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Terrestrial Trunked Radio (TETRA); Voice plus Data (V+D); Part 12: Supplementary services stage 3; Sub-part 24: Call Retention (CRT)

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Foreword

This final draft European Telecommunication Standard (ETS) has been produced by the Terrestrial Trunked Radio ETSI Project of the European Telecommunications Standards Institute (ETSI), and is now submitted for the Voting phase of the ETSI standards approval procedure.

This ETS is a multi-part standard and will consist of the following parts:

Part 1: "General network design";

Part 2: "Air Interface (AI)";

Part 3: "Interworking at the Inter-System Interface (ISI)";

Part 4: "Gateways basic operation";

Part 5: “Peripheral Equipment Interface (PEI)";

Part 6: "Line connected Station (LS)";

Part 7: "Security";

Part 9: "General requirements for supplementary services";

Part 10: "Supplementary services stage 1";

Part 11: "Supplementary services stage 2";

Part 12: "Supplementary services stage 3";

Part 13: "SDL model of the Air Interface (AI)";

Part 14: "Protocol Implementation Conformance Statement (PICS) proforma specification".

Proposed transposition dates	
Date of latest announcement of this ETS (doa):	3 months after ETSI publication
Date of latest publication of new National Standard or endorsement of this ETS (dop/e):	6 months after doa
Date of withdrawal of any conflicting National Standard (dow):	6 months after doa

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1 Scope

This ETS specifies the supplementary service Call Retention which is applicable to various basic services supported by TETRA SwMIs. Basic services are specified in ETS 300 392-2 [4].

SS-CRT is a supplementary service which applies either during call establishment or once call is established to protect a call from pre-emption by another call of lower priority.

NOTE: There are currently no equivalent services specified by ITU-T or ETSI for public ISDN.

Supplementary service specifications are produced in three stages, according to the method described in ITU-T Recommendation I.210 [2]. The present document contains the stage 3 specifications of SS-CRT. The stage 3 descriptions specify the supplementary services requirements, procedures and protocols needed to support the supplementary service.

This ETS is applicable to circuit mode TETRA V+D tele-services and bearer services. This ETS is not applicable to TETRA Short Data Service (SDS).

Man Machine Interfaces and charging principles are outside the scope of this ETS.

The first edition of this ETS is based on the latest edition of ECMA-264 [1]. Additions to ECMA-264 [1] have been made to take into account particular TETRA specifics such as group calls and to include requirements and situations not addressed in ECMA-264 [1].

2. Normative references

This ETS incorporates by dated and 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] ECMA-264 (1997): "Private Integrated Services Network (PISN) - Specification- Inter-Exchange Signalling protocol - Call Priority Interruption and Call Priority Interruption Protection Supplementary Services (QSIG-CPI(P))".

[2] ITU-T Recommendation I.210 (1993): "Principles of telecommunication services supported by an ISDN and the means to describe them".

[3] ITU-T Recommendation Z.100 (1993): "CCITT Specification and description language (SDL)".

[4] ETSI ETS 300 392-2 (1995): "Terrestrial Trunked Radio (TETRA); Voice plus Data (V+D); Part 2: Air Interface (AI)".

[5] ETSI ETS 300 392-9 (1998): "Terrestrial Trunked Radio (TETRA); Voice plus Data (V+D); Part 9: General requirements for supplementary services".

[6] ETSI ETS 300 392-3-2 (1998): "Terrestrial Trunked Radio (TETRA); Voice plus Data (V+D); Part 3: Interworking at the Inter-System Interface (ISI); Sub-part 2: Additional Network Feature Individual Call (ANF-ISIIC)".

[7] ETSI ETS 300 392-3-3 (1998): "Terrestrial Trunked Radio (TETRA); Voice plus Data (V+D); Part 3: Interworking at the Inter-System Interface (ISI); Sub-part 3: Additional Network Feature Group Call (ANF-ISIGC)".

[8] ETSI ETS 300 392-3-5 (1998): "Terrestrial Trunked Radio (TETRA); Voice plus Data (V+D); Part 3: Interworking at the Inter-System Interface (ISI); Sub-part 5: Additional Network Feature for Mobility Management (ANF-ISIMM)".

[9] ETSI ETS 300 392-12-4 (1999): "Terrestrial Trunked Radio (TETRA); Voice plus Data (V+D); Part 12: Supplementary services stage 3; Sub-part 4: Call Forwarding (CF)".

[10] ETSI ETS 300 392-12 (all sub-parts): "Terrestrial Trunked Radio (TETRA); Voice plus Data (V+D); Part 12: Supplementary services stage 3".

[11] ECMA-165: "Private Integrated Services Network (PISN) - Generic Functional Protocol for the Support of Supplementary Services - Inter-Exchange Signalling Procedures and Protocol (QSIG-GF)".

[12] ECMA-263: "Private Integrated Services Network (PISN) - Specification, Functional Model and Information Flows - Call Priority Interruption and Call Priority Interruption Protection Supplementary Services (CPI(P)SD), 2nd edition".

3 Definitions, symbols and abbreviations

3.1 Definitions

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

Call Priority Interruption Capability Level (CPICL): parameter indicating the priority of a call. (ECMA-263[12]) to be used in case of interworking

Call Priority Interruption Protection Level (CPIPL): parameter indicating a level of protection of a call against interruption from other calls. (ECMA-263[12]) to be used in case of interworking

Call Retention Value (CRV): value which defines the relative level of protection of established calls against pre-emption

Established call: active call that is selected for interruption

Impending priority interruption state: condition of an established call and a priority call after provision of an Impending priority interruption warning notification and before the release of the established call (SS-PPC)

Impending priority interruption warning notification: notification provided before the release of the established call (SS-PPC)

Non-priority call: call that has not been assigned a call priority value

Priority call: call that has a call priority value greater than zero

NOTE 1: A priority call may also be a protected call.

Protected call: call that has a CRV value greater than zero

NOTE 2: A protected call may also be a priority call.

Served user: user who requests SS-CRT

Switching and Management Infrastructure (SwMI): all of the TETRA equipment for a Voice plus Data (V+D) network except for subscriber terminals. The SwMI enables subscriber terminals to communicate with each other via the SwMI

Time to priority interruption: duration of the impending priority interruption state (SS-PPC)

Unprotected call: call which has not been assigned a CRV value or has a CRV value equal to zero

3.2 Symbols

For the purposes of this ETS, there are no additional symbols excepted the symbols used in the SDL representation (ITU-T Recommendation Z.100 [3]).

3.3 Abbreviations

3.3.1 General abbreviations

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

ANF	Additional Network Feature
APDU	Application Protocol Data Unit
GTSI	Group TETRA Subscriber Identity
ISDN	Integrated Services Digital Network
ISI	Inter System Interface
ITSI	Individual TETRA Subscriber Identity
GTSI	Group TETRA Subscriber Identity
MM	Mobility Management
PINX	Private Integrated Service Network eXchange
PISN	Private Integrated Service Network
PDU	Protocol Data Unit
SDL	(Functional) Specification and Description Language
SDS	Short Data Service
SS	Supplementary Service
SS-CPI	Call Priority Interruption Supplementary Service
SS-CPIP	Call Priority Interruption Protection Supplementary Service

NOTE: The abbreviation SS is only used when referring to a specific supplementary service.

SwMI	Switching and Management Infrastructure
TETRA	Trans-European Trunked Radio

3.3.2 Supplementary service abbreviations

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

AL	Ambience Listening
AoC	Advice of Charge
AP	Access Priority
AS	Area Selection
BIC	Barring of Incoming Calls
BOC	Barring of Outgoing Calls
CAD	Call Authorized by Dispatcher
CCBS	Call Completion to Busy Subscriber
CCNR	Call Completion on No Reply
CFB	Call Forwarding on Busy
CFNRy	Call Forwarding on No Reply
CFNRc	Call Forwarding on Not Reachable
CFU	Call Forwarding Unconditional
CLIP	Calling Line Identification Presentation
CLIR	Calling/Connected Line Identification Restriction
COLP	Connected Line Identification Presentation
CR	Call Report
CRT	Call Retention
CRV	Call Retention Value
CW	Call Waiting
DGNA	Dynamic Group Number Assignment
DL	Discreet Listening
HOLD	Call Hold
IC	Include Call
LE	Late Entry
LSC	List Search Call

PC	Priority Call
PPC	Pre-emptive Priority Call
PSS1	Private Signalling System number one
QSIG	Q Interface SignallinG protocol (ECMA standard)
SNA	Short Number Addressing
TC	Transfer of Control
TPI	Talking Party Identification

4 Signalling protocol for the support of SS-CRT

4.1 SS-CRT description

SS-CRT is a supplementary service that allows for the protection of calls against interruption. SS-CRT may be invoked by either the calling user or the called user.

A priority interruption only occurs if the call originating from the calling user has a higher Call Priority than the Call Retention Value (CRV) of at least one of the established calls on the selected inter-SwMI link.

SS-CRT is applicable to all circuit mode basic services defined in ETS 300 392-2 [4].

4.2 SS-CRT services offered over the TNSS-SAP

This clause describes SS-CRT specific services offered by the Circuit Mode Control Entity (CMCE) at the Supplementary Services service access point (TNSS-SAP) of the TETRA voice plus data layer 3 service boundary in a TETRA Mobile Station (MS) or TETRA Line Station (LS). The SS-CRT service access point is used in conformance testing as a normative boundary in MSs and LSs.

NOTE 1: As the present document only deals with the SS-CRT all the service primitives have been shown without a TNSS-CRT-prefix e.g. the TNSS-CRT-F request is shorten into a CRT-F request.

NOTE 2: As man-machine interface or User A MS/LS applications are outside the scope of the present document service primitives are used to define information exchange to and from the standardized part of the MS/LS. Those primitives may be only indirectly accessible.

The SS-CRT service primitives for the served user(s) at the MS/LS TNSS-SAP shall be:

- CRT-B;
- CRT-F.

4.2.1 CRT-B request

The CRT-B request primitive shall be sent by the Served User MS/LS to the MS/LS CMCE application over TNSS-SAP to request the invocation of SS-CRT "backward" for an incoming call.

The CRT-B request primitive shall contain the SS-CRT parameters listed in table 1.

Table 1: Parameters for the primitive CRT-B request

Parameter	Request
Basic Service	M
CRV-B	M (Notes 1, 2)
NOTE 1: If not provided, the CRV shall be the default CRV value. NOTE 2: In case of group call, the CRV-B is provided by the group controlling SwMI, not the served user MS/LS.	

4.2.2 CRT-F request

The CRT-F request primitive shall be sent by the Served User MS/LS to the MS/LS CMCE application over TNSS-SAP to request the invocation of SS-CRT "forward" for an outgoing call.

The CRT-F request primitive shall contain the SS-CRT parameters listed in table 2.

Table 2: Parameters for the primitive CRT-F request

Parameter	Request
Basic Service	M
CRV-F	M (Note)
NOTE: If not provided, the CRV shall be the default CRV value.	

NOTE: The following information flows do not appear at the TNSS-SAP:

- ISI-CRT-B;
- ISI-CRT-F.

4.3 Parameter description

- CRV-B;

  - no Protection (0);
  - low Protection (1);
  - medium Protection (2);
  - total Protection (3).

- CRV-F;

  - no Protection (0);
  - low Protection (1);
  - medium Protection (2);
  - total Protection (3).

5. Signalling procedures for the support of SS-CRT

5.1 SS-CRT operational requirements

5.1.1 Requirements on the Originating MS/LS

Call establishment procedures for the outgoing side of an MS/LS and call release procedures, as specified in ETS 300 392-2 [4], shall apply.

Generic procedures for the call-related control of supplementary services, as specified in ETS 300 392-9 [5] for an MS/LS, shall apply.

NOTE: This applies to call-related control of supplementary services during call establishment as well as once call is established.

5.1.2 Requirements on the Originating SwMI

Call establishment procedures for the outgoing side of an inter-SwMI link and call release procedures, as specified in ETS 300 392-3-2 [6] and ETS 300 392-3-3 [7], shall apply.

Generic procedures for the call-related control of supplementary services, as specified in ETS 300 392-9 [5] for an End SwMI, shall apply.

NOTE: This applies to call-related control of supplementary services during call establishment as well as once call is established.

5.1.3 Requirements on the Terminating SwMI

Call establishment procedures for the incoming side of an inter-SwMI link and call release procedures, as specified in ETS 300 392-3-2 [6] and ETS 300 392-3-3 [7], shall apply.

For the support of SS-CRT, generic procedures for the call-related control of supplementary services, as specified in ETS 300 392-9 [5] for an End SwMI, shall apply.

NOTE: This applies to call-related control of supplementary services during call establishment as well as once call is established.

5.1.4 Requirements on the Terminating MS/LS

Call establishment procedures for the incoming side of an MS/LS and call release procedures, as specified in ETS 300 392-2 [4], shall apply.

For the support of SS-CRT, generic procedures for the call-related control of supplementary services, as specified in ETS 300 392-9 [5] for an End MS/LS, shall apply.

5.1.5 Requirements on a Transit SwMI

Basic call procedures, as specified in ETS 300 392-3-2 [6] and ETS 300 392-3-3 [7] for a Transit SwMI, shall apply.

Generic procedures for the call-related control of supplementary services, as specified in ETS 300 392-9 [5] for a Transit SwMI, shall apply.

5.1.6 Requirements on the Group Call Controlling SwMI

Call establishment procedures for the outgoing side of an inter-SwMI link and call release procedures, as specified in ETS 300 392-3-2 [6] and ETS 300 392-3-3 [7], shall apply.

Call establishment procedures for the incoming side of a inter-SwMI link and call release procedures, as specified in ETS 300 392-3-2 [6] and ETS 300 392-3-3 [7], shall apply.

For the support of SS-CRT, generic procedures for the call-related control of supplementary services, as specified in ETS 300 392-9 [5] for a Group Controlling SwMI, shall apply.

5.2 SS-CRT coding requirements

5.2.1 SS-CRT PDUs

The information contained in the following description tables correspond to the following key:

- Length: length of the sub-argument in bits;
- Type: element type (1, 2 or 3) described in subclause 14.7 of ETS 300 392-2 [4];
- C/O/M: conditional/optional/mandatory;
- Remark: comment or reference to note(s).

5.2.1.1 CRT-B

The CRT-B PDU is sent by the Served User A MS/LS application to the Terminating SwMI to invoke SS-CRT backward.

CRT-B PDU shall contain the SS-CRT information elements described in table 3.

Table 3: CRT-B PDU contents

Information element	Length	Type	C/O/M	Remark
SS-Type	6	1	M	Defined in ETS 300 392-9 [5]
CF-PDU type	5	1	M	CRT-B
CRV-B	2	1	O	Note
Basic Service Information	8	1	M	
NOTE: If not provided, CRV default value shall be used.				

5.2.1.2 CRT-F

The CRT-F PDU is sent by the Served User A MS/LS application to the Originating SwMI to invoke SS-CRT forward.

CRT-F PDU shall contain the SS-CRT information elements described in table 4.

Table 4: CRT-F PDU contents

Information element	Length	Type	C/O/M	Remark
SS-Type	6	1	M	Defined in ETS 300 392-9 [5]
CF-PDU type	5	1	M	CRT-F
CRV-F	2	1	O	Note
Basic Service Information	8	1	M	
NOTE: If not provided, CRV default value shall be used.				

5.2.1.3 ISI-CRT-B

The ISI-CRT-B PDU is sent:

- by the Terminating SwMI to either the preceding Transit SwMI or to the Originating SwMI to invoke SS-CRT backward over ISI;

- by one Transit SwMI to either the preceding Transit SwMI or to the originating SwMI.

ISI-CRT-B PDU shall contain the SS-CRT information elements described in table 5.

Table 5: ISI-CRT-B PDU contents

Information element	Length	Type	C/O/M	Remark
SS-Type	6	1	M	Defined in ETS 300 392-9 [5]
CF-PDU type	5	1	M	ISI-CRT-B
ISI-CRV-B	2	1	M	Note 1
Basic Service Information	8	1	M	Note 2
NOTE 1: ISI-CRV-B is related to the value presented by the MS/LS CRT-B PDU, the value determined by default by the Terminating SwMI or the value defined in a group call setup. The actual relation with CRV-B is outside the scope of this ETS.				
NOTE 2: Different values of ISI-CRV-B may be assigned to different basic services.				

5.2.1.4 ISI-CRT-F

The ISI-CRT-F PDU is sent by:

- the Originating SwMI towards either the next Transit SwMI or the Terminating SwMI;
- a Transit SwMI towards either the next Transit SwMI or the Terminating SwMI.

ISI-CRT-F PDU shall contain the SS-CRT information elements described in table 6.

Table 6: ISI-CRT-F PDU contents

Information element	Length	Type	C/O/M	Remark
SS-Type	6	1	M	Defined in ETS 300 392-9 [5]
CF-PDU type	5	1	M	ISI-CRT-F
ISI-CRV-F	2	1	M	Note 1
Basic Service Information	8	1	M	Note 2
NOTE 1: ISI-CRV-F is related to the value presented by the MS/LS CRT-F PDU, the value determined by default by the Originating SwMI or the value defined in a group call setup. The actual relation with CRV-F is outside the scope of this ETS.				
NOTE 2: Different values of ISI-CRV-F may be assigned to different basic services.				

5.2.2 TETRA PDU information element coding

5.2.2.1 Basic Service

Basic Service information element shall be encoded as specified in table 90, subclause 14.8.2 of ETS 300 392-2 [4].

5.2.2.2 CRV-B

The Call retention Value Backward CRV-B information element shall contain the value of the call protection level required by the called user (Individual, Group or Default). It shall be encoded as defined in table 7.

Table 7: CRV-B information element content

Information element	Length	Value	Remark
CRV-B	2	00_2	No Protection
		01_2	Low Protection
		10_2	Medium Protection
		11_2	Total Protection

5.2.2.3 CRV-F

The Call Retention Value Forward CRV-F information element shall contain the value of the call protection level required by the calling user (Individual or Default). It shall be encoded as defined in table 8.

Table 8: CRV-F information element content

Information element	Length	Value	Remark
CRV-F	2	00_2	No Protection
		01_2	Low Protection
		10_2	Medium Protection
		11_2	Total Protection

5.2.2.4 ISI-CRV-B

The Inter System Interface Call retention Value Backward ISI-CRV-B information element shall contain the value of the call protection level required by the called user (Individual, Group or Default). It shall be encoded as defined in table 9.

Table 9: CRV-B information element content

Information element	Length	Value	Remark
ISI-CRV-B	2	00_2	No Protection
		01_2	Low Protection
		10_2	Medium Protection
		11_2	Total Protection

5.2.2.5 ISI-CRV-F

The Inter System Interface Call Retention Value Forward ISI-CRV-F information element shall contain the value of the call protection level required by the calling user (Individual or Default). It shall be encoded as defined in table 10.

Table 10: CRV-F information element content

Information element	Length	Value	Remark
ISI-CRV-F	2	00_2	No Protection
		01_2	Low Protection
		10_2	Medium Protection
		11_2	Total Protection

5.3 SS-CRT state definitions

5.3.1 States at the originating MS/LS

The procedures for the Originating MS/LS are written in terms of the following conceptual states existing within the SS-CRT Supplementary Service Control entity in that MS/LS in association with a particular call.

5.3.1.1 State CRT-Idle

SS-CRT is not operating.

5.3.1.2 State SS-CRT Active

SS-CRT has been activated upon call setup.

5.3.2 States at the Originating SwMI

The procedures for the Originating SwMI are written in terms of the following conceptual states existing within the SS-CRT Supplementary Service Control entity in that SwMI in association with a particular call.

5.3.2.1 State CRT-Idle

SS-CRT is not operating.

5.3.3 States at the Transit SwMI

The procedures for the Transit SwMI are written in terms of the following conceptual states existing within the SS-CRT Supplementary Service Control functional entity in that SwMI in association with a particular call.

5.3.3.1 State CRT-Idle

SS-CRT is not operating.

5.3.3.2 State SS-CRT Active

SS-CRT has been activated upon call setup.

5.3.4 States at the Terminating SwMI

The procedures for the Terminating SwMI are written in terms of the following conceptual states existing within the SS-CRT Supplementary Service Control functional entity in that SwMI in association with a particular call.

5.3.4.1 State CRT-Idle

SS-CRT is not operating.

5.3.4.2 State SS-CRT Active

SS-CRT has been activated upon call setup.

5.4 SS-CRT signalling procedures

5.4.1 SS-CRT signalling procedures for activation, deactivation and registration

Not applicable.

5.4.2 SS-CRT signalling procedures for invocation and operation

Annex A contains one example of message sequences.

NOTE 1: SS-CRT may be invoked to "protect" a call against possible interruption by priority calls.

NOTE 2: Calls with an associated Call Retention Value (CRV) in which the CRV value is greater than 0 are known as "protected calls".

NOTE 3: Protected calls may also be priority calls if SS-PPC was invoked at the same time as SS-CRT.

NOTE 4: The resulting CRV for a call is the highest value between CRV-F and CRV-B.

5.4.2.1 Actions at the Originating (Calling User) MS/LS

The SDL representation of procedures at the Originating MS/LS is shown in figure B.1.

To invoke SS-CRT, the Originating MS/LS shall send a CRT-F request PDU, and re-enter state CRT-Idle. The PDU shall either be sent in the SETUP message that establishes the call or in a call related FACILITY. The argument to the invoke operation shall convey the requested CRV by the calling user.

NOTE: The method by which the value of the CRV is assigned is outside the scope of this ETS.

5.4.2.2 Actions at the Originating SwMI

The SDL representation of procedures at the Originating SwMI is shown in figure B.2.

5.4.2.2.1 Normal procedures

Upon receipt of an SS-CRT invocation from the calling user in a CRT-F PDU (with an U-SETUP or in a call related FACILITY), the Originating SwMI shall check the received CRV-F value (authorized range). The Originating SwMI shall then send an ISI-CRT-F PDU (with an ISI-IC-SETUP or in a call related FACILITY). The ISI-CRT-F PDU shall convey the ISI-CRV-F corresponding to the CRV requested by the calling user.

NOTE 1: The method by which the value of the CRV is assigned is outside the scope of the present document.

NOTE 2: If SS-CRT is not invoked in the forward direction, the "saved" protection level will be zero.

NOTE 3: If SS-CRT is invoked without a CRV-F value (no value or invalid value), a default CRV value shall be used.

On receipt of a ISI-CRT-B PDU (either with an ISI-IC-CONNECT message or in a call related ISI-FACILITY) containing the value of the ISI-CRV-B information element, the Originating SwMI shall determine if the value contained therein is higher than that already saved for the Forward direction (CRV-F) for the same call; the Originating SwMI shall save as the CRV value for the duration of the call the highest of the two values. The Originating SwMI shall then revert to SS-CRT Idle state.

5.4.2.2.2 Exceptional procedures

If the originating SwMI receives a SS-CRT request with a CRV-F higher than the range of values authorized, it substitutes the highest authorized CRV for that calling user; it will not disconnect the call for which call retention was requested.

5.4.2.3 Actions at a Transit SwMI

The SDL representation of procedures at the Transit SwMI is shown in figure B.3.

5.4.2.3.1 Normal procedures

The CRV-F value contained in the ISI-CRT-F PDU (with either an ISI-IC-SETUP or a call related FACILITY) shall be stored by the Transit SwMI and shall be passed on to the Subsequent SwMI.

NOTE: If SS-CRT is not invoked in the forward direction, the "saved" protection level will be zero.

On receipt of an ISI-CRT-B PDU (with an ISI-IC-CONNECT or in a call related FACILITY), the Transit SwMI shall compare the ISI-CRV-F value stored and the ISI-CRV-B value received and shall determine the call retention value to be the highest of the two values. This CRV shall be assigned to the call by the Transit SwMI and shall be saved for the duration of the call.

5.4.2.3.2 Exceptional procedures

Not applicable.

NOTE 1: It is assumed that the Transit SwMI receives SS-CRT invocation with proper values of CRV only; the improper values will have been either rejected or corrected by the end SwMIs (Originating and Terminating).

NOTE 2: It is assumed that the Transit SwMI has the same range of authorized CRVs as the originating and the terminating SwMI.

5.4.2.4 Actions at the Terminating (Called User) SwMI

The SDL representation of procedures at the Terminating SwMI is shown in figure B.4.

5.4.2.4.1 Normal procedures

On receipt of an ISI-CRT-F PDU (with an ISI-IC-SETUP message or in a call related FACILITY), the Terminating SwMI shall save the ISI-CRV-F value contained in the ISI-CRT-F PDU.

NOTE: If SS-CRT is not invoked in the forward direction, the "saved" protection level will be zero.

On receipt of a CRT-B PDU (with an U-CONNECT or a call related FACILITY) for invocation of SS-CRT by the called user, the Terminating SwMI shall first check the CRV-B associated with the called user (authorized range). The Terminating SwMI shall then compare the two resulting values ISI-CRV-F and ISI-CRV-B and shall determine which of the two values is the highest; the CRV for the call shall be the highest value of the two, shall be assigned to the call and shall be stored for the duration of the call.

The Terminating SwMI shall send an ISI-CRT-B PDU, and re-enter state CRT-Idle. This ISI-CRT-B PDU shall be sent in either the ISI-IC-CONNECT message or in a call related FACILITY.

5.4.2.4.2 Exceptional Procedures

If the terminating SwMI receives a SS-CRT request with a CRV-B higher than the range of values authorized, it substitutes the highest authorized CRV for that called user; it will not disconnect the call for which call retention was requested.

5.4.2.5 Actions at the Group Controlling SwMI

The SDL representation of procedures at the Group Controlling SwMI is basically similar to the representation at the Terminating SwMI shown in figure B.4 (with the exception that there is no called user SS-CRT invocation).

5.4.2.5.1 Normal procedures

On receipt of an ISI-CRT-F PDU (with an ISI-GC-SETUP message or in a call related FACILITY), the Terminating SwMI shall save the ISI-CRV-F value contained in the ISI-CRT-F PDU.

NOTE 1: If SS-CRT is not invoked in the forward direction, the "saved" protection level will be zero.

The values of CRV-B and ISI-CRV-B for a group call are stored in the group controlling SwMI and are associated to a group call. The Group Controlling SwMI shall then compare the two resulting values ISI-CRV-F and ISI-CRV-B and shall determine which of the two values is the highest; the CRV for the group call shall be the highest value of the two, shall be assigned to the group call and shall be stored for the duration of the group call.

The Group Controlling SwMI shall send an ISI-CRT-B PDU, and re-enter state CRT-Idle. This ISI-CRT-B PDU shall be sent in either the ISI-GC-CONNECT message or in a call related FACILITY.

NOTE 2: The CRT-B value for a group call may be changed during an established group call; means to effectuate this operation are outside the scope of this ETS.

NOTE 3: In the case of a change of CRV-B request during a group call, there will be no invocation of QSIG PSS1 signalling but transparent signalling.

NOTE 4: In the case of a calling user who is member of a group call, the calling user keeps his calling user status and does not become a called user in the group; there is no conflict between CRV-F and CRV-B for that user.

5.4.2.5.2 Exceptional procedures

Not applicable.

5.4.2.6 Actions at the Terminating (Called User) SwMI

The SDL representation of procedures at the Terminating SwMI is shown in figure B.5.

5.4.2.6.1 Normal procedures

On receipt of a SS_CRT request during call setup, the SS_CRT terminating MS/LS shall send an SS_CRT request with U_CONNECT. At that time the terminating MS/LS enters state SS_CRT_Active. In the same manner, upon reception of a U_CONNECT without invocation of SS_CRT, the terminating MS/LS shall enter state SS_RET_Active in order to allow for further request of CRV-B. This MS/LS will not check the validity of the request and simply pass it to the Terminating SwMI which shall do the checking.

The terminating MS/LS shall also enter SS_RET_Active upon reception of D_SETUP and answers with either U_CONNECT if it does not wish to request a value of call protection or SS_CRT_req with U_CONNECT as described above. The incoming SS_CRT forward request from the originating SwMI/MS/LS is not normally presented to the terminating MS/LS.

At any time, once state SS_RET_Active is entered, the SS_CRT_Terminating_MS/LS may present request for new values of CRV-B in a call unrelated facility U-FACILITY.

5.4.2.6.2 Exceptional Procedures

N.A.

5.5 Interworking

5.5.1 Interworking with Public ISDN

NOTE: At the time of publication of the present document, no equivalent service has been specified for public ISDNs.

On a call to a TETRA SwMI from a public ISDN that does not support an equivalent service, the Incoming Gateway SwMI may behave as specified in 5.4.2.2 for an Originating SwMI. The incoming call from the Public ISDN shall be assigned a CRV of zero.

On a call from a TETRA SwMI to a public ISDN that does not support an equivalent service, the Outgoing Gateway SwMI shall behave as specified in 5.4.2.3 for a Terminating SwMI. The outgoing call from TETRA towards a public ISDN shall loose its call retention parameters and shall not be disconnected because the SS-CRT request cannot be satisfied.

5.5.2 Interworking with Private ISDN

The operation of the PISN is assumed to be in compliance with ECMA-264 [1]. The TETRA Gateway shall convert the information flows and PDUs within TETRA into information flows and APDUs. The description is split for clarity into procedures in case of incoming calls from PISN to TETRA and into procedures of outgoing calls from TETRA to PISN. TETRA SS-CRT procedures are extremely close to PISN SS-CPIP procedures; the interworking can be defined into mapping tables of information flows and of PDUs to APDU and vice versa. The PISN accepts only Call Interruption Protection request during call establishment; call related CPIP request outside a call establishment shall be ignored by PINX.

NOTE: The encapsulation of TETRA PDUs into ROSE APDUs in the case of ISI operation does not correspond to a case of interworking with PISN.

Table 11 indicates the mapping between the PISN incoming call information flows and the TETRA corresponding information flows. The TETRA Gateway acts in this case as a terminating PINX for the PISN and as an originating SwMI for TETRA.

Table 11: PISN-TETRA Information flow mapping

PISN		TETRA	
Comments	**PISN Information Flow**	**TETRA Information Flow**	**Comments**
Note 1	ra_CPIP_F_INV	ISI-CRT-F or CRT-F	Notes 2, 3
Note 1	rb_CPIP_B_INV	ISI-CRT-B or CRT-B	Notes 2, 3
NOTE 1: PISN SS-CPIP information flows are always associated to a call SETUP (SETUP or CONNECT).			
NOTE 2: Shall be associated to either an air interface call D-SETUP, an ISI-IC-SETUP, an ISI-IC-CONNECT or an U-CONNECT.			
NOTE 3: Shall depend upon the initial destination of the call, either to a MS/LS or to another SwMI.			

Table 12 indicates the mapping between the PISN ROSE APDUs and the TETRA PDUs.

Table 12: PISN SS-CPIP ROSE Invoke APDU and TETRA SS-CRT PDUs Mapping

PISN		TETRA	
Comments	**ROSE Invoke APDU**	**TETRA PDU**	**Comments**

Note 3	CPIPRequestArg ::= SEQUENCE{
	
	cpiProtectionLevel CPIProtectionLevel
	
	argumentExtension CHOICE{
	extension [1] IMPLICIT Extension,
	
	sequenceOfExtn [2] IMPLICIT SEQUENCE OF
	
	Extension} OPTIONAL}
		CRV-F
		ISI-CRV-F
		ISI-CRV-B
		or CRV-B
			Notes 1,2

NOTE 1: CPIPLevel and CRV levels mapping should be trivial (four values each).			
NOTE 2: The Gateway shall select the proper TETRA PDU depending on the final destination of the call, air interface and/or next SwMI.			
NOTE 3: The PISN does not need to distinguish between backward and forward since the direction of ROSE APDU, tied to the call related establishment will be unambiguous.			

5.5.3 Interworking with non-ISDNs

When interworking with a non-ISDN that does not support an equivalent service, the procedures defined in subclause 5.5.1 for interworking with a public ISDN that does not support an equivalent service shall apply.

When interworking with a non-ISDN that supports an equivalent service, the two networks may cooperate in the operation of SS-CRT. In this case, either the Originating SwMI functionality or the Terminating SwMI functionality will be provided in the non-ISDN. Established Call User's SwMI functionality may also be provided in the non-ISDN. The Incoming or Outgoing Gateway SwMI shall provide conversion between the signalling protocol specified in this Standard and the signalling protocol of the other network.

5.6 Protocol interactions between SS-CRT and other supplementary services and ANFs

This subclause specifies protocol interactions with other supplementary services and ANFs for which stage 3 standards had been published at the time of publication of this ETS. For interactions with supplementary services and ANFs for which stage 3 standards are published subsequent to the publication of the present document, see those other stage 3 ETSs.

NOTE 1: Additional interactions that have no impact on the signalling protocol at the ISI can be found in the relevant stage 1 specifications.

NOTE 2: Simultaneous conveyance of APDUs for SS-CRT and another supplementary service or ANF in the same message, each in accordance with the requirements of its respective stage 3 standard, does not, on its own, constitute a protocol interaction.

5.6.1 Interaction with Completion of Call to Busy Subscriber (SS-CCBS)

No interaction.

NOTE: The CCBS call will have the same CRV as the initial call.

5.6.2 Interaction with Completion of Call on No Reply (SS-CCNR)

No interaction.

NOTE: The CCNR call will have the same CRV as the initial call.

5.6.3 Interaction with Call Forwarding Unconditional (SS-CFU)

The following interaction shall apply if SS-CFU is supported in accordance with ETS 300 392-12-4 [9].

Actions at the Rerouteing SwMI

On receiving a FORWARD PDU, the Rerouteing SwMI shall include in the SETUP message to the Forwarded-to SwMI any CRT-F PDU that has been sent in the original SETUP message.

5.6.4 Interaction with Call Forwarding Busy (SS-CFB)

The interaction specified in subclause 5.6.3 shall apply if SS-CFB is supported in accordance with ETS 300 392-12-4 [9].

5.6.5 Interaction with Call Forwarding No Reply (SS-CFNR)

The interaction specified in subclause 5.6.3 shall apply if SS-CFNR is supported in accordance with ETS 300 392-12-4 [9].

5.6.6 Interaction with Advice of Charge (SS-AOC)

No interaction.

5.6.7 Interaction with ANF-Mobility Management

Two cases of migration are distinguished:

- the case where the migration of any of the potential served users of SS-CRT occurs when no call is in progress;

- the case where the migration of any of the potential served users of SS-CRT occurs while a call is in progress and for this call, SS-CRT has been invoked.

NOTE: The case where migration of any of the potential served user of SS-CRT occurs while call establishment is in progress is not presently covered.

For each of those two cases, migration of the calling user and migration of the called user is considered.

5.6.7.1 Migration while no call is in progress

In this case, no distinction is made between calling user and called user since at that time any of the users may become either calling or called. The migration shall follow the normal migration path described in ANF-ISI-MM [8]. The served user visited SwMI shall send the MIGRATION PDU to the served user home SwMI as defined in table 64 of ETS 300 392-3-5 [8]; in this PDU, the visited SwMI indicates whether it supports exchange of SS profile or not; served user home SwMI replies with a MIGRATION RESPONSE PDU authorizing the migration. The served user home SwMI then sends the PROFILE UPDATE PDU for that particular ITSI as specified in table 77 of ETS 300 392-3-5 [8].

The served user visited SwMI responds to this PROFILE UPDATE PDU by a PROFILE UPDATE RESPONSE specified in table 78 of ETS 300 392-3-5 [8]. The served user home SwMI sends then an SS-PROFILE UPDATE PDU giving the list of supplementary services which the migrating served user may invoke; in this list shall appear SS-CRT; in reply to this SS-PROFILE UPDATE PDU, the visited SwMI shall send to the served user home SwMI the SS-PROFILE UPDATE RESPONSE PDU specified in table 79 of ETS 300 392-3-5 [8]. The particular SS-Migration profile information elements for SS-CRT are specified in the following tables:

5.6.7.1.1 SS-information

The SS-information element shall indicate if a supplementary service should be supported for the individual subscriber or for the group in the visited SwMI. The SS-information element shall refer to a given supplementary service as indicated by the SS-type information sub-element.

Table 13: SS-information contents

Information sub-element	Length	Type	C/O/M	Remark
SS-type	6	1	M	
SS-status	2	1	M	

5.6.7.1.2 SS-information response

The SS-information element shall indicate if a supplementary service is supported or not for the individual subscriber or for the group in the visited SwMI MM. The SS-information element shall refer to a given supplementary service as indicated by the SS-type information sub-element.

Table 14: SS-information response contents

Information sub-element	Length	Type	C/O/M	Remark
SS-type	6	1	M	
SS-response status	2	1	M	

5.6.7.1.3 SS-migration profile (original)

The SS-migration profile (original) shall define one original migration profile of a supplementary service for an individual subscriber or for a group. The element shall be sent from the home SwMI MM to the visited SwMI MM. It shall indicate the home SwMI MM's preference contents for the profile.

Table 15: SS-migration profile (original) contents

Information sub-element	Length	Type	C/O/M	Remark
SS-type	6	1	M	Note 1
Profile status	2	1	M	
SS-ISI-PROFILE		3	O	Note 2
NOTE 1: If the receiving SwMI MM does not understand the SS-type then it shall ignore the SS-ISI-PROFILE.				
NOTE 2: The contents of SS-ISI-PROFILE shall be as defined, if applicable, for the supplementary service in each supplementary service subpart of ETS 300 392-12 [10].				

5.6.7.1.4 SS-migration profile response (temporary)

The SS-migration profile (temporary) shall define one original migration profile of a supplementary service for an individual subscriber or for a group. The element shall be sent from the visited SwMI MM to the home SwMI MM. It shall indicate the profile that shall be used for the individual subscriber or for the group in the visited SwMI.

Table 16: SS-migration profile (temporary) contents

Information sub-element	Length	Type	C/O/M	Remark
SS-type	6	1	M	Note 1
SS-profile response status	2	1	M	
SS-ISI-PROFILE		3	O	Note 2
NOTE 1: If the receiving SwMI MM does not understand the SS-type then it shall ignore the SS-ISI-PROFILE.				
NOTE 2: The contents of SS-ISI-PROFILE shall be defined, if applicable, for the supplementary service in each supplementary service subpart of ETS 300 392-12 [10].				

5.6.7.1.5 SS-profile response status

The SS-profile response element shall specify the relationship between the original SS-migration profile (received in the SS-profile update_ind) and the created SS-migration profile.

Table 17: SS-profile response status element contents

Information element	Length	Value	Remark
SS-profile response status	2	00_2	Original SS-migration profile accepted as received
		01_2	Original SS-migration profile redefined, contents not sent to the home SwMI MM
		10_2	Original SS-migration profile redefined, contents sent to the home SwMI MM
		11_2	Creation of the SS-migration profile failed

5.6.7.1.6 SS-profile update indicator

The SS-profile update indicator element shall indicate whether the SS-migration profiles are exchanged as part of the migration or group attachment service. If sent as part of the migration service, the parameter shall also indicate if they are sent before or after the final migration approval (MIGRATION RESPONSE PDU).

Table 18: SS-profile update indicator contents

Information sub-element	Length	Value	Remark
SS-profile update indicator	2	00_2	Not applicable
		01_2	Sent before final migration approval or Sent as part of group attachment
		10_2	Sent after final migration approval
		11_2	Reserved
NOTE: The value "10_2" is not applicable for groups.			

5.6.7.1.7 SS-response status

The SS-response status information element shall indicate whether a supplementary service is supported or not in the visited SwMI MM.

Table 19: SS-response status

Information sub-element	Length	Value	Remark
SS-response status	2	00_2	Not supported
		01_2	Supported
		10_2	Reserved
		11_2	Reserved

5.6.7.1.8 SS-status

The SS-status information element shall indicate whether a supplementary service should or should not be supported in the visited SwMI MM.

Table 20: SS-status

Information sub-element	Length	Value	Remark
SS-status	2	00_2	Not supported
		01_2	Supported, with original SS-migration profile
		10_2	Supported, without original SS-migration profile
		11_2	Reserved

5.6.7.1.9 SS-CRT-ISI-PROFILE Information Element

The SS-CRT-ISI-PROFILE Information element indicates the content of the SS-CRT parameters to the served user visited SwMI. It is specified as follows in table 21.

Table 21: SS-CRT-ISI-Profile

Information sub-element	Length	Value	Remark
Type 3 Element Identifier	4	0101	SS-ISI-PROFILE
Length indicator	11	9	
SS-Type	4	24	SS-CRT
CRV Range	2	00 to 11	Low, Medium Low, Medium High, High
Backward/Forward	1	0 = B, 1 = F	
More bit	1	0, 1	

5.6.7.2 Migration while a call is in progress and SS-CRT has been invoked

Migration of the calling user

The new SwMI is the SwMI where the calling user has migrated. The call restoration new SwMI process (specified in ANF-ISIIC [6]) is used; once the registration of the calling user is completed, the ISI-IC-CALL RESTORE is completed; the old SwMI sets up a new call from the old SwMI to the new visited SwMI with the value of the CRV assigned to the call which is extended and an indication B/F whether the resulting CRV was provided as a CRV-B or as a CRV-F.

As a recommended option, the two PDUs that were used to set up the initial call with the same ISI-CRV-B and ISI-CRV-F values that were used for the old call are extended to the new visited SwMI.

NOTE: The ISI-CRV-B and ISI-CRV-F are used in that case in the opposite directions to the normal ISI-IC call setup but the end result on the resulting CRV is not affected.

Regardless of the selected option, the call between the old SwMI and the called user SwMI has remained unaffected keeping the same level of protection. Once this process is completed, each served user can initiate a change of CRV.

Migration of the called user

The new SwMI is the called user visited SwMI; the call restoration new SwMI process (specified in ANF-ISIIC [6]) is used; once the called user has completed its registration in the new called user SwMI, the ISI-CALL-RESTORE is completed; a new call is setup between the old SwMI and the new called user SwMI; in those new ISI-IC-SETUP and ISI-IC-CONNECT, the same CRV value is used; the CRV value selected for that extension of the call (both in the ISI-IC-SETUP and in the ISI-IC-CONNECT) is the value which was assigned to the "old" call with the indication F/B (Forward/Backward).

As a recommended option, the former ISI-CRV-F and ISI-CRV-B are carried in an ANF-ISISS PDU (this time in the proper direction) and the highest value of those two is used to protect the call.

Regardless of the selected option, the call between the old SwMI and the original called user SwMI has remained unaffected keeping the same level of protection. Once this process is completed, each served user can initiate a change of CRV.

Annex A (informative): Examples of message sequences

This annex describes one typical message flow for SS-CRT.

Example message sequence for successful invocation of SS-CRT

In this example the request for SS-CRT made by the calling user is subsequently followed by a request for SS-CRT from the called user.

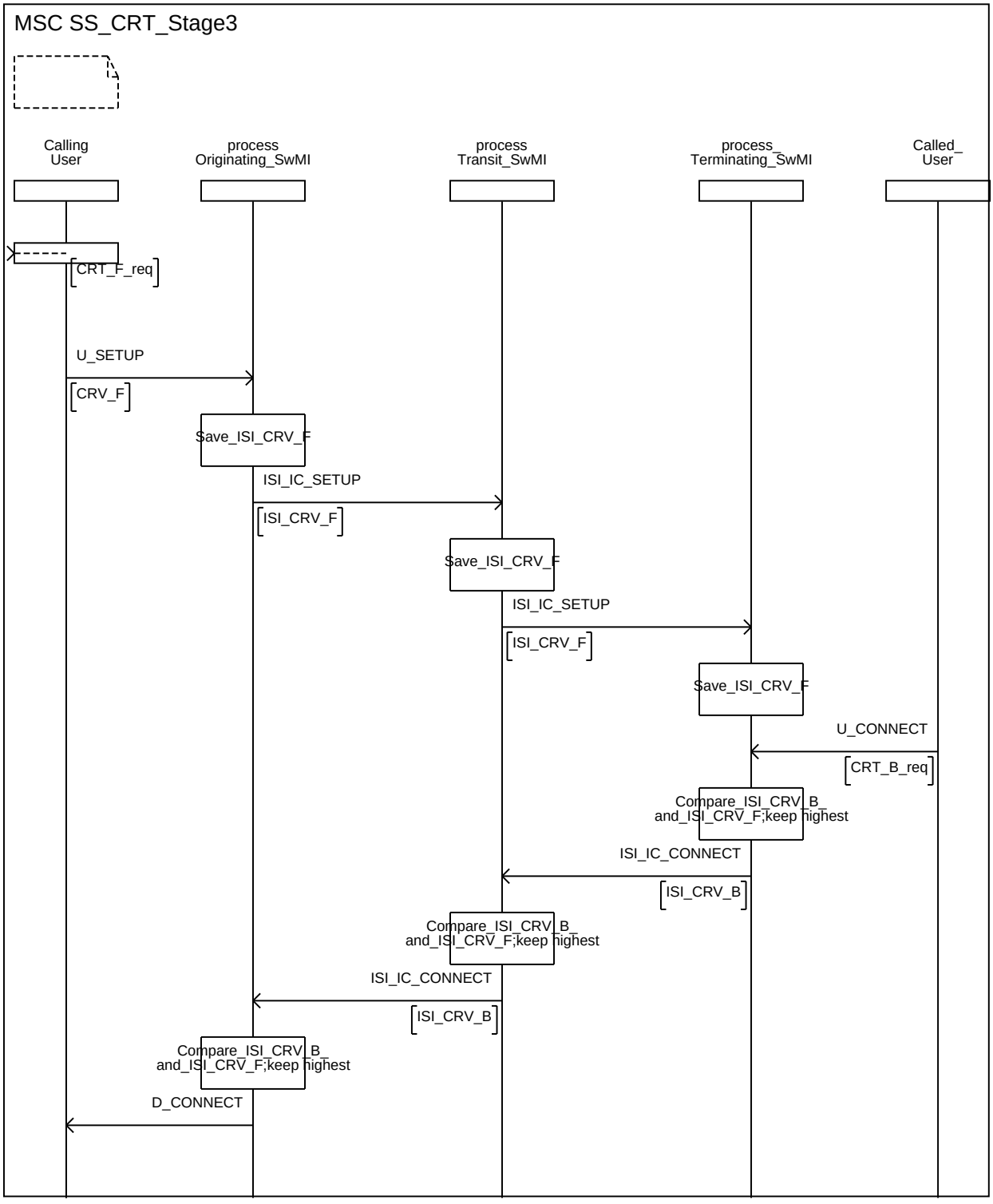


Figure A.1: Message sequence for successful invocation of SS-CRT

Annex B (informative): Specification and Description Language (SDL) representation of procedures

The diagrams in this annex use the Specification and Description Language defined in ITU-T Recommendation Z.100 [3].

Each diagram represents the behaviour of SS-CRT Supplementary Service Control entity at a particular type of SwMI. In accordance with the protocol model described in ECMA-165 [11], the Supplementary Service Control entity uses, via Co-ordination Functions, the services of Generic Functional Procedures Control and Basic Call Control.

B.1 SS-CRT at the Originating MS/LS

Figure B.1 shows the behaviour of an SS-CRT entity within the Originating MS/LS.

Input signals from the left represent primitives from the user, or an entity acting on behalf of the user.

Input signals from the right represent primitives from the co-ordination functions in respect of messages received from the Subsequent SwMI. Output signals to the right represent primitives to the co-ordination functions in respect of messages sent to the Originating (Calling User) SwMI.

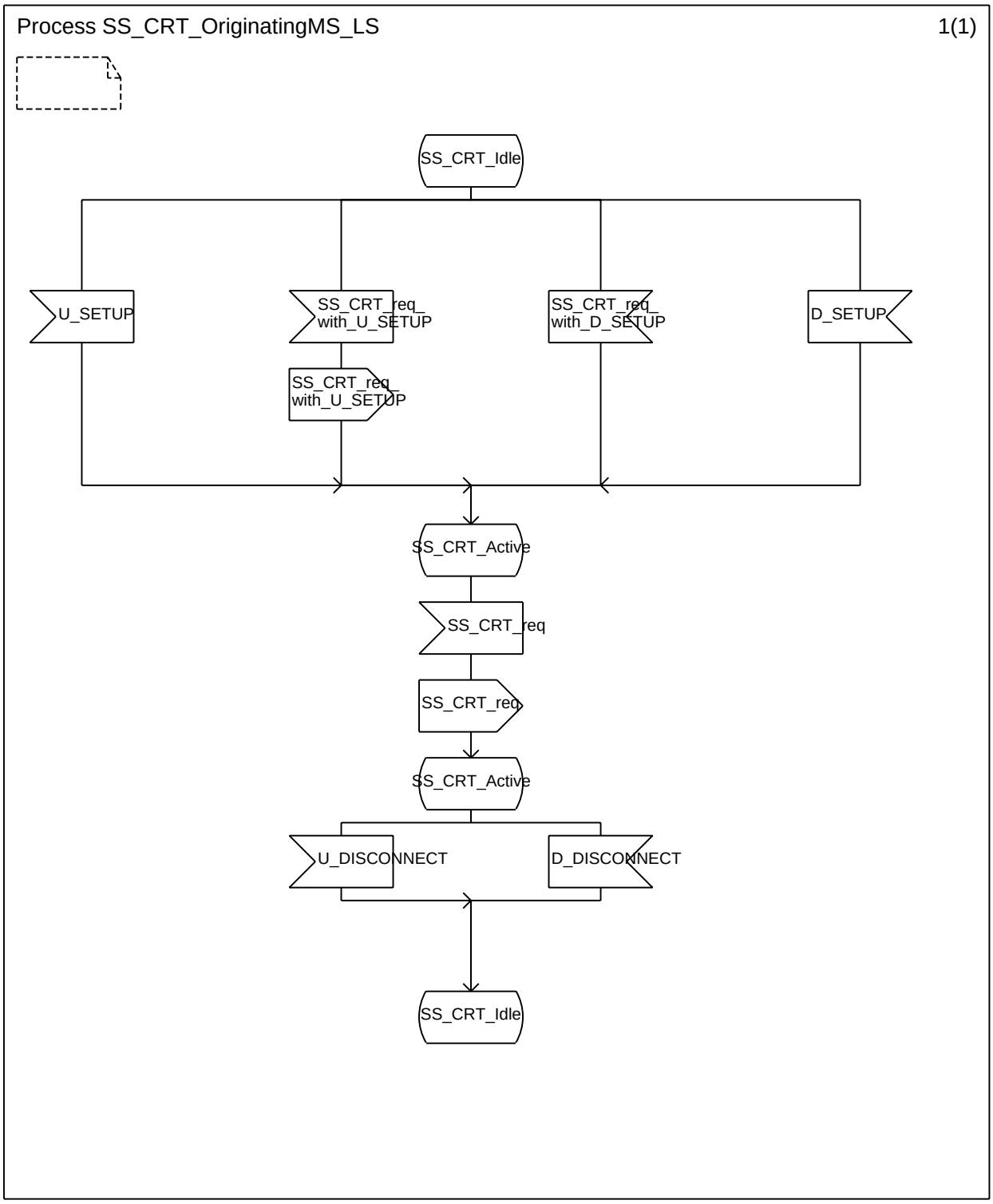


Figure B.1: Originating MS/LS SDL (SS-CRT)

B.2 SS-CRT at the Originating SwMI

Figure B.2 shows the behaviour of an SS-CRT entity within the Originating SwMI.

Input signals from the left represent primitives from the user, or an entity acting on behalf of the user.

Input signals from the right represent primitives from the co-ordination functions in respect of messages received from the Subsequent SwMI. Output signals to the right represent primitives to the co-ordination functions in respect of messages sent to the Subsequent SwMI.

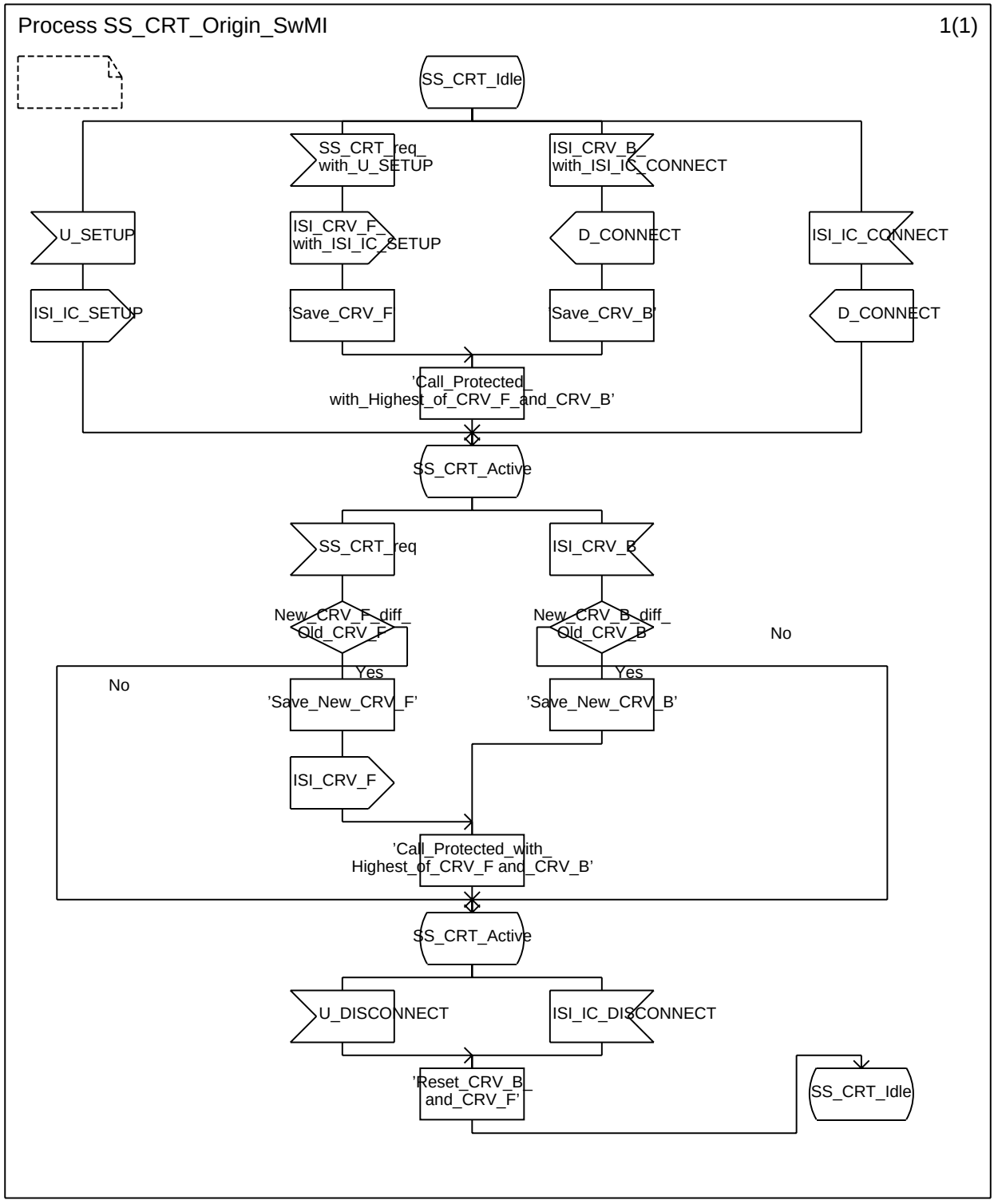


Figure B.2: Originating SwMI SDL (SS-CRT)

B.3 SS-CRT at the Transit SwMI

Figure B.3 shows the behaviour of an SS-CRT entity within the Transit SwMI.

Input signals from the left represent primitives from the co-ordination functions in respect of messages received from the Preceding SwMI. Output signals to the left represent primitives to the co-ordination functions in respect of messages sent to the Preceding SwMI. Output signals to the right represent primitives to the co-ordination functions in respect of messages sent to the Subsequent SwMI. Input signals from the right represent primitives from the co-ordination functions in respect of messages received from the Subsequent SwMI.

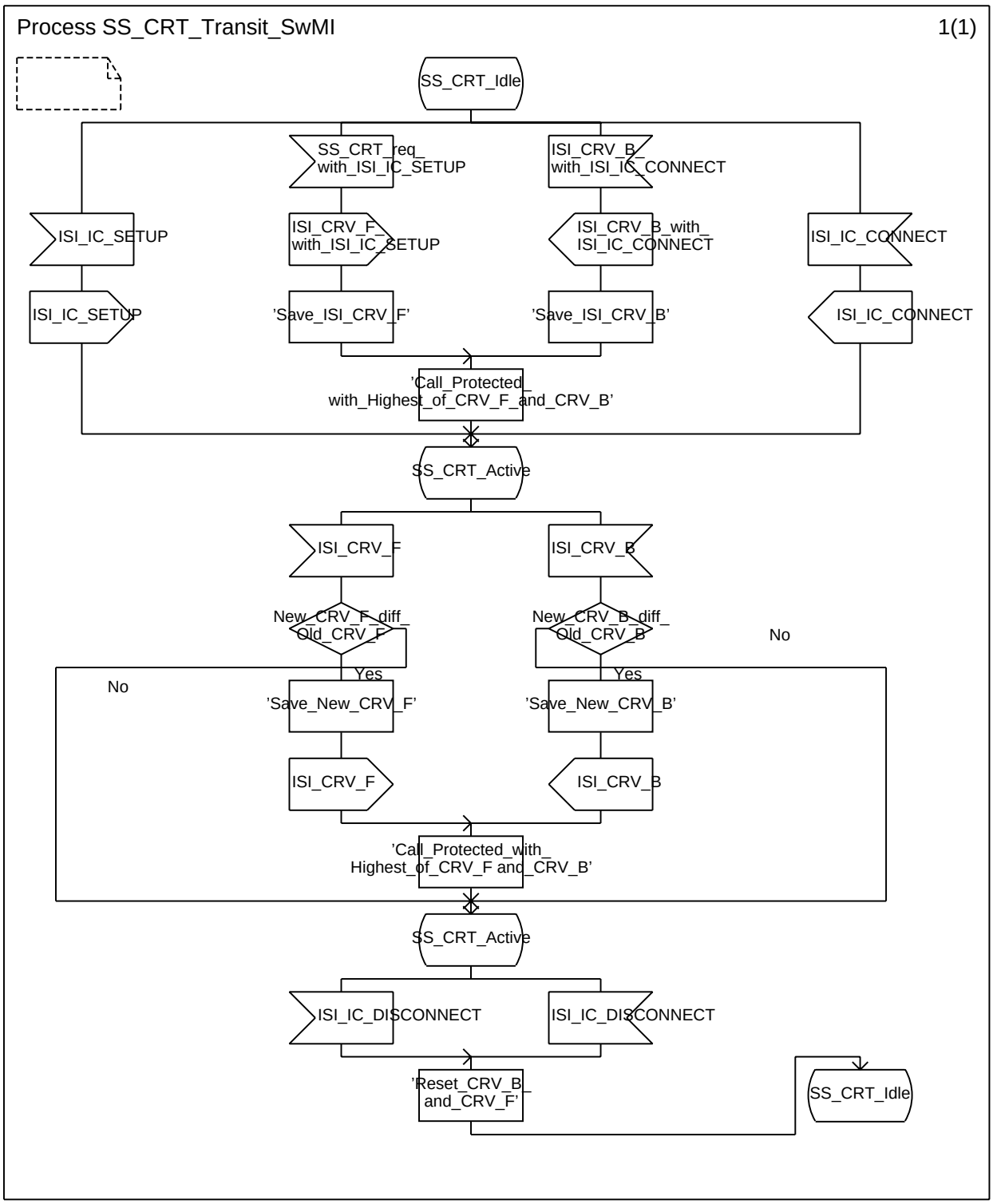
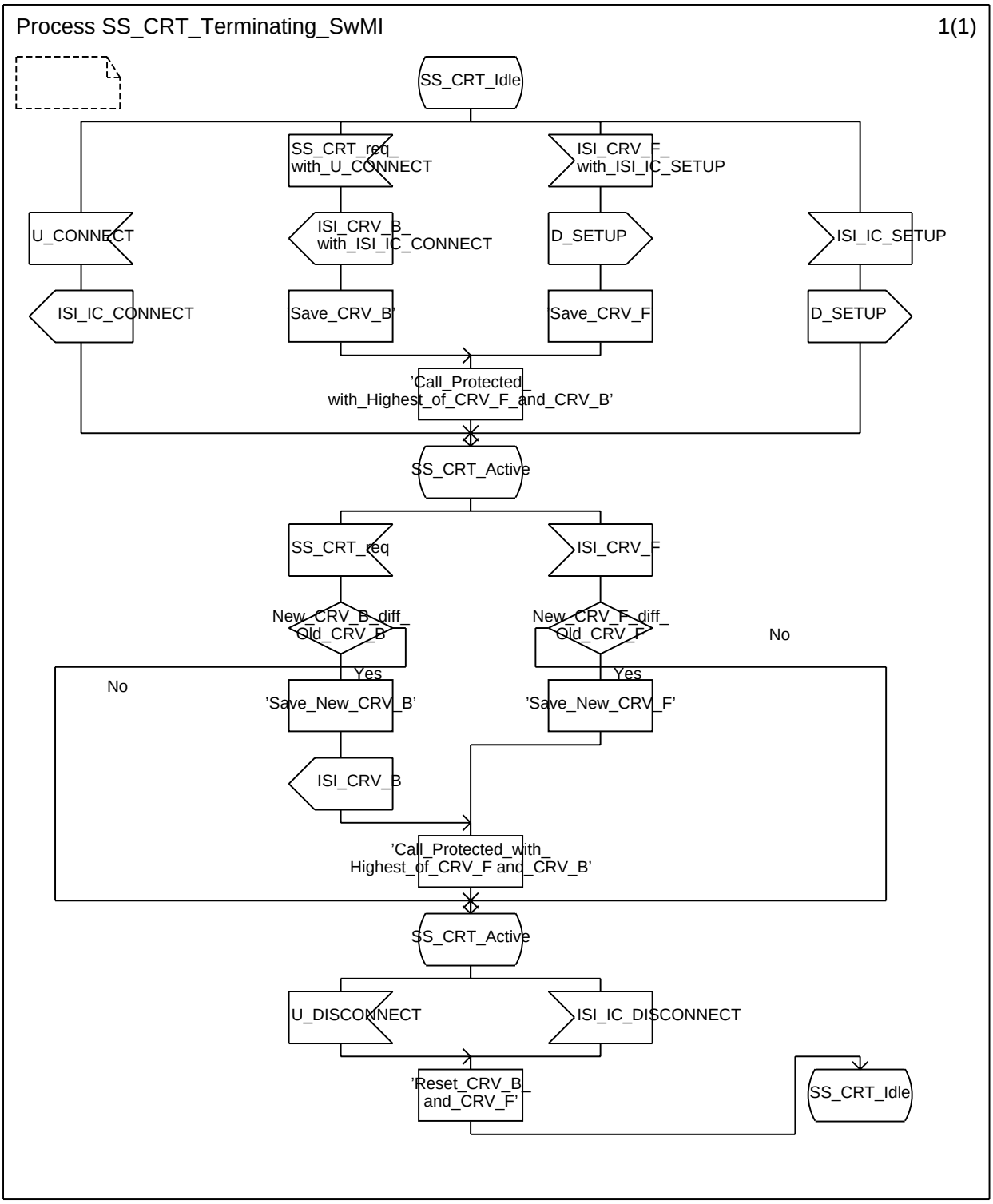


Figure B.3: Transit SwMI SDL (SS-CRT)

B.4 SS-CRT at the Terminating SwMI

Figure B.4 shows the behaviour of an SS-CRT entity within the Terminating SwMI. Input signals from the left represent primitives from the co-ordination functions in respect of messages received from the Preceding SwMI. Output signals to the left represent primitives to the co-ordination functions in respect of messages sent to the Preceding SwMI. Input signals from the right represent primitives from the called user, or an entity acting on behalf of the called user.



NOTE: This figure applies also to group controlling SwMI with deletion of signals U_CONNECT and D_SETUP.

Figure B.4: Terminating SwMI SDL (SS-CRT)

B.5 SS-CRT at the Terminating (Called User) MS/LS

Figure B.5 shows the behaviour of an SS-CRT entity within the Terminating MS/LS.

Input signals from the right represent primitives from the user, or an entity acting on behalf of the user.

Input signals from the left represent primitives from the co-ordination functions in respect of messages received from the Terminating SwMI. Output signals to the left represent primitives to the co-ordination functions in respect of messages sent to the Terminating (Called User) SwMI.

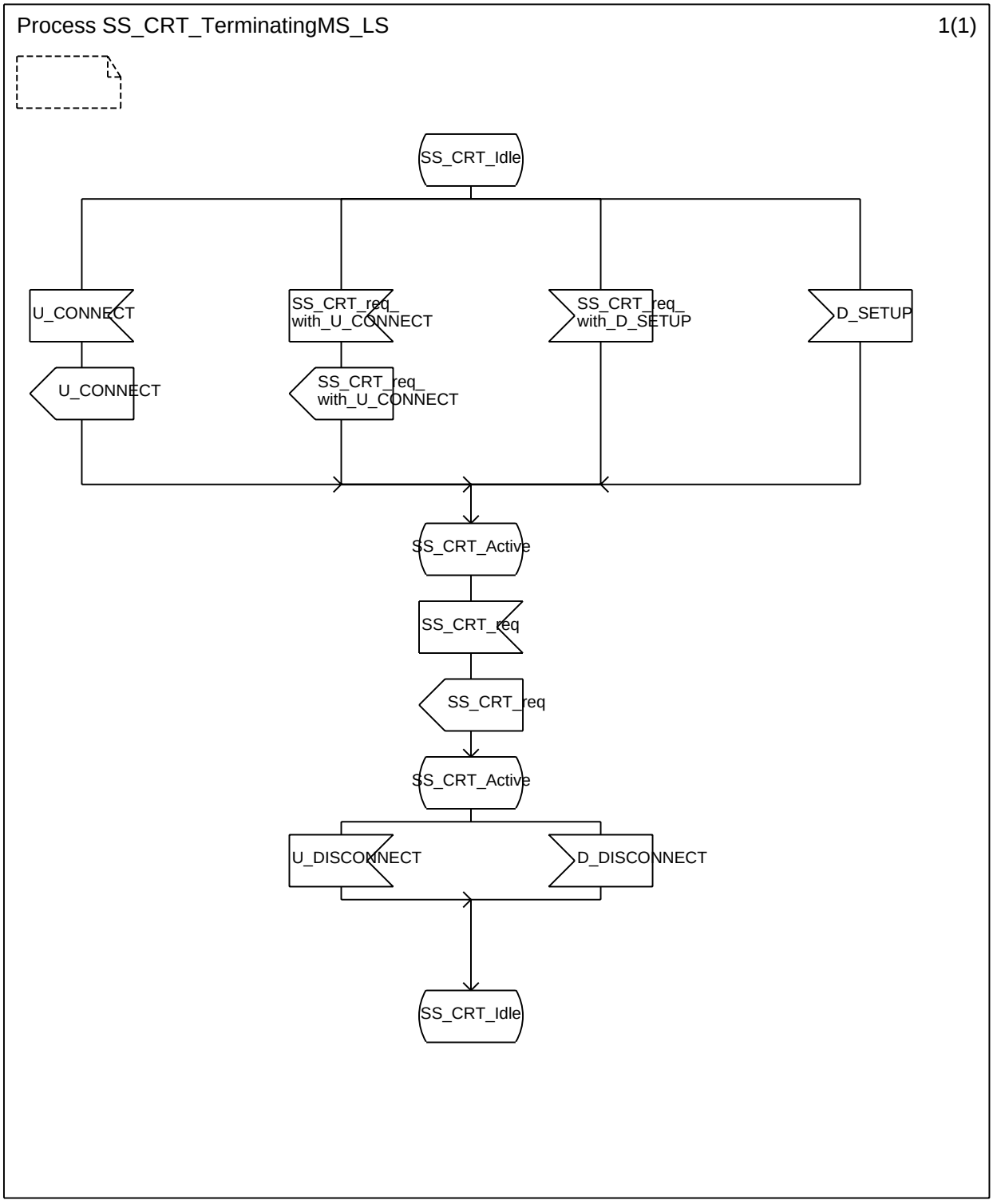


Figure B.5: SS-CRT SDL at Terminating (Called) MS/LS

History

Document history		
December 1999	Public Enquiry	PE 200015: 1999-12-15 to 2000-04-14
May 2000	Vote	V 20000707: 2000-05-08 to 2000-07-07