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**DIGITAL SUBSCRIBER SIGNALLING
SYSTEM No. 1**

**INTEGRATED SERVICES DIGITAL NETWORK
(ISDN) – STAGE 3 DESCRIPTION FOR
CHARGING SUPPLEMENTARY SERVICES
USING DSS 1**

Clause 3 – Reverse charging

ITU-T Recommendation Q.956

(Previously “CCITT Recommendation”)

FOREWORD

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ITU-T Recommendation Q.956, clause 3 was prepared by ITU-T Study Group 11 (1993-1996) and was approved under the WTSC Resolution No. 1 procedure on the 17th of October 1995.

NOTE

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

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SUMMARY

This Recommendation defines the operation of the Digital Subscriber Signalling System No. 1 (DSS 1) for the support of the Reverse Charging (REV) Supplementary service at the T or the coincident S and T reference point of the User to Network Interface of the Integrated Services Digital Network (ISDN).

The Reverse Charging supplementary service allows the served user, on a per-call basis, to request at call establishment time or during active phase of the call or at the call clearing, that charging be applied to the called user, or, on a subscription basis, to be charged for all incoming calls.

**INTEGRATED SERVICES DIGITAL NETWORK (ISDN) - STAGE 3
DESCRIPTION
FOR CHARGING SUPPLEMENTARY SERVICES USING DSS 1**

(Geneva, 1995)

3 Reverse Charging

3.1 Scope

This Recommendation specifies the stage three of the Reverse Charging (REV) supplementary for Integrated Services Digital Network (ISDN) at the T reference point or coincident S and T reference point as defined in Recommendation I.411 [1] by means of the Digital Subscriber Signalling System No. 1 (DSS 1). Stage three identifies the protocol procedures and switching functions needed to support a telecommunication service (see Recommendation I.130 [2]).

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

The REV supplementary service is a supplementary service allowing a called user to be charged for the actual communication, that is for usage-based calls.

Four cases of reverse charging are distinguished:

- Case A: Reverse charging requested by the calling user at call set-up time;
- Case B: Reverse charging for the rest of the call requested by the calling user or the called user during the active phase of the call;
- Case C: Reverse charging for the entire call requested by the called user during the active phase of the call;
- Case D: Reverse charging unconditional.

NOTE – The calling user should not be provided with a bearer connection until the option of charging, either normal or reversed has been resolved.

The REV 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 REV supplementary service, to be attached at either side of a T reference point or coincident S and T reference point when used as an access to the public ISDN.

3.2 References

The following 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 currently valid ITU-T Recommendations is regularly published.

- [1] ITU-T Recommendation I.411 (1993), *ISDN user-network interfaces – Reference configurations*.
- [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 of terms for ISDNs*.

- [4] ITU-T Recommendation Q.932 (1993), *Digital Subscriber Signalling System No. 1 (DSS 1) - Generic procedures for the control of ISDN supplementary services.*
- [5] ITU-T Recommendation Q.931 (1993), *Digital Subscriber Signalling System No. 1 (DSS 1) - ISDN user-network interface layer 3 specification for basic call control.*
- [6] CCITT Recommendation X.208 (1988), *Specification of Abstract Syntax Notation One (ASN.1).*
- [7] CCITT Recommendation X.219 (1988), *Remote operations: Model, notation and service definition.*
- [8] ITU-T Recommendation I.210 (1993), *Principles of telecommunication services supported by an ISDN and the means used to describe them.*
- [9] ITU-T Recommendation clause 1/Q.954 (1993), *Stage 3 description for multiparty supplementary services using DSS 1, Clause 1 – Conference Calling.*
- [10] ITU-T Recommendation clause 2/Q.956 (1995), *Stage 3 description for charging supplementary services using DSS 1, Clause 2 – Advice Of Charge (AOC).*
- [11] ITU-T Recommendation clause 4/Q.953 (1995), *ISDN stage 3 description for call completion supplementary services using DSS 1, Clause 4 – Terminal Portability.*
- [12] CCITT Recommendation Z.100 (1988), *Specification and description language.*
- [13] ITU-T Recommendation clause 3/Q.736 (1995), *Stage 3 description for charging supplementary services using Signalling System No. 7, Clause 3 – Reverse charging (REV).*

3.3 Definitions

For the purposes of this Recommendation, the following definitions apply.

3.3.1 basic telecommunication service: A bearer service or teleservice. The term “bearer service” and “teleservice” are defined in 2.2/I.112 [3], definitions 202 and 203.

3.3.2 called user: The called user is the user to whom an incoming call is offered.

3.3.3 calling user: The calling user is the user initiating an outgoing call at the originating interface.

3.3.4 invoke component: See 8.2.3.1.1/Q.932 [4].

3.3.5 network: The DSS 1 protocol entity at the network side of the user-network interface.

3.3.6 no transfer mode: This indicates that the charging function is done at the originating side when the Reverse Charging is invoked.

3.3.7 reject component: See 8.2.3.1.1/Q.932 [4].

3.3.8 return result component: See 8.2.3.1.1/Q.932 [4].

3.3.9 return error component: See 8.2.3.1.1/Q.932 [4].

3.3.10 service; telecommunications service: See 2.2/I.112 [3], definition 201.

3.3.11 supplementary service: See 2.4/I.210 [8].

3.3.12 transfer mode: This indicates that the charging function is done at the destination side when the Reverse Charging is invoked.

3.3.13 user: The DSS 1 protocol entity at the user side of the user-network interface.

3.4 Abbreviations

For the purposes of this Recommendation, the following abbreviations are used.

Fac	Facility information element
INV	Invoke component
Not.ind.	Notification indicator information element

N(R)	“Reverse charging (For the rest of the call)” notification description
N(W)	“Reverse charging (Whole call)” notification description
RE	Return Error component
RR	Return Result component
REV	Reverse Charging
REV-I	REVIndication operation
REV-R	RequestREV operation
REV-T	REV-T-Status operation

3.5 Description

Case A

This supplementary service allows a calling user, on a per-call basis, to request reverse charging at call set-up time and the called user to accept or reject the charges.

If the REV supplementary service request is rejected by either the network or the called user, the call shall be cleared.

When the calling user does not explicitly request reverse charging, the calling user is charged as normal.

In order to use this supplementary service, the calling and the called users need to have the capability to request and accept respectively the REV supplementary service.

Case B

This supplementary service allows a calling and a called user, to request reverse charging during the active phase of the call. When the calling user requests this supplementary service, the called user is allowed to accept or reject the charges.

If the REV supplementary service request is rejected by either the network or the called user, the call remains unaffected.

With this supplementary service, the usage-based charges are charged to the called user from the moment of the acceptance of the request.

In order to use this service, the calling and the called users need to have the capability to request and accept respectively the REV supplementary service if this service is requested by the calling user and the called user, needs to have the capability for requesting the REV supplementary service if this service is requested by the called user.

Case C

This supplementary service allows a called user before disconnection of the call, to request reverse charging for the entire call.

If the REV supplementary service request is rejected, the call remains unaffected.

When a called user does not explicitly request the REV supplementary service, the calling user is charged as normal.

With this supplementary service, the usage-based charges are charged to be called user from the beginning of the call.

In order to use this supplementary service, the called user needs to have the capability for requesting the REV supplementary service.

Case D

This supplementary service allows the called user to be charged for all incoming calls, or all incoming calls for a predefined set of basic service. No user request is required.

3.6 Operational requirements

3.6.1 Provision/withdrawal

The provision of one or more of the Cases A-D is a network option.

The calling user does not need to subscribe to this supplementary service.

This supplementary service is provided either by a called user's subscription or it is generally available.

Call-by-call reverse charging and unconditional reverse charging are performed under the following condition:

- a) Call-by-call reverse charging (Cases A-C). Selection of called user's subscription or generally available is a network matter.
- b) Unconditional reverse charging. Only provision by called user's subscription should be provided, because the called user cannot reject reverse charging in this case.

If the REV supplementary service is provided at a coincident S and T reference point, then it shall be provided on a per ISDN numbers basis.

3.6.2 Requirements on the originating network side

The normal procedures of Recommendation Q.931 [5] apply, the extensions are defined below.

Case A

The originating network shall be able to handle this supplementary service as described in 3.9.2.1.

Case B

The originating network shall be able to handle this supplementary service as described in 3.9.2.2.

Case C

No special requirement exists, except for the calling user notification.

Case D

No special requirement exists, except for the calling user notification.

3.6.3 Requirements on the destination network side

Case A

The destination network shall be able to handle this supplementary service as described in 3.9.2.1.

Case B

The destination network shall be able to handle this supplementary service as described in 3.9.2.2.

Case C

The destination network shall be able to handle this supplementary service as described in 3.9.2.3.

Case D

The destination network shall be able to handle this supplementary service as described in 3.9.2.4.

3.7 Coding requirements

3.7.1 Messages

Depending on the requested REV Case, basic call control messages as well as the FACILITY and the NOTIFY messages may be used for operation of the REV supplementary service.

3.7.2 Additional information elements

3.7.2.1 Coding of the Facility information element

Tables 3-1 and 3-2 show the definition of the operations required for the REV supplementary service using ASN.1 as specified in Recommendation X.208 [6] and using the OPERATION macro as defined in Figure 4/X.219 [7].

The formal definition of the component types to encode these operations is provided in Recommendation Q.932 [4].

The inclusion of components in a Facility information elements is defined in 8.2.3/Q.932 [4].

3.7.2.2 Coding of the Notification indicator information element

The Notification indicator information element is used in Case B (requested by the called user), Case C and Case D for reverse charging notification; the network sends this notification to the calling user. See Table 3-3.

TABLE 3-1/Q.956

**Coding of the facility information element for the REV supplementary service
when provided at the coincident S and T reference point**

```
Reverse-Charging-Service-Operations-and-Errors { ccitt recommendation q 956 reverse-charging (3)
operations-and-errors (1) }

DEFINITIONS ::=
BEGIN
EXPORTS      RequestREV, REVIndication, UserIgnored, REVIAlreadyRunning;
IMPORTS      OPERATION, ERROR
FROM
Remote-Operation-Notation { joint-iso-ccitt remote-operations (4) notation (0) }
userNotSubscribed, rejectedByNetwork, rejectedByUser, notAvailable,
invalidCallState, basicServiceNotProvided,
supplementaryServiceInteractionNotAllowed, resourceUnavailable,
proceduralError,
FROM
General-Error-List { ccitt recommendation q 950 general-error-list (1) };

RequestREV ::= OPERATION
ARGUMENT case Case
RESULT
ERRORS {
userNotSubscribed, rejectedByNetwork, rejectedByUser, notAvailable,
invalidCallState, basicServiceNotProvided,
supplementaryServiceInteractionNotAllowed, resourceUnavailable,
proceduralError, UserIgnored, REVIAlreadyRunning }

REVIndication ::= OPERATION

Case ::= ENUMERATED { caseA(1), caseB(2), caseC(3) }
requestREV RequestREV ::= 60
REVIndication ::= OPERATION
rEVIndication REVIndication ::= 61
UserIgnored ::= ERROR
REVIAlreadyRunning ::= ERROR
userIgnored UserIgnored ::= 45
rEVIAlreadyRunning REVIAlreadyRunning ::= 49
END -- of Reverse-Charging-Service-Operations
```

TABLE 3-2/Q.956

**Coding of the Facility information element for the REV supplementary service
(for interworking with private ISDNs)**

```

Reverse-Charging-Service-Private-Networks-Operation { ccitt recommendation q.956
reverse-charging (3) private-networks-operation (2) }

DEFINITIONS ::=
BEGIN
EXPORTS      REV-T-Status;
IMPORTS      OPERATION, ERROR
FROM
Remote-Operation-Notation { joint-iso-ccitt remote-operations (4) notation (0) };

REV-T-Status ::= OPERATION
ARGUMENT status Status

Status ::= ENUMERATED { wholeCall(1), forTheRestOfTheCall(2) }

rEV-T-Status REV-T-Status ::= 62

END -- of Reverse-Charging-Service-Private-Networks-Operation

```

TABLE 3-3/Q.956

**Codepoint in the Notification indicator information element
for the REV supplementary service**

Notification description (octet 3)	
Bits	
7 6 5 4 3 2 1	
1 1 0 1 1 1 0	Reverse charging (Whole call)
1 1 0 1 1 1 1	Reverse charging (For the rest of the call)

3.8 State definitions

The following states are used in the dynamic description (SDL):

REV idle: The REV supplementary service has not been requested.

REV request: The REV supplementary service request has been made and is waiting for a response.

REV indication: A message with a RequestREV invoke component has been received.

REV active: The REV supplementary service is active, i.e. the REV request has been positively acknowledged by the network.

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

3.9 Signalling procedures at the coincident S and T reference point

3.9.1 Activation/deactivation/registration

Not applicable.

3.9.2 Invocation and operation

3.9.2.1 Case A

3.9.2.1.1 Normal operation

3.9.2.1.1.1 Actions at the originating local exchange

To request REV Case A, the calling user shall send to the network a SETUP message including a RequestREV invoke component indicating Case A in the Facility information element. The originating local exchange, receiving this request in a SETUP message, shall check if this supplementary service can be provided, e.g.:

- supplementary service interaction is allowed (see 3.12);
- Signalling System No. 7 supports this supplementary service.

If these checks are successful, the originating local exchange, forwards this information towards the network side, in association with the basic call request.

3.9.2.1.1.1.1 Reception of REV acceptance

When the originating local exchange receives, from the network, the indication that the call and the REV supplementary service are accepted by the called user, it shall send to the calling user a CONNECT message including the RequestREV return result component in the Facility information element.

The calling user shall not be charged for this call.

If Case D applies at the called side, the originating local exchange receiving this indication from the network, shall send to the calling user in the CONNECT message including, in addition to the RequestREV return result component, the notification description “Reverse charging (whole call)” in the Notification indicator information element (see 3.12.21).

3.9.2.1.1.1.2 Reception of a call release indication

When the originating local exchange receives, from the network, a call release indication, it shall send to the calling user a DISCONNECT message with the Facility and Cause information elements indicating respectively the error (if any) and cause received from the network.

3.9.2.1.1.2 Actions at the destination local exchange

3.9.2.1.1.2.1 Network actions

When the destination local exchange receives, from the network, a call set-up indication including the REV supplementary service request, it shall check (in addition to basic call control procedures):

- the REV Case D does not apply;
- the called user subscription exists (optional).

If these checks are successful, the destination local exchange shall send, to the called user, a SETUP message including a RequestREV invoke component indicating Case A in the Facility information element.

Then, basic call control procedures apply (see clause 5/Q.931 [5]).

3.9.2.1.1.2.1.1 REV and call acceptances

When the destination local exchange receives a CONNECT message with the Facility information element indicating the RequestREV return result component, it shall send this information towards the calling user and the called user shall be charged for this call.

If Case D applies for this call, the destination local exchange shall not send the REV supplementary service request to the called user; and, receiving a CONNECT message from the called user, the destination local exchange shall generate the REV return result component and the REV notification, and send this information to the network in association with the call acceptance indication (see 3.12.21).

3.9.2.1.1.2.1.2 Call or REV refusal

When the destination local exchange receives from the called user, as a result of REV refusal, one or multiple clearing messages with the Facility and Cause information elements indicating an error and a cause it shall send this information towards the calling user.

If multiple clearing messages are received, the network shall retain the Facility information element along with the cause retained, according to 5.2.5.3/Q.931 [5] until the clearing procedures are completed.

If the network retains the Facility information element, the following procedures shall apply. In the event that the cause received from the called user is returned towards the calling user, the associated Facility information element shall also be returned. If there are multiple clearing messages containing causes of equal priority, the first Facility information element contained in the clearing messages shall be sent towards the calling user. If any of the clearing messages with the highest priority causes do not contain the Facility information elements and this cause value is #29 "Facility rejected", the error value "rejectedByUser" shall be sent towards the calling user. If any of the clearing messages with the highest priority causes do not contain a Facility information element and the cause value received from the called user is not #29 "Facility rejected", the error value "basicServiceNotProvided" shall be sent towards the calling user.

3.9.2.1.1.2.2 User actions

If the called user accepts the call and accepts to be charged, it shall send a CONNECT message with the Facility information element indicating the RequestREV return result component.

If the called user does not accept to be charged, it shall send a call clearing message with the Facility and Cause information elements indicating respectively the error value "rejectedByUser" and cause value #29 "Facility rejected".

If the called user does not accept the call, basic call control procedures apply (see 5.2/Q.931 and 5.3/Q.931 [5]).

3.9.2.1.2 Exceptional procedures

The general exceptional procedures are described in 6.3.6/Q.932 [4] and exceptional procedures specific for the REV supplementary service are described below.

3.9.2.1.2.1 Rejection of the request

If the REV supplementary service request is rejected by either the network or the called user, the network shall initiate call clearing procedures in accordance with clause 5/Q.931 [5], the DISCONNECT message sent to the calling user shall include one of the following RequestREV return error values in the Facility information element and one of the following Cause values:

i) Rejection by the network

- If the network supports but cannot provide this supplementary service (e.g. in case of limited signalling capability); the first clearing message sent by the network to the calling user shall include the error value "resourceUnavailable" and the Cause value #29 "Facility rejected".
- If the called user subscription option is not met; the DISCONNECT message sent by the network to the calling user shall include the error value "userNotSubscribed" and the Cause value #29 "Facility rejected".
- If supplementary service interaction is not allowed (e.g. the calling user requesting the REV supplementary service and the CONF supplementary service in the SETUP message, see 3.12), the DISCONNECT message sent to the calling user shall include the error value "supplementaryServiceInteractionNotAllowed" and the Cause value #29 "Facility rejected".

ii) Rejection by the called user

- If the called user accepts the call but ignores the REV supplementary service request and does not include the REV return result component in the CONNECT message (selected for the call), the network shall send to the calling user, a DISCONNECT message including the error value "userIgnored" and Cause value #29 "Facility rejected".

- If the called user accepts the call but rejects the REV supplementary service request by sending a REV supplementary service return error component or reject component, the DISCONNECT message sent by the network to the calling user shall include the same error value and Cause value #29 “Facility rejected” if the error value is correct for the REV supplementary service, and if the called user returns a wrong return error value for the REV supplementary service or reject component, the DISCONNECT message sent by the network to the calling user shall include the error value “notAvailable” and Cause value #29 “Facility rejected”.

In both cases the network shall also send, to the called user, a call clearing message according to 5.3/Q.931 [5] including Cause value #29 “Facility rejected”.

3.9.2.1.2.2 Rejection of the call

If the call itself is not accepted by either the network or the called user:

- at the called user-network interface, basic call control procedures apply. The DISCONNECT message sent to the calling user shall include the error value “basicServiceNotProvided” and the Cause in accordance with basic call control procedures (see clause 5/Q.931 [5]);
- at the calling user-network interface, if the network is able to distinguish between call rejection and REV rejection, the first clearing message sent by the network to the calling user shall include the error value “basicServiceNotProvided” and a Cause in accordance with basic call control procedures (see clause 5/Q.931 [5]).

After this sequence, basic call control clearing procedures apply (see clause 5/Q.931 [5]).

3.9.2.1.2.3 Other exceptional procedures

If the network receives the RequestREV invoke component indicating Case A in any message other than the SETUP message, the network shall send the error value “proceduralError” to the user in an appropriate message.

If the called user sends a call clearing message without the REV supplementary service acceptance or rejection and if the cause value is #29 “Facility rejected”, the network sends the error value “rejectedByUser” to the calling user.

If the called user sends a call clearing message without the REV supplementary service acceptance or rejection and if the cause value is not #29 “Facility rejected”, the network sends the error value “basicServiceNotProvided” to the calling user.

If the called user sends the return result component in any messages except the CONNECT message to the network, the message shall be discarded and the call shall proceed.

If the called user sends the return error component in any messages other than in call clearing messages or in the CONNECT message, the message shall be discarded and the call shall proceed.

If the called user sends the reject component in any messages other than the RELEASE COMPLETE message or the CONNECT message, the message shall be discarded and the call shall proceed.

3.9.2.2 Case B

3.9.2.2.1 Request by the calling user

3.9.2.2.1.1 Normal operation

3.9.2.2.1.1.1 Actions at the originating local exchange

To request REV Case B, the calling user, being in the Active state, shall send to the network a FACILITY message including a RequestREV invoke component indicating Case B in the Facility information element.

The originating local exchange, receiving this request in a FACILITY message, shall check if this supplementary service can be provided, e.g.:

- the call is in the Active state;
- supplementary service interaction is allowed (see 3.12);
- Signalling System No. 7 supports this supplementary service;
- REV is not running.

If these checks are successful, the originating local exchange forwards this information towards the network side.

3.9.2.2.1.1.1.1 Reception of REV acceptance

When the originating local exchange receives, from the network, the indication that, the REV supplementary service request is accepted by the called user, it shall:

- stop charging to the calling user;
- accumulate charging for the rest of the call to the called user (if the network applies non-transfer mode);
- send to the calling user a FACILITY message including the RequestREV return result component in the Facility information element.

3.9.2.2.1.1.1.2 Reception of REV refusal

When the originating local exchange receives, from the network, the indication that the REV supplementary service is refused; it shall send to the calling user a FACILITY message with the Facility information element indicating the error received from the network. The call remains unaffected.

3.9.2.2.1.1.2 Actions at the destination local exchange

3.9.2.2.1.1.2.1 Network actions

When the destination local exchange receives a REV request from the calling user, it shall check if:

- the call is in the Active state;
- a called user subscription exists (optional).

If these checks are met, the destination local exchange shall send to the called user a FACILITY message including a RequestREV invoke component indicating Case B in the Facility information element and it starts the timer “REV ignore (T-rev)”.

3.9.2.2.1.1.2.1.1 REV acceptance

When the destination local exchange receives, a FACILITY message including, in the Facility information element, the RequestREV return result component, while the timer T-rev is still running, it shall:

- charge for the rest of this call to the called user (if the network applies transfer mode);
- subsequently transmit this information to the network;
- stop the timer T-rev.

3.9.2.2.1.1.2.1.2 REV refusal

When the destination local exchange receives a FACILITY message including, in the Facility information element, a REV return error component, while the timer T-rev is still running, it shall:

- subsequently transmit this information to the network;
- stop the timer T-rev.

The call remains unaffected.

3.9.2.2.1.1.2.2 User actions

If the called user accepts to be charged, it shall send a FACILITY message with the Facility information element indicating the RequestREV return result component.

If the called user does not accept to be charged, it shall send a call clearing message with the Facility and Cause information elements indicating respectively the error value “rejectedByUser” and cause value #29 “Facility rejected”.

3.9.2.2.1.2 Exceptional procedures

The general exceptional procedures are described in 6.3.6/Q.932 [4] and exceptional procedures specific for the REV supplementary service are described below.

If the REV supplementary service request is rejected by either the network or the called user, the existing call remains unaffected and the calling user is charged continuously; the FACILITY message returned to the calling user shall include one of the following RequestREV return error values in the Facility information element:

i) *Rejection by the network*

- If the network supports but cannot provide this supplementary service (e.g. in case of limited signalling capability); the FACILITY messages sent to the calling user shall include the error value “resourceUnavailable”.
- If the called user subscription option is not met; the FACILITY message sent to the calling user shall include the error value “userNotSubscribed”.
- If, at the originating or destination network side of the interface, the call is not in the Active state; the FACILITY message sent to the calling user shall include the error value “invalidCallState”.
- If supplementary service interaction is not allowed (e.g. the calling user requesting the REV supplementary service is the controller of a conference, see 3.12); the FACILITY message sent to the calling user shall include the error value “supplementaryServiceInteractionNotAllowed”.
- If the REV supplementary service is already running; the FACILITY message sent to the calling user shall include the error value “rEVIsAlreadyRunning”.

NOTE – If the REV supplementary service is already running, the network may optionally include the notification description “Reverse charging (Whole call)” or “Reverse charging (For the rest of the call)” in the Notification indicator information element.

ii) *Ignorance or rejection by the user*

- If the network timer “REV ignore (T-rev)” expires; the FACILITY message sent by the network to the calling user shall include the error value “userIgnored”.
- If, after having sent the FACILITY message to the called user, the destination network receives from that user a REV return error component or reject component; the FACILITY message sent to the calling user shall include the same error value if the error value is correct for the REV supplementary service, and if the called user returns a wrong return error value for the REV supplementary service or reject component, the FACILITY message sent to the calling user shall include the error value “notAvailable”.

If the originating network receives the RequestREV invoke component indicating Case B in any message other than the FACILITY message, the network shall send the error value “proceduralError” to the calling user in appropriate message.

3.9.2.2.2 Request by the called user

3.9.2.2.2.1 Normal operation

3.9.2.2.2.1.1 Actions at the originating local exchange

When the originating local exchange receives, from the network, the indication that REV Case B applies at the called side, it shall:

- stop charging the calling user;
- accumulate charging for the rest of the call to the called user (if the network applies non-transfer mode);
- send to the calling user a NOTIFY message including the notification description “Reverse charging (For the rest of the call)” in the Notification indicator information element;
- return to the network the REV confirmation (see clause 3/Q.736 [13]).

3.9.2.2.2.1.2 Actions at the destination local exchange

To request Case B, the called user, being in the Active state of the call, shall send to the network a FACILITY message with a RequestREV invoke component indicating Case B in the Facility information element.

The destination local exchange receiving this request shall check, if:

- the REV supplementary service is not running;
- the call is in the Active state;
- a called user subscription exists (optional);
- network signalling capability are met;
- supplementary service interaction is allowed.

If these checks are successful, the destination local exchange shall transmit this request to the network; and, at the receipt of a REV network confirmation, the destination local exchange shall:

- charge for the rest of this call to the called user (if the network applies transfer mode);
- return to the called user a FACILITY message including a RequestREV return result component in the Facility information element.

3.9.2.2.2 Exceptional procedures

The general exceptional procedures are described in 6.3.6/Q.932 [4] and exceptional procedures specific for the REV supplementary service are described below.

If the REV supplementary service request is rejected by the network, the existing call remains unaffected and the calling user is charged continuously; the FACILITY message returned to the called user shall include one of the following RequestREV return error value in the Facility information element:

- if the network supports but cannot provide this supplementary service (e.g. in case of limited signalling capability); the FACILITY message sent to the called user shall include the error value “resourceUnavailable”;
- if the called user subscription option is not met; the FACILITY message sent to the called user shall include the error value “userNotSubscribed”;
- if, at the destination network side of the interface, the call is not in the Active state, the FACILITY message sent to the called user shall include the error value “invalidCallState”;
- if supplementary service interaction is not allowed (e.g. the called user requesting the REV supplementary service is the controller of a conference, see 3.12); the FACILITY message sent to the called user shall include the error value “supplementaryServiceInteractionNotAllowed”;
- if the REV supplementary service is already running; the FACILITY message sent to the called user shall include the error value “rEVIsAlreadyRunning”.

NOTE – If the REV supplementary service is already running, the network may optionally include the notification description “Reverse charging (Whole call)” or “Reverse charging (For the rest of the call)” in the Notification indicator information element.

If the destination network receives the RequestREV invoke component indicating Case B in any message other than the FACILITY message, the network shall send the error value “proceduralError” to the called user in an appropriate message.

3.9.2.3 Case C

3.9.2.3.1 Normal operation

3.9.2.3.1.1 Actions at the originating local exchange

When the originating local exchange receives, from the network, the indication that REV Case C applies at the called side, it shall:

- reverse all usage-based charges from the calling to the called user;
- send to the calling user a NOTIFY message including the notification description “Reverse charging (Whole call)” in the Notification indicator information element;
- return to the network the REV confirmation (see clause 3/Q.736 [13]).

The calling user shall not be charged for this call.

3.9.2.3.1.2 Actions at the destination local exchange

To request REV Case C, the called user, being in the Active state of the call, shall send to the network a FACILITY message with a RequestREV invoke component indicating Case C in the Facility information element.

The destination local exchange receiving this request shall check, if:

- the REV supplementary service is not running;
- the call is in the Active state;
- a called user subscription exists (optional);
- Signalling System No. 7 supports this supplementary service;
- supplementary service interaction is allowed.

If these checks are successful, the destination local exchange shall transmit this request to the network, and at the receipt of a REV network confirmation, the destination local exchange shall:

- charge all usage-based charges on this call to the called user (if the network applies transfer mode);
- return to the called user a FACILITY message including a RequestREV return result component in the Facility information element.

3.9.2.3.2 Exceptional procedures

The general exceptional procedures are described in 6.3.6/Q.932 [4] and exceptional procedures specific for the REV supplementary service are described below.

If the REV supplementary service request is rejected by the network, the existing call remains unaffected and the calling user is charged continuously; the FACILITY message returned to the called user shall include one of the following RequestREV return error value in the Facility information element:

- if the network supports but cannot provide this supplementary service (e.g. in case of limited signalling capability); the FACILITY message sent to the called user shall include the error value “resourceUnavailable”;
- if the called user subscription option is not met; the FACILITY message sent to the called user shall include the error value “userNotSubscribed”;
- if, at the destination network side of the interface, the call is not in the Active state, the FACILITY message sent to the called user shall include the error value “invalidCallState”;
- if supplementary service interaction is not allowed (e.g. the called user requesting the REV supplementary service is the controller of a conference, see 3.12); the FACILITY message sent to the called user shall include the error value “supplementaryServiceInteractionNotAllowed”;
- if the REV supplementary service is already running; the FACILITY message sent to the called user shall include the error value “rEVIAlreadyRunning”.

NOTE – If the REV supplementary service is already running, the network may optionally include the notification description “Reverse charging (Whole call)” or “Reverse charging (For the rest of the call)” in the Notification indicator information element.

If the network receives the RequestREV invoke component indicating Case C in any message other than the FACILITY message, the network shall send the error value “proceduralError” to the user in an appropriate message.

3.9.2.4 Case D

3.9.2.4.1 Normal operation

3.9.2.4.1.1 Actions at the originating local exchange

When the originating local exchange receives, from the network, the indication, in association to the call acceptance, that the REV supplementary service applies at the called side, it shall include in the CONNECT message sent to the calling user, the Notification indicator information element indicating the notification description “Reverse charging (Whole call)”.

The calling user shall not be charged for this call.

3.9.2.4.1.2 Actions at the destination local exchange

When a call is addressed to a user who has subscribed to this supplementary service, the network shall check if reverse charging shall be associated with that call (depending on the subscription option, the REV supplementary service applies for all services or only for some of them) and if this applies, it shall:

- send to the called user a SETUP message including a REVIndication invoke component in the Facility information element;
- transmit to the network the REV indication;
- proceed with normal call control procedures, with the particularity that this call is charged to the called user.

3.9.2.4.2 Exceptional procedures

The general exceptional procedures are described in 6.3.6/Q.932 [4] and exceptional procedures specific for the REV supplementary service are not identified.

3.10 Procedures at T reference point for Interworking with private ISDNs

Procedures defined in 3.9 apply with the exceptions described below.

When the originating local exchange receives, from the network, the indication that REV Case B or Case C applies at the called side, it shall send to the private ISDN the FACILITY message including the REV-T-Status (for the rest of the call/whole call) invoke component in the Facility information element instead of the NOTIFY message including the Reverse charging (for the rest of the call/whole call) notification in the Notification indicator information element.

When the originating local exchange receives, from the network, the indication, in association to the call acceptance, that REV Case D applies at the called side, it shall send to the private ISDN the CONNECT message including the REV-T-Status (whole call) invoke component in the Facility information element instead of the Reverse charging (whole call) notification in the Notification information element.

3.11 Interaction with other networks

3.11.1 Interaction with non ISDNs

When the REV supplementary service request fails at a gateway to a network that does not support the REV supplementary service:

- for Case A, the DISCONNECT message return to the calling user shall include the error value “rejectedByNetwork” and Cause value #29 “Facility rejected”;
- for Case B, the FACILITY message return to the calling or called user shall include the error value “rejectedByNetwork”;
- for Case C, the FACILITY message return to the called user shall include the error value “rejectedByNetwork”;
- for Case D, no DSS 1 impact.

When a REV notification (for Case B, Case C or Case D) fails at a gateway to a network that does not support the REV notification, no information is sent to the called user.

3.12 Interaction with (other) supplementary services

3.12.1 Call Waiting

No impact.

3.12.2 Call Transfer

No applicable interaction at this time.

3.12.3 Connected Line Identification Presentation

No impact.

3.12.4 Connected Line Identification Restriction

No impact.

3.12.5 Calling Line Identification Presentation

No impact.

3.12.6 Calling Line Identification Restriction

No impact.

3.12.7 Closed User Group

No impact.

3.12.8 Conference Calling

3.12.8.1 REV is requested by the conference controller

For REV Case A and Case D no impact.

For REV Case B and Case C, if the network receives from the conference controller a REV request, it shall reject this request with return error value “supplementaryServiceInteractionNotAllowed” as described in 3.9.2.2.2.2 (Case B) and 3.9.2.3.2 (Case C) respectively.

3.12.8.2 REV is requested by a conferee

See clause 1/Q.954 [9].

3.12.9 Direct-Dialling-In

No impact.

3.12.10 Call Diversion

3.12.10.1 REV is requested by the call calling user (user A, leg A → B1)

- Case A

If REV Case A is requested by the calling user of a diverted call, the network shall reject this request as described in 3.9.2.1.2.1 unless:

- REV Case D applies at the served user of the call diversion supplementary service;
- the network has been informed by the served user of the call diversion supplementary service that the charge transfer is allowed as described in 3.9.2.4.1.2.

- Case B

If REV Case B is requested by the calling user of a diverted call, the network shall reject this request as described in 3.9.2.2.1.2.

- Case C and Case D

Not applicable.

3.12.10.2 REV is requested by the served user of the call diversion supplementary service

- Case A, Case B and Case C

Not applicable.

- Case D

No impact (REV applies to the A → B1 and/or Bm-1 → Bm legs).

3.12.10.3 REV is requested by the forwarded-to user

- Case A, Case B (requested by the calling user)
Not applicable.
- Case B (requested by the called user), Case C and Case D
No impact (REV applies to the Bm → C leg).

3.12.11 Line Hunting

No impact.

3.12.12 Three-Party Service

No impact.

3.12.13 User-to-User Signalling

REV Case A: UUI is charged to the called user.

REV Case B: Before the REV acceptance, UUI is based on normal charging principle. After the acceptance, UUI is charged to the called user.

REV Case C: UUI is charged to the called user.

REV Case D: UUI is charged to the called user.

3.12.14 Multiple Subscriber Number

No impact.

3.12.15 Call hold

No impact.

3.12.16 Advice-of-charge

See clause 2/Q.956 [10].

3.12.17 Sub-addressing

No impact.

3.12.18 Terminal Portability

See clause 4/Q.953 [11].

3.12.19 Completion of Calls to Busy Subscriber

For further study.

3.12.20 Malicious Call Identification

No applicable interaction at this time.

3.12.21 Reverse charging

3.12.21.1 Case A

If REV Case A is requested by the calling user while REV Case D applies; the REV Case A request is not presented to the called user and the calling user shall receive a CONNECT message including the RequestREV return result component in the Facility information element and the notification description “Reverse charging (Whole call)” in the Notification indicator information element.

3.12.21.2 Case B

If REV Case B is requested by the calling user while other REV Cases (Case A, Case B, Case C or Case D) applies; the REV Case B request is not presented to the called user and the calling user shall receive a FACILITY message including the error value “rEVIsAlreadyRunning”, and in addition, the network may optionally include the notification description “Reverse charging (Whole call)” or “Reverse charging (For the rest of the call)” in the Notification indicator information element.

The REV supplementary service request collision occurs when the calling user requests REV Case B and the called user requests Case C at the same time. Then the following procedures apply:

- If this collision occurs at the user-network interface of the calling user or in the network, the REV Case B request is not presented to the called user and the calling user shall receive a FACILITY message including the error value “rEVIsAlreadyRunning”, and in addition, the network includes the notification description “Reverse charging (Whole call)” in the Notification indicator information element.
- If this collision occurs at the user-network interface of the called user, the REV Case B request is not affected by this collision and the network shall return a FACILITY message including the error value “rEVIsAlreadyRunning” to the called user.

If REV Case B is requested by the called user while other REV Cases (Case A, Case B, Case C or Case D) apply: the network shall return a FACILITY message including the error value “rEVIsAlreadyRunning” to the called user, and in addition, the network may optionally include the notification description “Reverse charging (Whole call)” or “Reverse charging (For the rest of the call)” in the Notification indicator information element.

3.12.21.3 Case C

If REV Case C is requested by the called user while other REV Cases (Case A, Case B, Case C or Case D) applies: the network shall return a FACILITY message including the error value “rEVIsAlreadyRunning” to the called user, and in addition, the network may optionally include the notification description “Reverse charging (Whole call)” or “Reverse charging (For the rest of the call)” in the Notification indicator information element.

3.12.21.4 Case D

See 3.12.21.1, 3.12.21.2 and 3.12.21.3.

3.12.22 Multi-Level Precedence and Preemption

No impact.

3.13 Parameter values

For Case B, the network shall implement the REV ignore timer (T-rev). This timer is started when the network sends to the called user the FACILITY message carrying the REV operation invoke component and it is stopped when a FACILITY message is received from the called user carrying the REV operation return result component or the REV operation return error component. If timer T-rev expires (default value: 15 seconds) the procedures defined in 3.9.2.2.1.2 follow.

3.14 Dynamic description (SDLs)

The SDL description in Figures 3-1 to 3-16 is based on the model of protocol control and call control as defined in Recommendation Q.931 [5]. Where there is an ambiguity in the text 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 the Recommendation Z.100 [12].

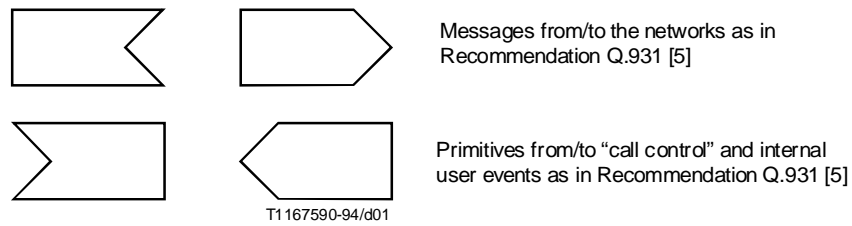


FIGURE 3-1/Q.956
REV calling user side process SDL

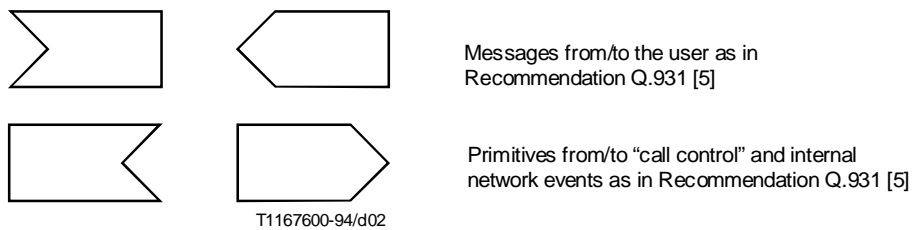


FIGURE 3-2/Q.956
REV originating network side process SDL

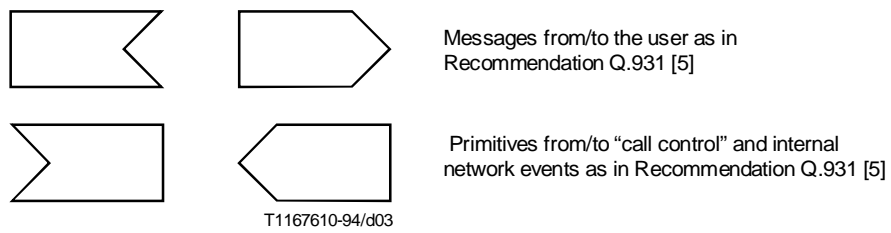


FIGURE 3-3/Q.956
REV destination network side process SDL

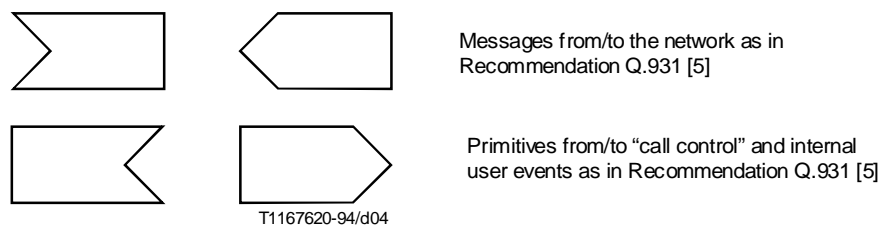
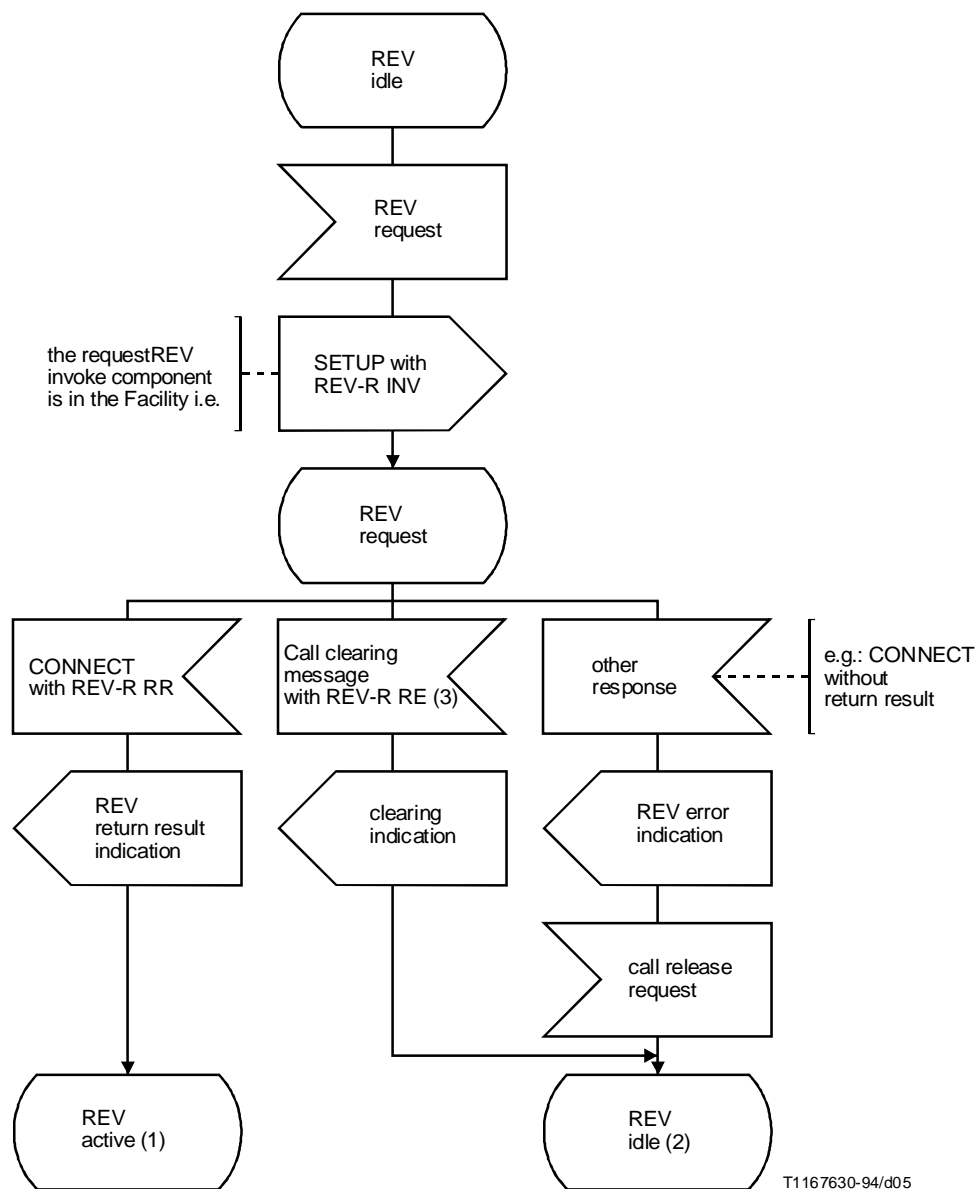
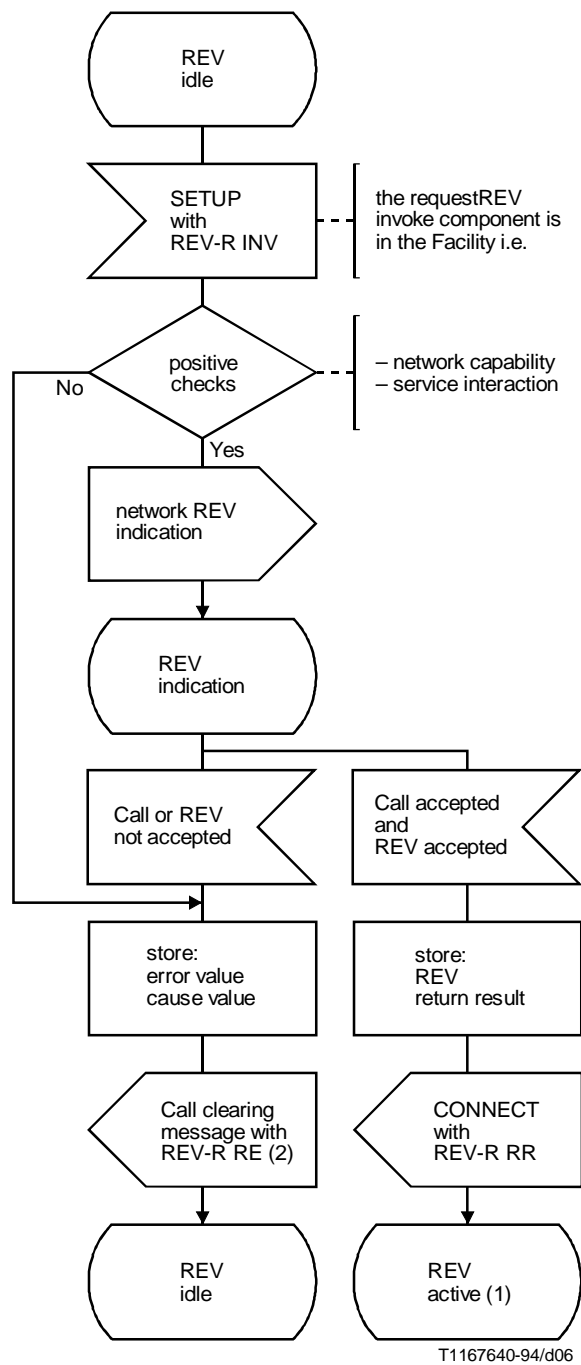


FIGURE 3-4/Q.956
REV called user side process SDL



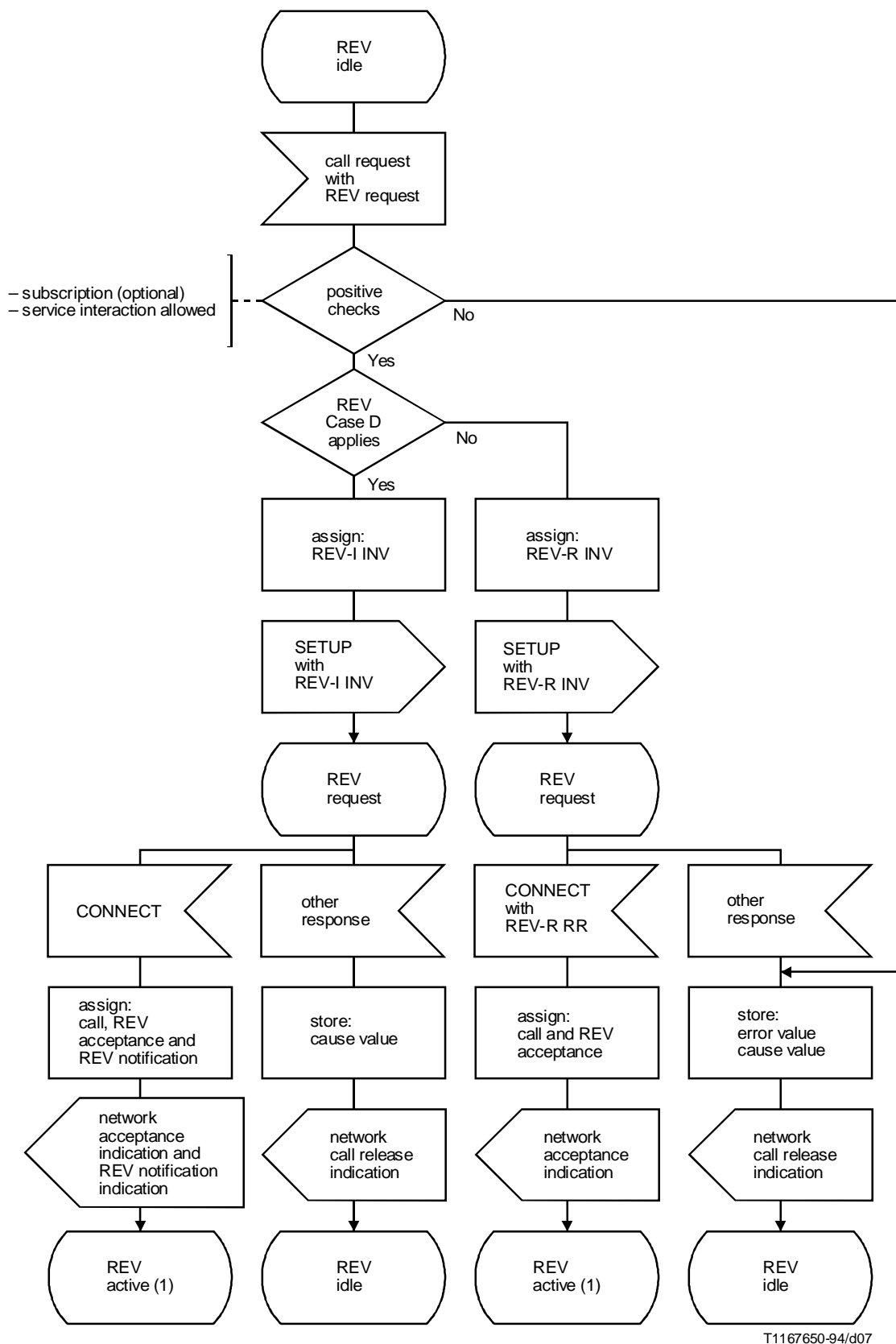
- (1) REV becomes idle when the call is released.
- (2) Normal call clearing procedures shall apply.
- (3) The call clearing message may or may not contain a return error or reject component.

FIGURE 3-5/Q.956
Case A calling user side SDL



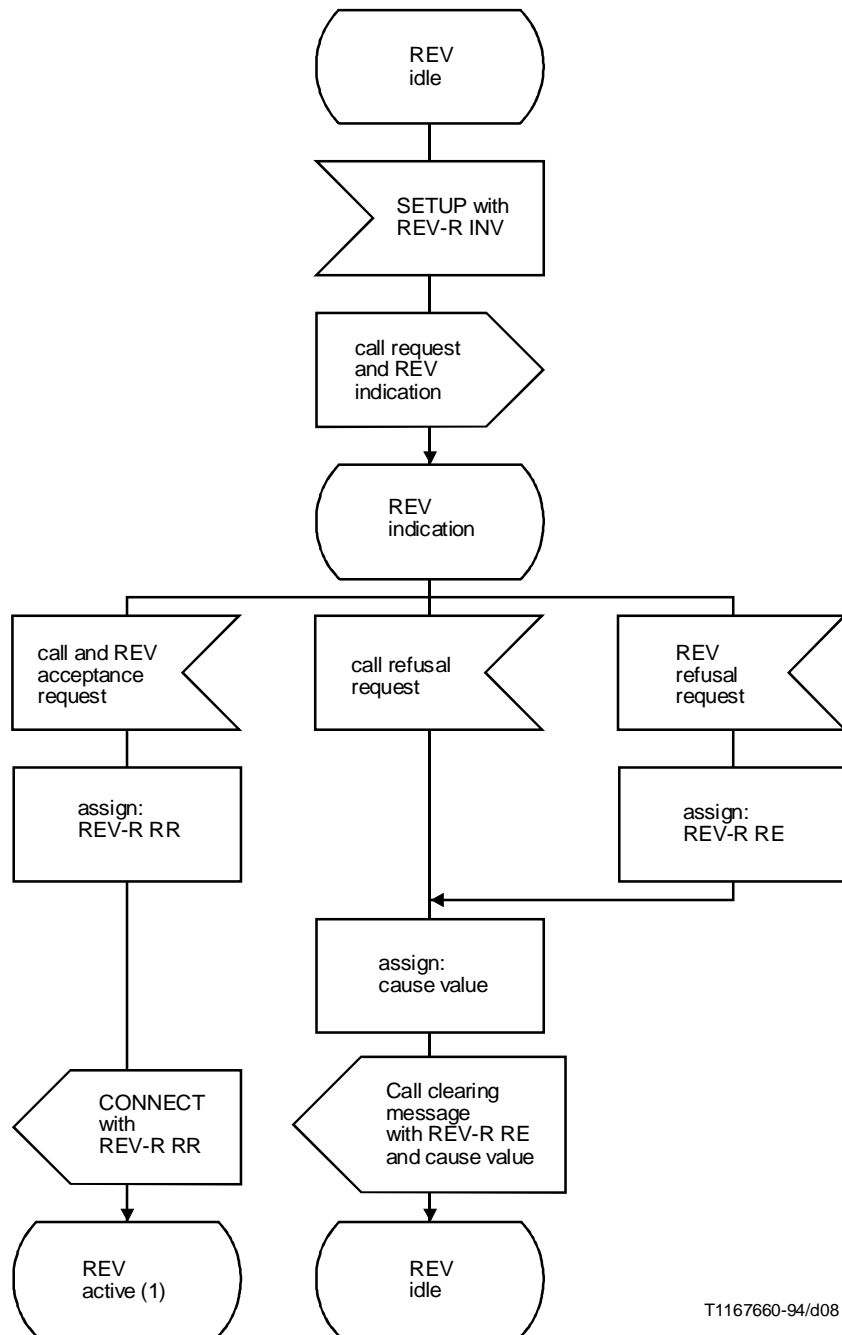
- (1) REV becomes idle when the call is released.
- (3) The call clearing message may or may not contain the Facility information element.

FIGURE 3-6/Q.956
Case A originating network side SDL



(1) REV becomes idle when the call is released.

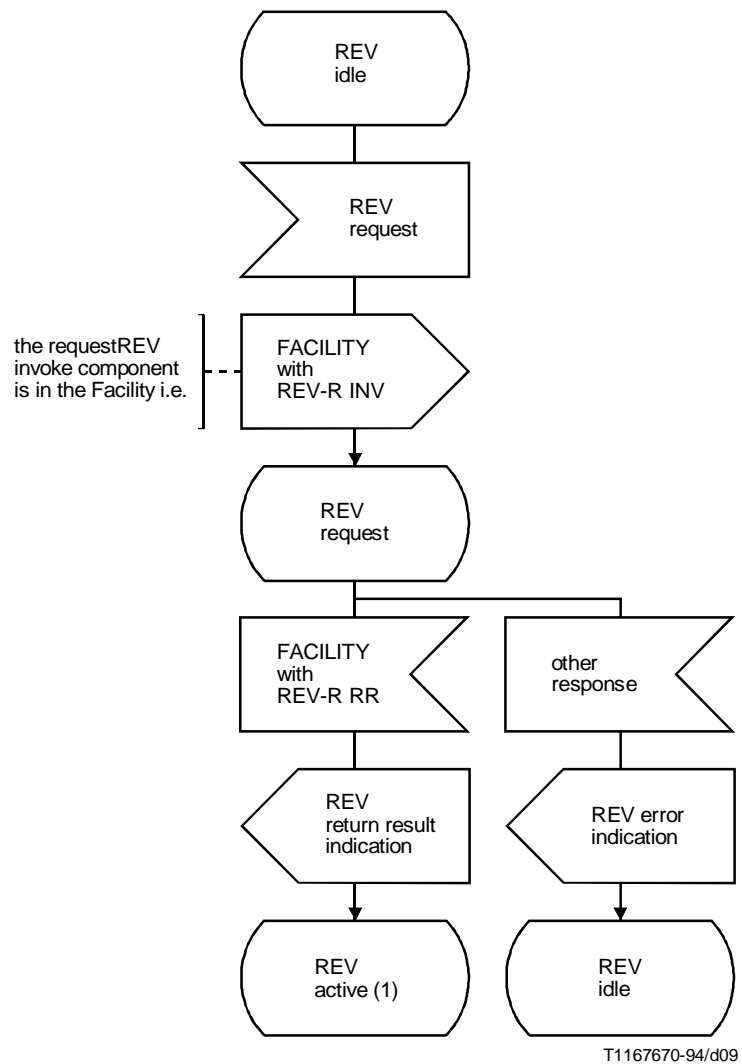
FIGURE 3-7/Q.956
Case A destination network side SDL



T1167660-94/d08

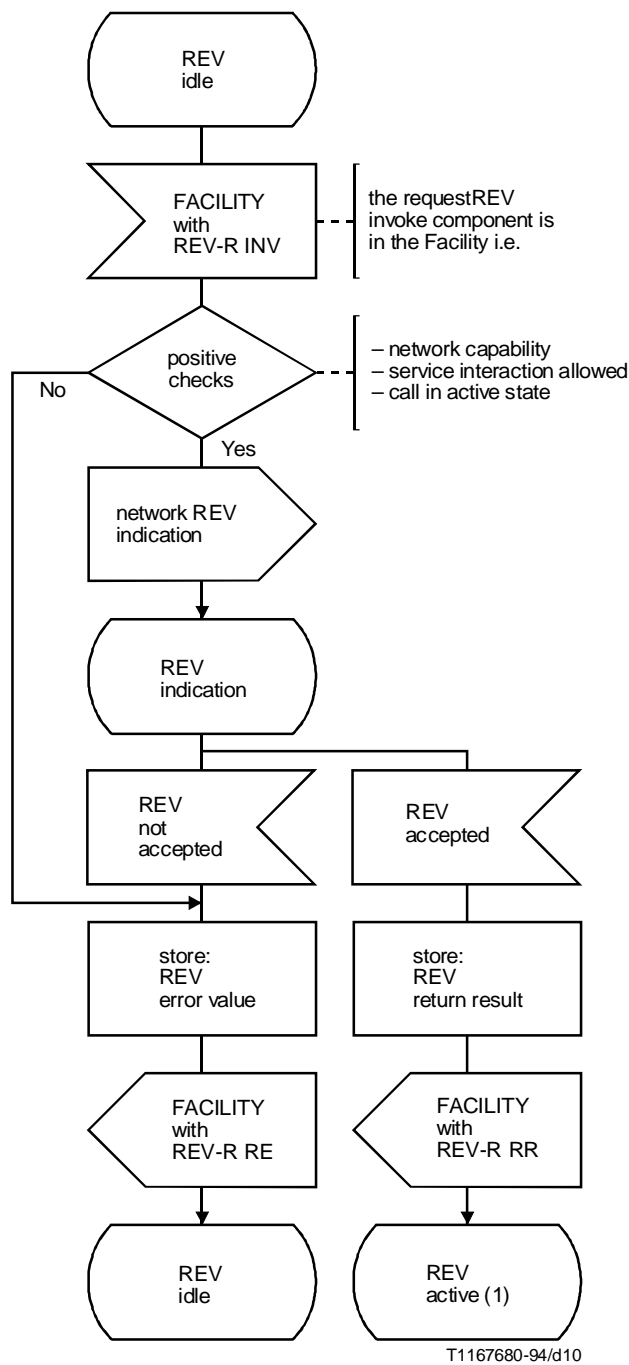
(1) REV becomes idle when the call is released.

FIGURE 3-8/Q.956
Case A called user side SDL



(1) REV becomes idle when the call is released.

FIGURE 3-9/Q.956
Case B (requested by the calling user) calling user side SDL



(1) REV becomes idle when the call is released.

FIGURE 3-10/Q.956
Case B (requested by the calling user) originating network side SDL

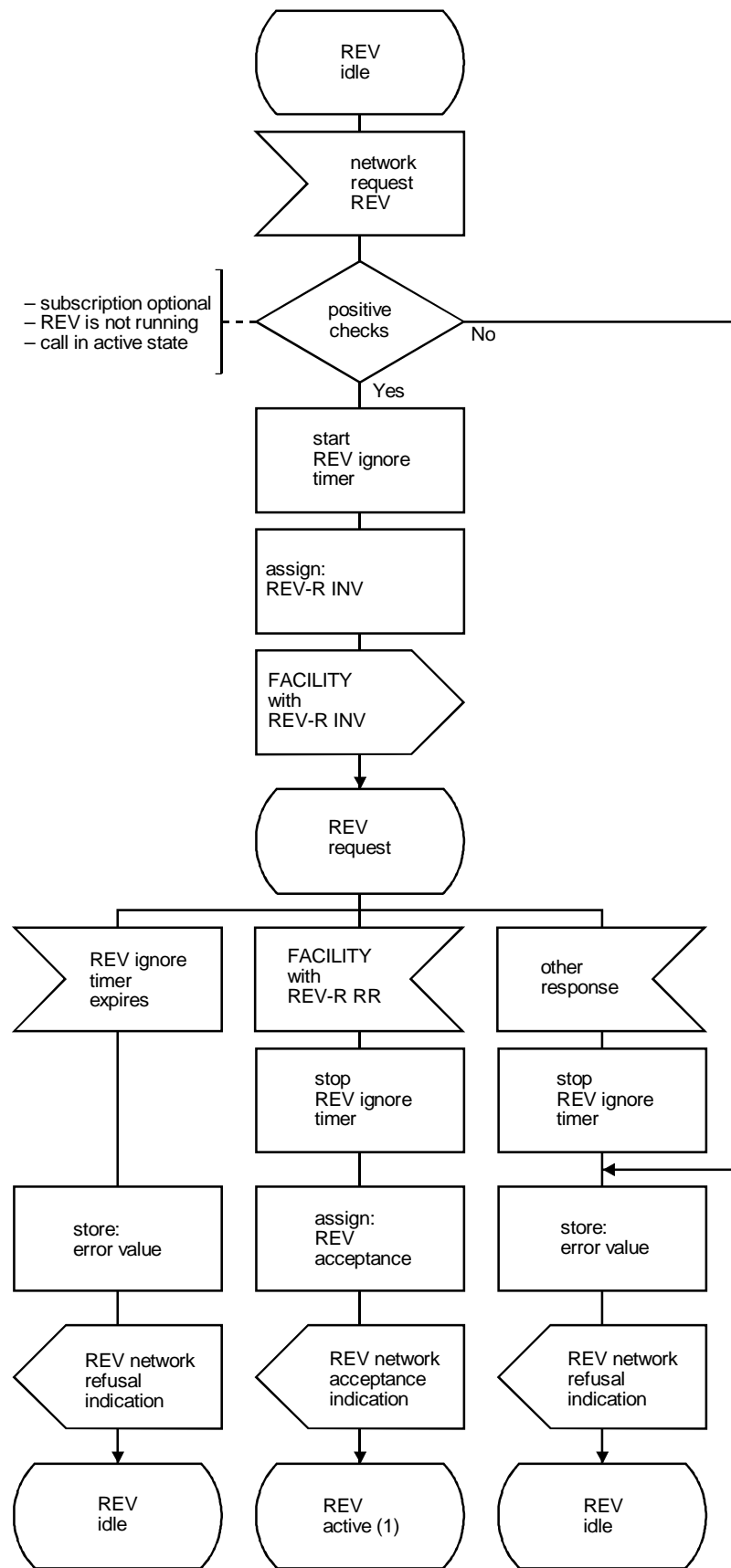
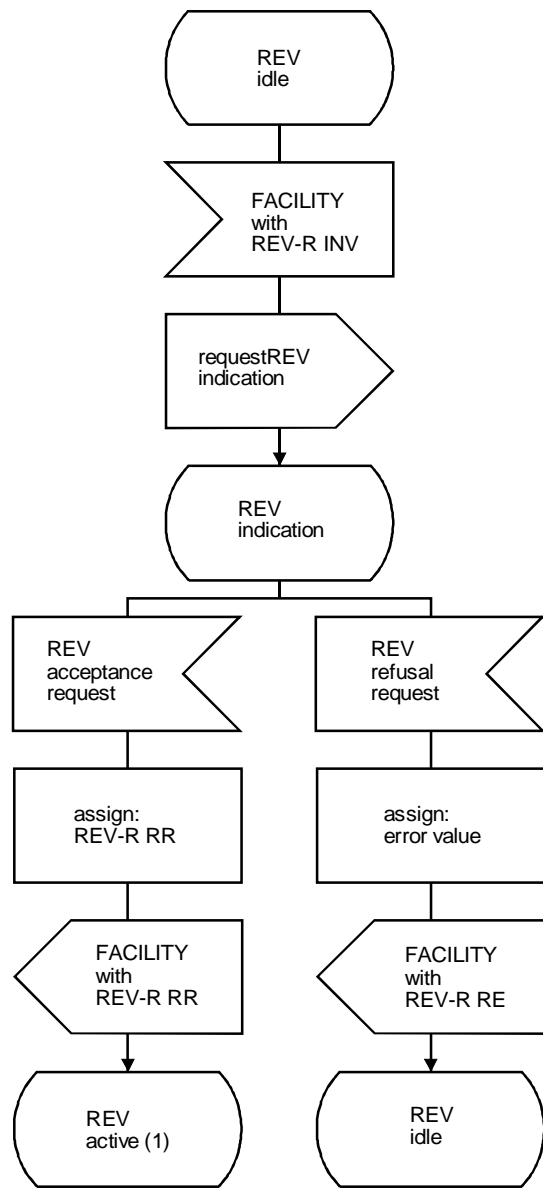


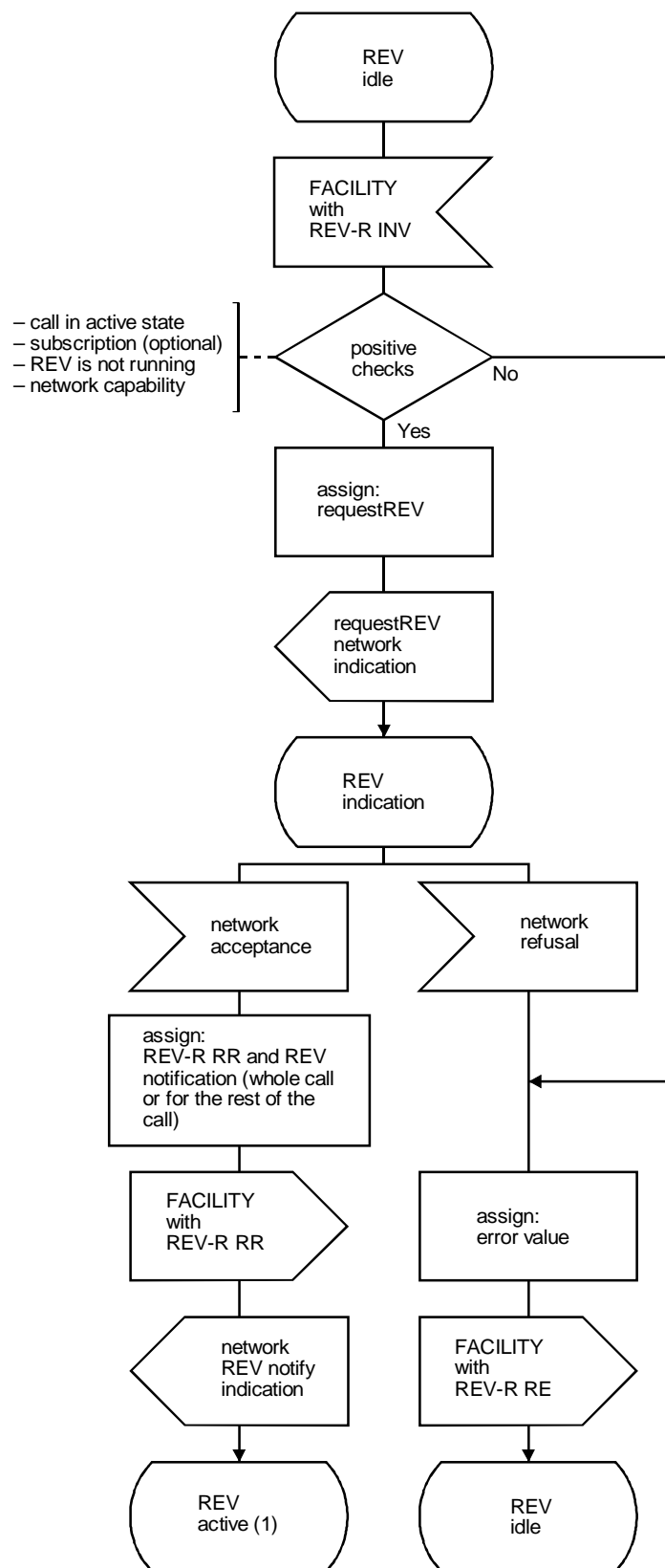
FIGURE 3-11/Q.956
Case B (requested by the calling user) destination network side SDL



T1167700-94/d12

(1) REV becomes idle when the call is released.

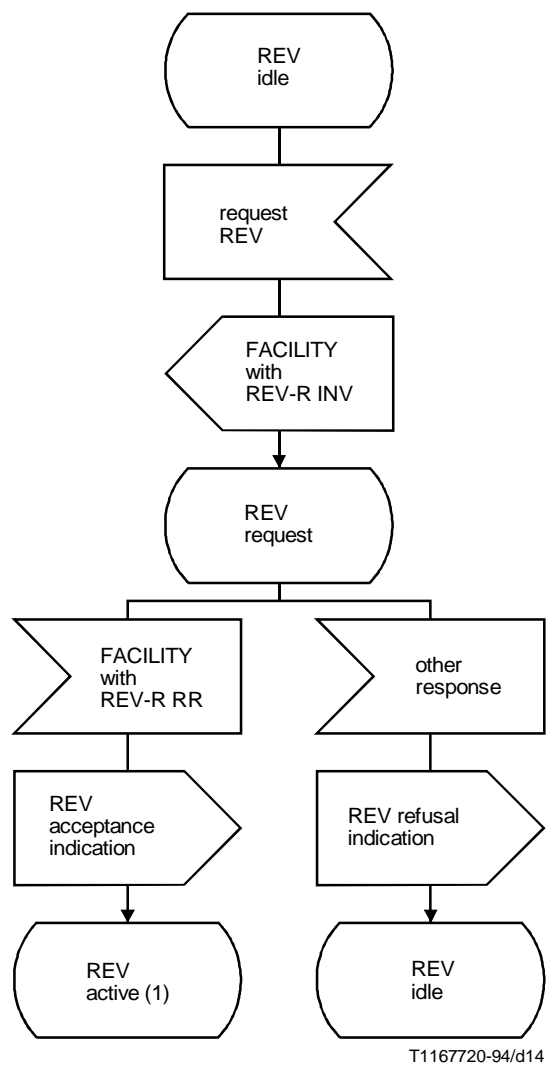
FIGURE 3-12/Q.956
Case B (requested by the calling user) called user side SDL



T1167710-94/d13

(1) REV becomes idle when the call is released.

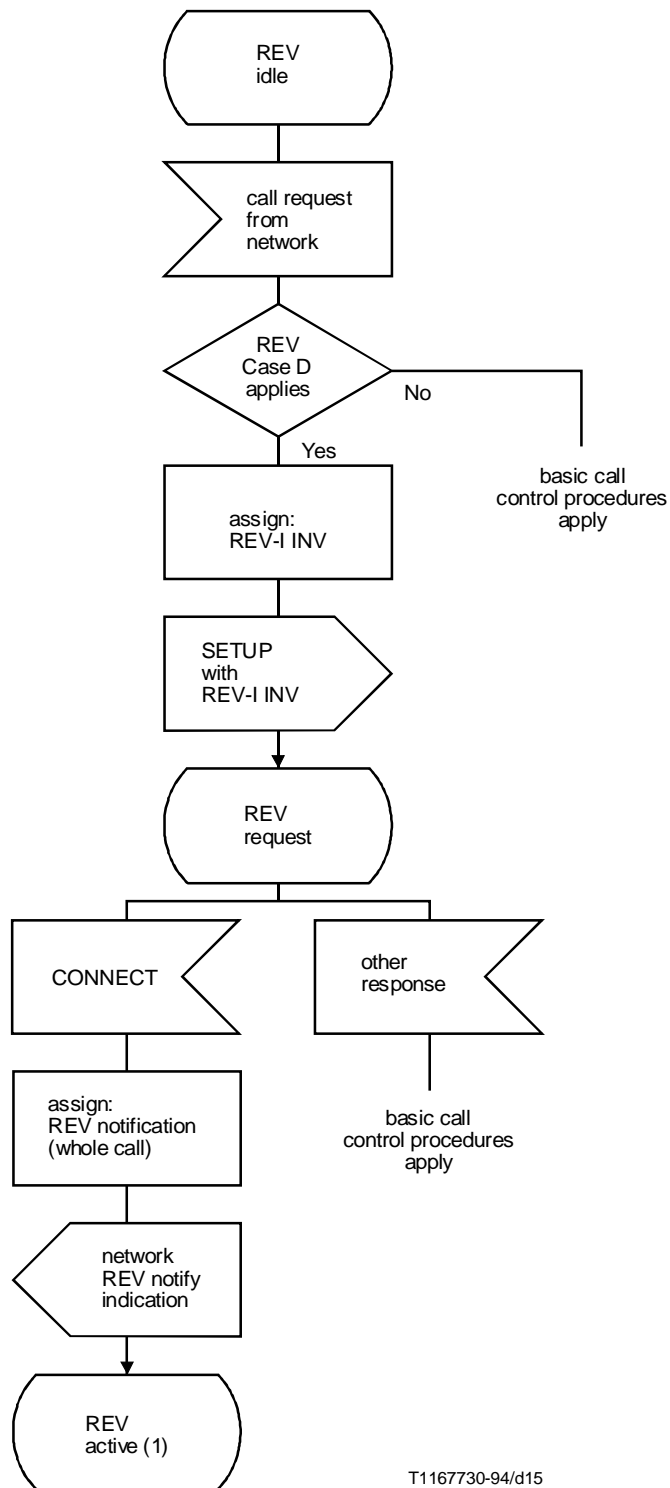
FIGURE 3-13/Q.956
Case B (requested by the called user) and Case C destination network side SDL



T1167720-94/d14

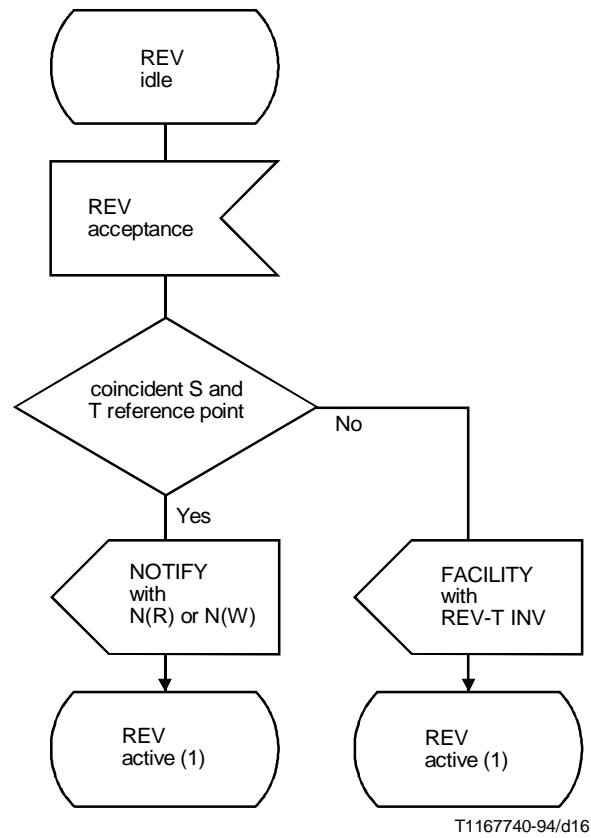
(1) REV becomes idle when the call is released.

FIGURE 3-14/Q.956
Case B (requested by the called user) and Case C called user side SDL



(1) REV becomes idle when the call is released.

FIGURE 3-15/Q.956
Case D destination network side SDL



(1) REV becomes idle when the call is released.

FIGURE 3-16/Q.956
**Case B (requested by the called user),
Case C and Case D originating network side SDL**

Appendix I

Information flows

(This appendix does not form an integral part of this Recommendation)

The examples in Figures 3-I.1 to 3-I.6 show, in general, only the messages which convey REV supplementary service information and their REV supplementary service related contents. Otherwise, basic call control procedure shall apply.

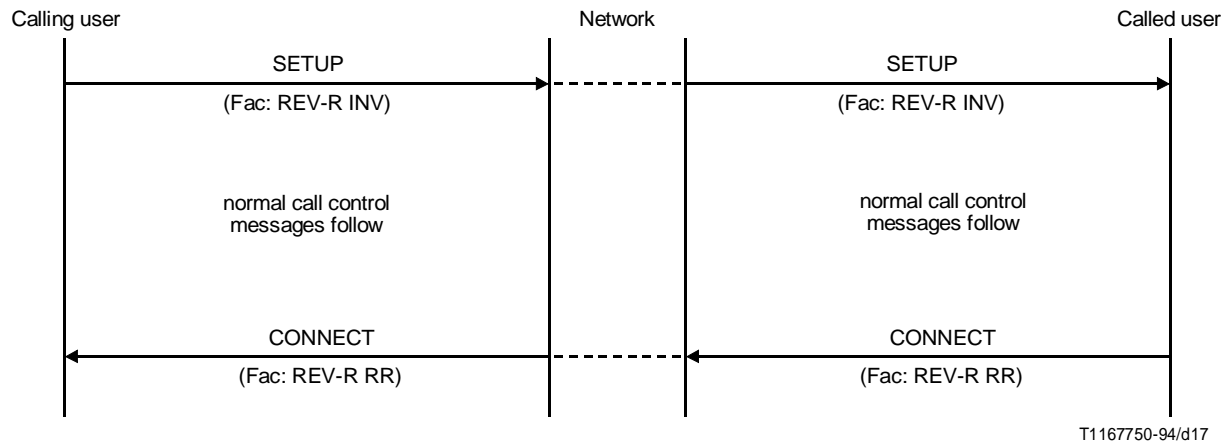


FIGURE 3-I.1/Q.956

Example of REV Case A successful invocation procedure

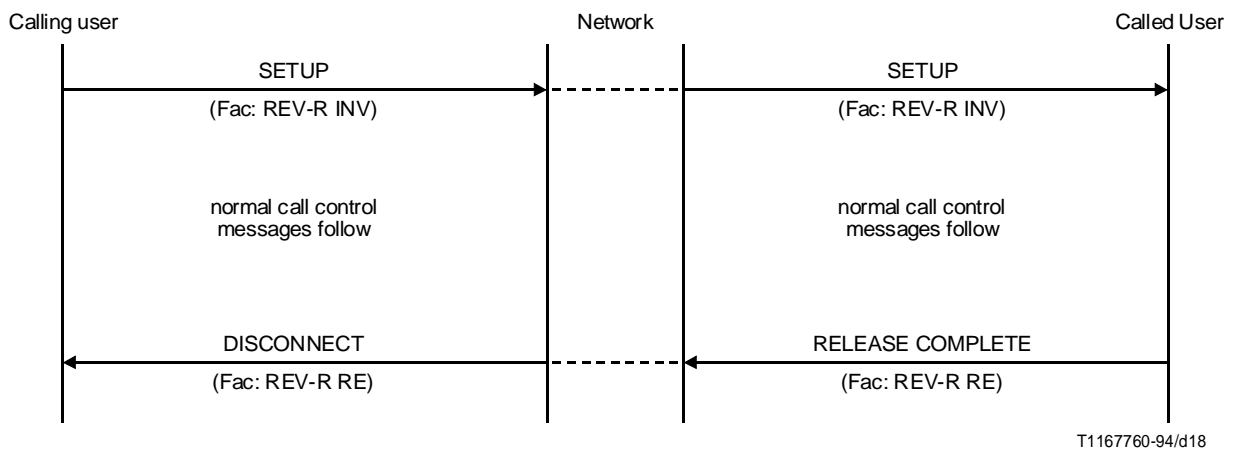


FIGURE 3-I.2/Q.956

Example of REV Case A unsuccessful invocation procedure

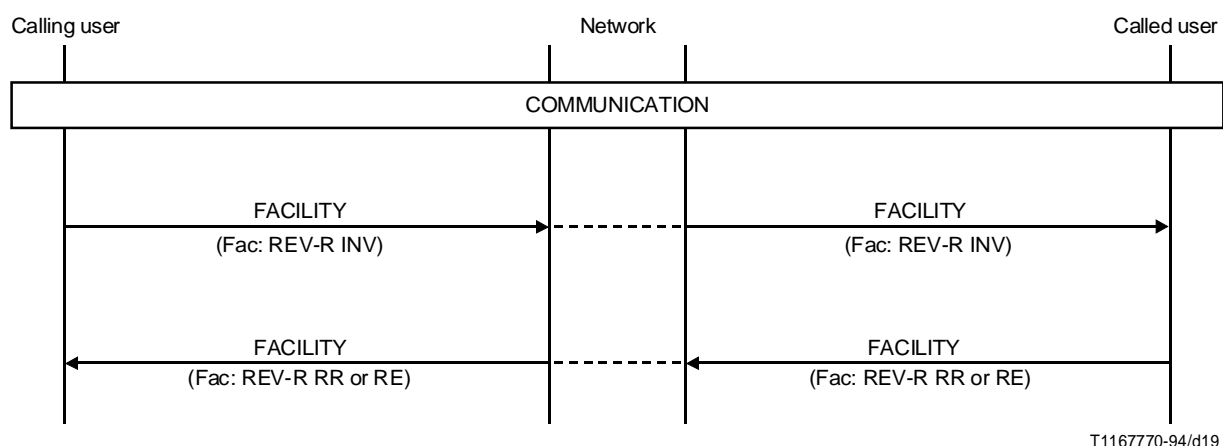
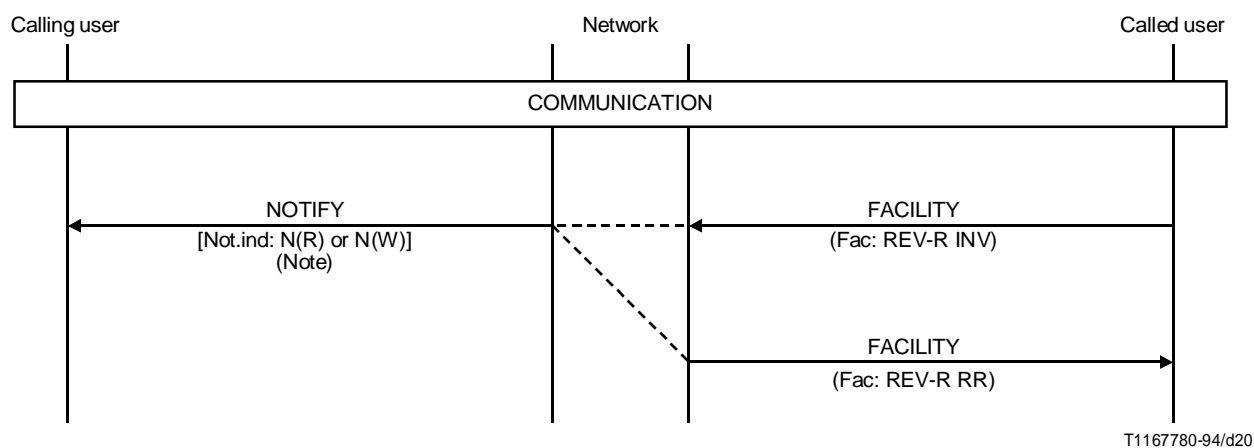


FIGURE 3-I.3/Q.956
Example of REV Case B (requested by the calling user)
successful and unsuccessful invocation procedure



NOTE – In case of interworking with private ISDN, the FACILITY message including the REV-T-Status (for the rest of the call/whole call) invoke component in the Facility information element is sent to the private ISDN.

FIGURE 3-I.4/Q.956
Example of REV Case B (requested by the called user)/
Case C successful invocation procedure

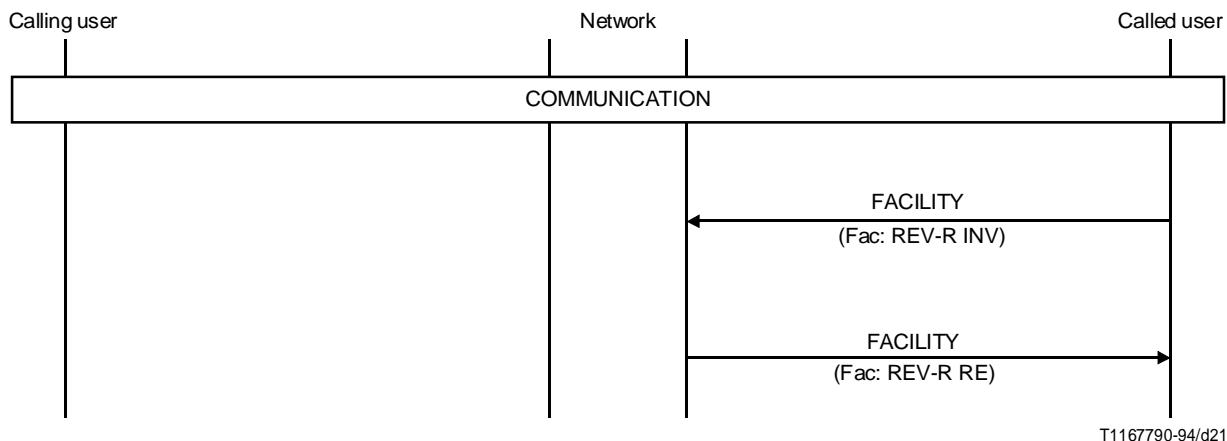
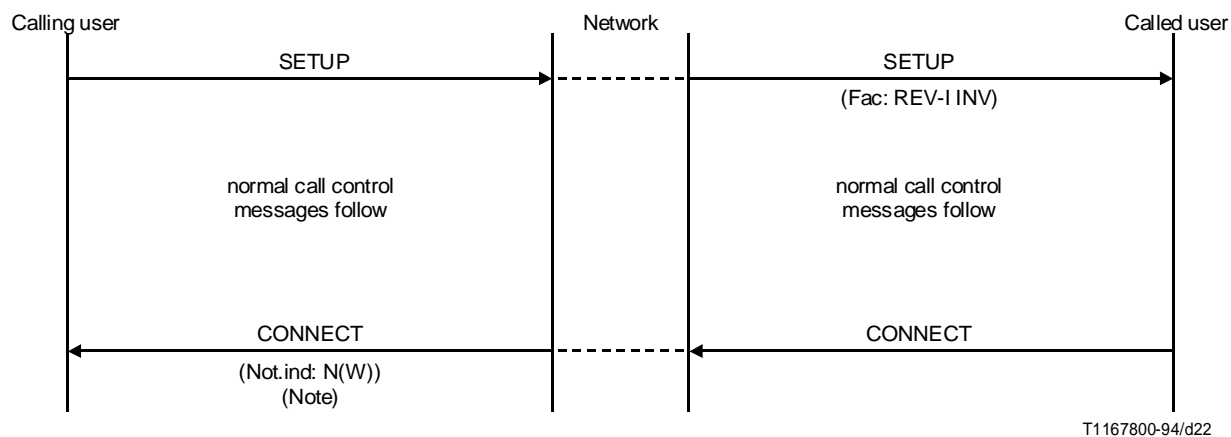


FIGURE 3-I.5/Q.956
**Example of REV Case B (requested by the called user)/
Case C unsuccessful invocation procedure**



NOTE – In case of interworking with private ISDN, the CONNECT message including the REV-T-Status (whole call) invoke component in the Facility information element is sent to the private ISDN.

FIGURE 3-I.6/Q.956
Example of REV Case D procedure