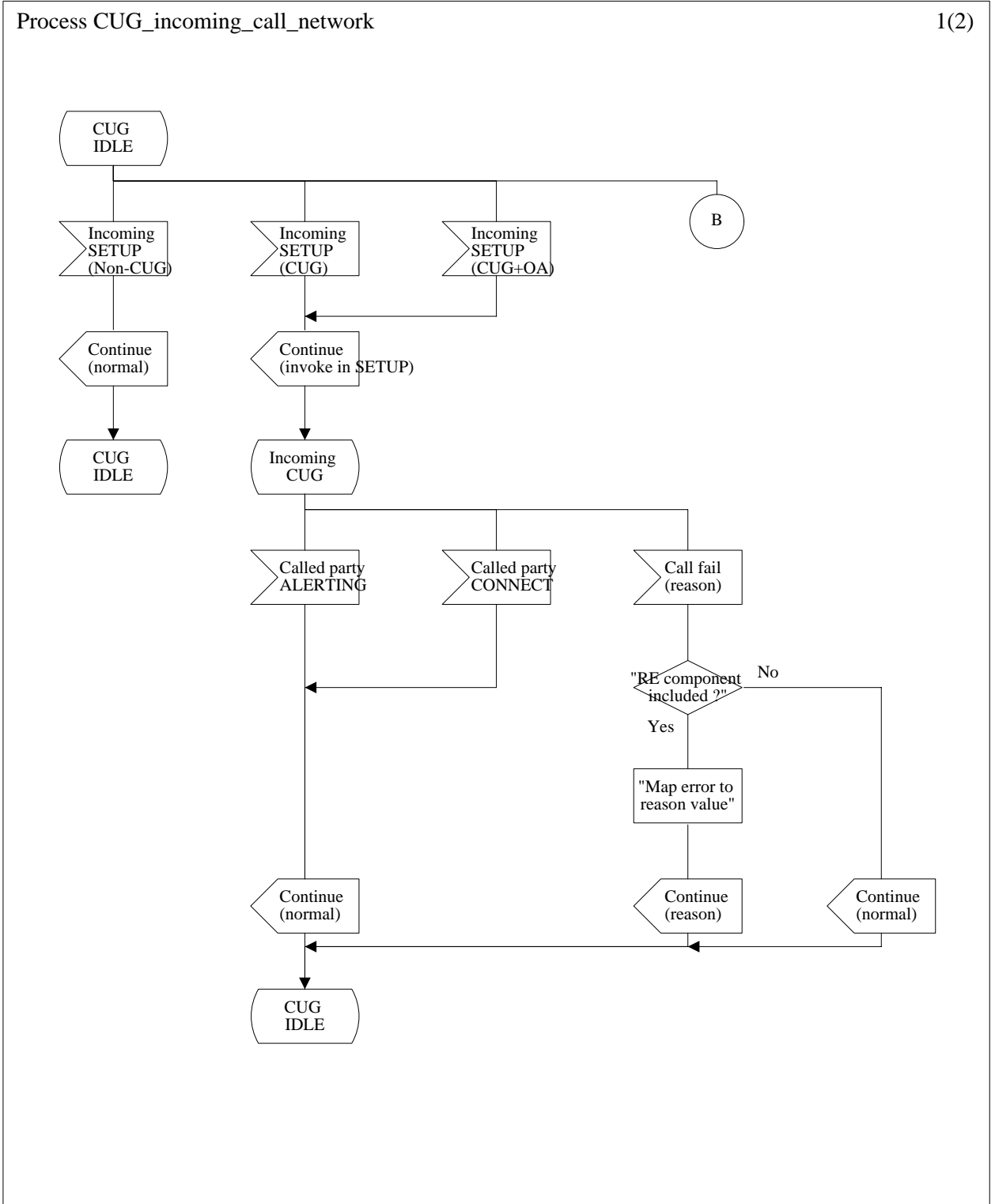


Figure 2 (sheet 1 of 2): CUG process - incoming call (network side)

Process CUG_incoming_call_network

2(2)

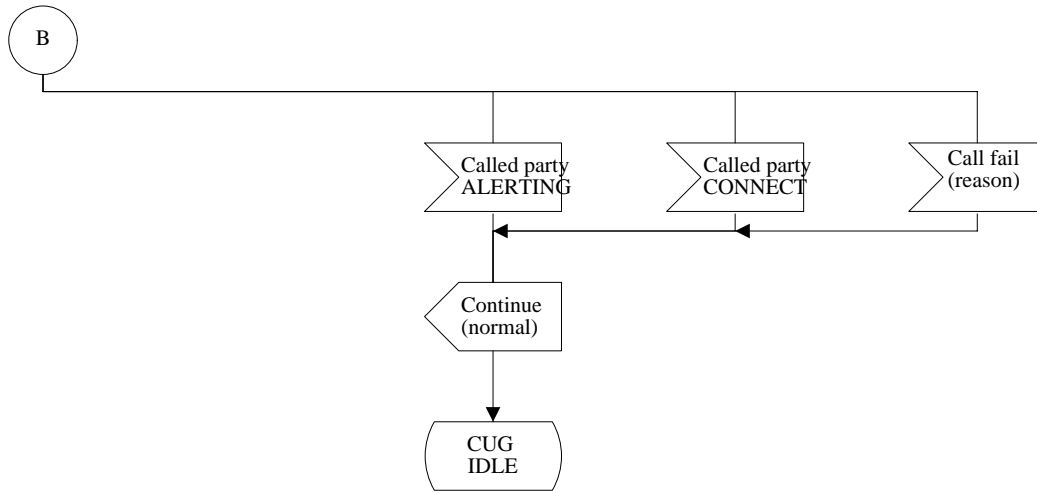
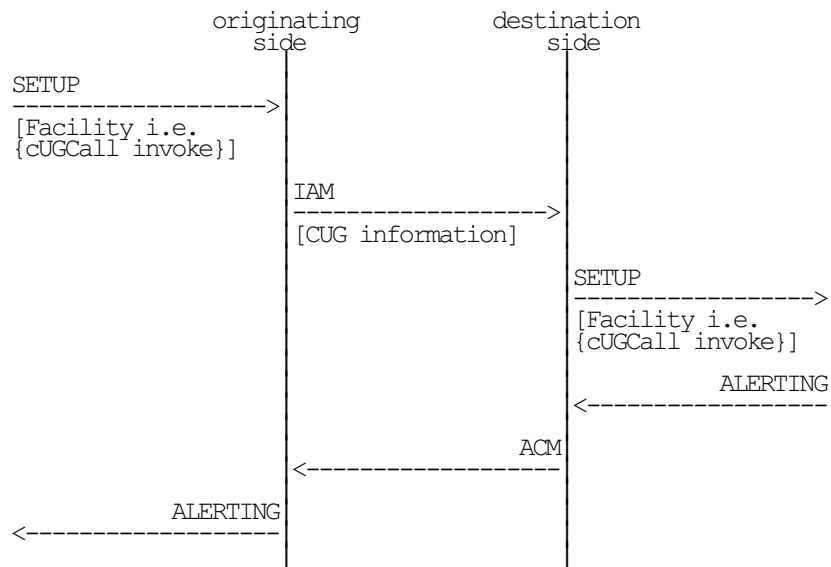


Figure 2 (sheet 2 of 2): CUG process - incoming call (network side)

Annex A (informative): Signalling flows

The examples in figures A.1 to A.5 show, in general, only the messages which convey CUG information and their CUG related contents. Otherwise, basic call control shall apply.



NOTE: Messages which do not convey CUG information are included for added clarification.

Figure A.1: Call passes both originating and destination network side checks and is successful in the destination user's side

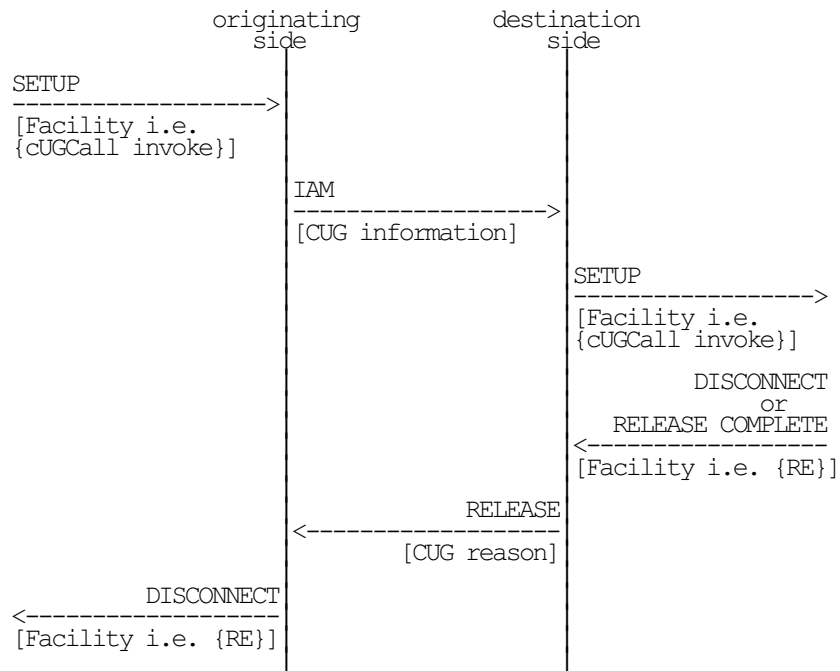
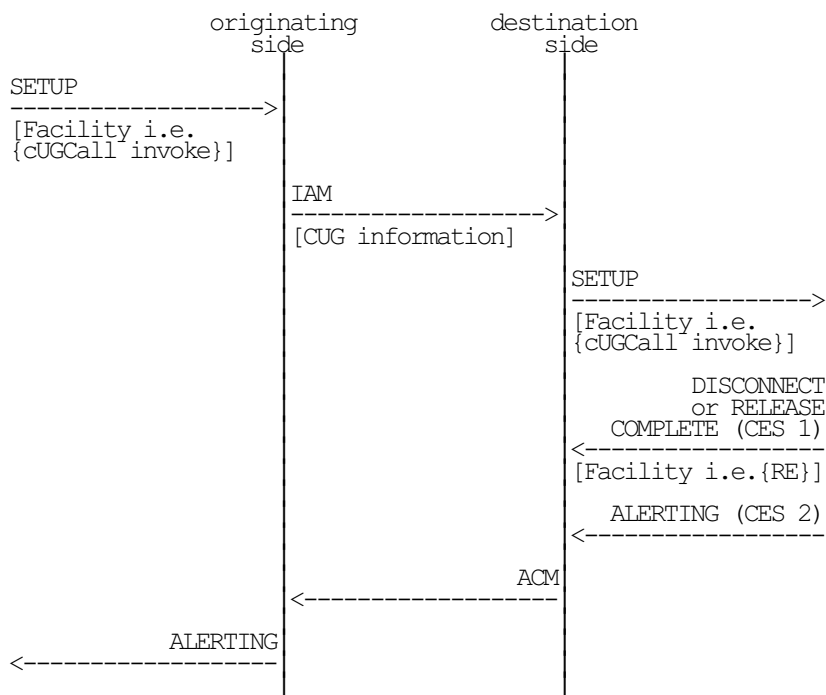


Figure A.2: Call passes both originating and destination network side checks but fails in the destination user's side



NOTE: Messages which do not convey CUG information are included for added clarification.

Figure A.3: Call passes both originating and destination network side checks, with point-to-multipoint configuration at destination user's side

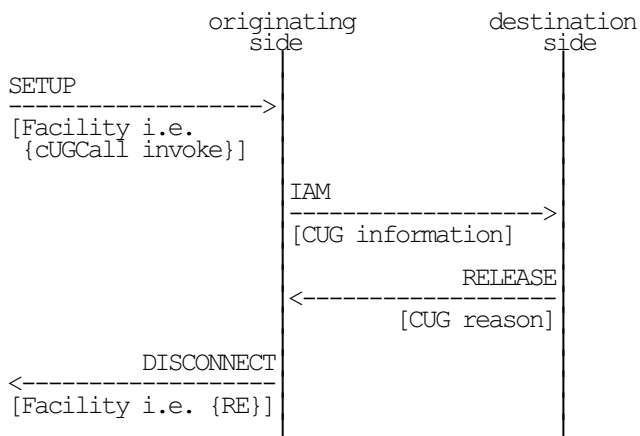


Figure A.4: Call fails destination network side checks

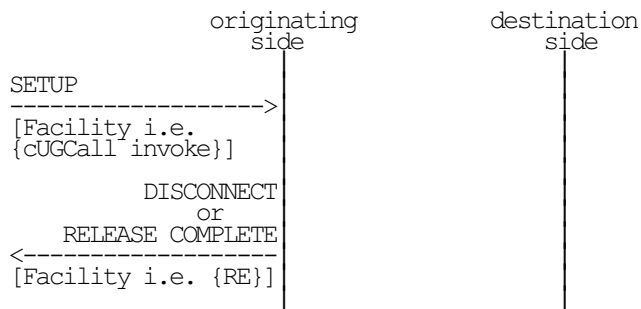


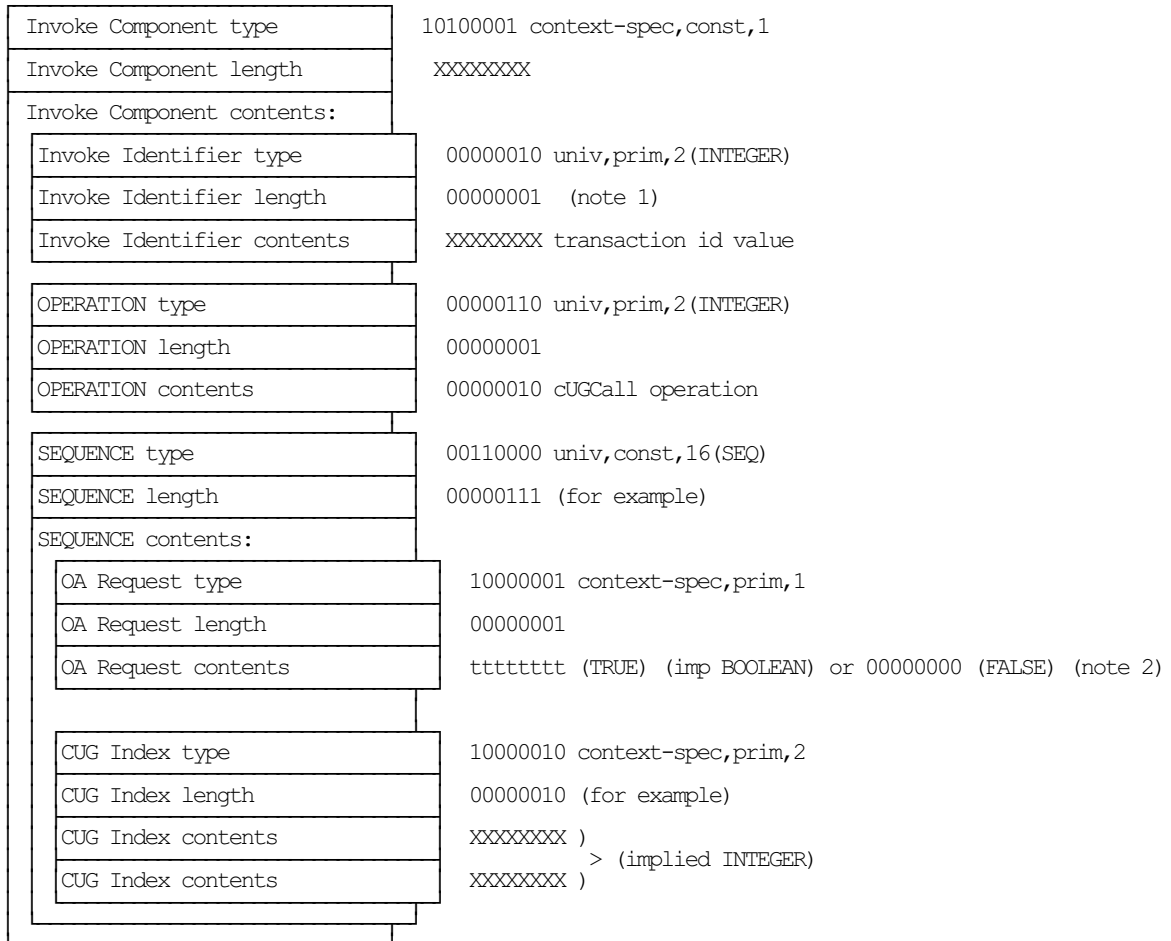
Figure A.5: Call fails originating network side checks

Annex B (informative): Diagram description of coding requirements

B.1 CUG call invoke component (typical example)

Example component structures for the CUG supplementary service are shown in figures B.1 and B.2.

In cases of discrepancies between this annex and clause 7, then clause 7 is considered as the prime source.



NOTE 1: The length of the invoke identifier is either 1 or 2 octets.

NOTE 2: Any value of "ttttttt" other than "00000000" represents the value TRUE.

Figure B.1

B.2 CUG call return error component

Return Error Component type	10100011 context-spec, const, 3
Return Error Component length	00000110
Return Error Component cont:	
Invoke Identifier type	00000010 univ, prim, 2 (INTEGER)
Invoke Identifier length	00000001 (note)
Invoke Identifier contents	XXXXXXXX invoke id value
ERROR type	00000010 univ, prim, 2 (INTEGER)
ERROR length	00000001
ERROR contents	XXXXXXXX error value

NOTE: The length of the invoke identifier is either 1 or 2 octets.

Figure B.2

Annex C (normative): Mapping of return errors and cause values

This annex specifies the requirements for the mapping of return error values into cause values at the destination network side, and the mapping of cause values into return error values at the originating network side.

C.1 Mapping at the destination network side

Table C.1 specifies which cause values shall be sent in ISUP towards the originating network if a CUG call is rejected as a result of the CUG check at the destination.

Table C.1: Rejection as a result of CUG check

Cause value sent in ISUP towards the originating network	The CUG call is rejected due to the following check result
#55	The attribute "incoming call barred within CUG" is set for the called user.
#87	The IC does not match with the CUG index, or the IC matches with the CUG index but not for the requested service (see note 1 of table 5).
#29	The CUG call is towards a network not supporting the CUG supplementary service (see subclause 1.5.2.5.1 of ETS 300 356-9).
Cause #29: "Facility rejected"	
Cause #55: "Incoming calls barred within CUG"	
Cause #87: "User not member of CUG"	

Table C.2 specifies which cause values shall be sent in ISUP towards the originating network if a CUG call is rejected by the called user.

Table C.2: CUG rejected by the called user

Cause value used in ISUP	Information received from the called user	
	Cause value	Return error
#87	X	(1), (2), (3)
as received from DSS1	X	(4)
#55	X	(5)
as received from DSS1	X	(6)
as received from DSS1	X	none
(1):	Error value "userNotMemberOfCUG"	
(2):	Error value "invalidOrUnregisteredCUGIndex"	
(3):	Error value "requestedBasicServiceViolatesCUGConstraints"	
(4):	Error value "inconsistencyInDesignatedFacilityAndSubscriber-Class"	
(5):	Error value "incomingCallsBarredWithinCUG"	
(6):	Error value "basicServiceNotProvided"	
X:	Mapping is independent of the cause value received from the called user	
Cause #87: "User not member of CUG"		
Cause #55: "Incoming calls barred within CUG"		

C.2 Mapping at the originating network side

Table C.3 specifies which return error values shall be sent to the calling user as a result of the received cause value from ISUP.

Table C.3: Mapping at the originating side

Type of CUG request at the calling user	Information sent to the calling user		Cause value received from ISUP
	Cause value	Return error	
Explicit request	#29	(1)	#55
Default request	#29	none	
Explicit request	#29	(2)	#87
Default request	#87	none	
Not a CUG request	#87	none	
Explicit request	according to basic call	(3)	other
Default request		none	
Not a CUG request		none	
(1): Error value "incomingCallsBarredWithinCUG" (2): Error value "userNotMemberOfCUG" (3): Error value "basicServiceNotProvided" Cause #29: "Facility rejected" Cause #55: "Incoming calls barred within CUG" Cause #87: "User not member of CUG"			

Annex D (informative): Summary of changes to the first edition

D.1 Technical changes

This revision introduces an annex C for alignment to ETS 300 356-9 (1995) concerning the procedures for informing the calling user in the case of call rejection.

D.2 Editorial changes

All references have been updated to current published versions as appropriate. In particular, the references to ETS 300 102-1 and ETS 300 102-2 have been replaced by references to ETS 300 403-1 and ETS 300 403-2, respectively.

The explicit definition of the coding of cause #87 has been replaced by a reference to ETS 300 485.

The last part of subclause 9.2.4.1 has been clarified and restructured.

Annex E (informative): Bibliography

- ETS 300 137 (1992): "Integrated Services Digital Network; Closed User Group (CUG) supplementary service; Functional capabilities and information flows".
- ETS 300 356-9 (1995): "Integrated Services Digital Network (ISDN); Signalling System No.7; ISDN User Part (ISUP) version 2 for the international interface; Part 9: Closed User Group (CUG) supplementary service [ITU-T Recommendation Q.735, clause 1 (1993), modified]".

History

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