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SERIES Q: SWITCHING AND SIGNALLING

Digital subscriber Signalling System No. 1 – Network layer

ISDN Digital Subscriber Signalling System No. 1 (DSS1) – Signalling specifications for frame mode switched and permanent virtual connection control and status monitoring

ITU-T Recommendation Q.933

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ITU-T Recommendation Q.933

ISDN Digital Subscriber Signalling System No. 1 (DSS1) – Signalling specifications for frame mode switched and permanent virtual connection control and status monitoring

Summary

This Recommendation defines the access to Remote Frame Handlers from ISDN user-network interfaces. It specifies the signalling to establish, maintain and release circuit-switched bearers between ISDN users and Remote Frame Handlers mainly by referencing ITU-T Rec. Q.931. It specifies also the signalling to establish, maintain and release frame relay virtual circuits within an established circuit-switched bearer by referencing ITU-T Rec. X.36.

In addition, it includes the protocol for frame relay permanent virtual connection status monitoring, together with the corresponding Protocol Implementation Conformance Statements (PICS) proforma. This revision replaces ITU-T Rec. Q.933 (1995) and no longer supports case B of Q.933 (1995) whereby ISDN local exchanges provide frame relay services.

This revision of ITU-T Rec. Q.933 (2003) is in alignment with the latest release of ITU-T Recs X.76 (2003) and X.36 (2003).

Source

ITU-T Recommendation Q.933 was revised by ITU-T Study Group 17 (2001-2004) and approved under the WTSA Resolution 1 procedure on 13 February 2003.

FOREWORD

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

The World Telecommunication Standardization Assembly (WTSA), which meets every four years, establishes the topics for study by the ITU-T study groups which, in turn, produce Recommendations on these topics.

The approval of ITU-T Recommendations is covered by the procedure laid down in WTSA Resolution 1.

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

NOTE

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

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

CONTENTS

ITU-T Recommendation Q.933

ISDN Digital Subscriber Signalling System No. 1 (DSS1) – Signalling specifications for frame mode switched and permanent virtual connection control and status monitoring

1 Scope

This Recommendation specifies the architecture and the signalling using ITU-T Rec. Q.931 for establishing, maintaining and clearing circuit-switched bearers at the ISDN user-network interface for both basic and primary rate interfaces to access a Remote Frame Handler. Within a circuit-switched bearer, one or more frame relay virtual circuits may be established. Establishing, maintaining and clearing frame relay switched virtual circuits are performed using X.36 signalling.

This Recommendation covers the following capabilities at the ISDN S/T reference point:

1) Circuit-switched access to a Remote Frame Handler (RFH) by establishing a circuit-switched bearer (ISDN B or H channels) between a user and a RFH using the signalling defined in ITU-T Rec. Q.931.

2) Establishing, maintaining and releasing of frame mode virtual circuits within a circuit-mode bearer with the signalling defined in ITU-T Rec. X.36.

Note that frame relay capabilities and services provided by a local ISDN exchange (ET) known as case B in the previous version of this Recommendation are not supported in this current version.

To avoid duplicating the signalling protocols as specified in ITU-T Recs Q.931 and X.36, this Recommendation only makes references to them. Only the material unavailable elsewhere is explicitly specified in this Recommendation. Clause 6 provides an overview of ISDN access to a Remote Frame Handler and clause 7 describes the call control procedures to establish, maintain and clear frame relay calls. Annex A provides the status reporting signalling for frame mode permanent virtual circuits and explains the relationship with clause 11/X.36. Annex D contains the PICS related to Annex A. Annexes B and C have been deleted and Annex E is replaced by Annex D/X.36. Appendix I moved to Appendix VII/X.36.

2 References

The following ITU-T Recommendations and other references contain provisions which, through reference in this text, constitute provisions of this Recommendation. At the time of publication, the editions indicated were valid. All Recommendations and other references are subject to revision; users of this Recommendation are therefore encouraged to investigate the possibility of applying the most recent edition of the Recommendations and other references listed below. A list of the currently valid ITU-T Recommendations is regularly published. The reference to a document within this Recommendation does not give it, as a stand-alone document, the status of a Recommendation.

– ITU-T Recommendation I.230 (1988), *Definitions of bearer services categories*.

– ITU-T Recommendation I.231.1 (1988), *Circuit-mode bearer service categories: Circuit-mode 64 kbit/s unrestricted, 8 kHz structured bearer service*.

– ITU-T Recommendation I.231.7 (1996), *Circuit-mode bearer service categories: Circuit-mode 1536 kbit/s unrestricted, 8 kHz structured bearer service*.

– ITU-T Recommendation I.231.8 (1996), *Circuit-mode bearer service categories: Circuit-mode 1920 kbit/s unrestricted, 8 kHz structured bearer service*.

– ITU-T Recommendation I.231.10 (1992), *Circuit-mode bearer service categories: Circuit-mode multiple-rate unrestricted 8 kHz structured bearer service*.

– ITU-T Recommendation I.320 (1993), *ISDN protocol reference model*.

– ITU-T Recommendation I.411 (1993), *ISDN user-network interface – Reference configurations*.

– ITU-T Recommendation I.430 (1995), *Basic user-network interface – Layer 1 specification*.

– ITU-T Recommendation I.431 (1993), *Primary rate user-network interface – Layer 1 specification*.

– ITU-T Recommendation Q.922 (1992), *ISDN data link layer specification for frame mode bearer services*.

– ITU-T Recommendation Q.931 (1998), *ISDN user-network interface layer 3 specification for basic call control*.

– ITU-T Recommendation X.36 (2003), *Interface between Data Terminal Equipment (DTE) and Data Circuit-terminating Equipment (DCE) for public data networks providing frame relay data transmission service by dedicated circuit*.

3 Definitions

No new definitions that are specific to this Recommendation are defined.

4 Abbreviations

This Recommendation uses the following abbreviations:

DLCI	Data Link Connection Identifier
DTE	Data Terminal Equipment
ET	Exchange Termination
FR	Frame Relay
ISDN	Integrated Services Digital Network
ISO	International Organization for Standardization
LAPB	Link Access Protocol Balanced
NT2	Network Termination 2
PVC	Permanent Virtual Circuit or Permanent Virtual Connection
RFH	Remote Frame Handler
SABME	Set Asynchronous Balanced Mode Extended (frame)
SVC	Switched Virtual Circuit or Switched Virtual Connection
TA	Terminal Adaptor
TE1	Terminal Equipment 1
UA	Unnumbered Acknowledgment
XID	Exchange Identification

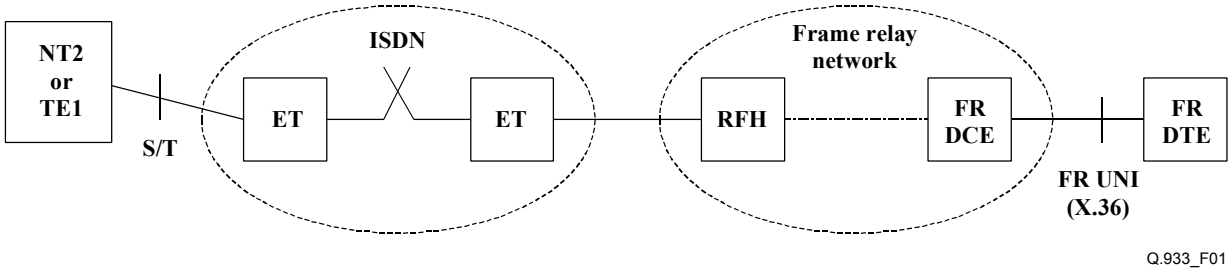
5 Conventions

No conventions specific to this Recommendation are defined.

6 Overview of ISDN access to a Remote Frame Handler

The architecture of ISDN access to a Remote Frame Handler (RFH) is illustrated in Figure 1. The user, shown as a TE1 or NT2, is located at the user side of an ISDN user-network interface and the Remote Frame Handler (RFH) is shown to be outside the ISDN for practical purposes. ITU-T Rec. Q.931 is used between the ISDN user and an ISDN local exchange (ET) and between an ISDN exchange and the RFH to set up, maintain and release a circuit-switched bearer between the user and the RFH. If a semi-permanent bearer exists between the ISDN user and the RFH, then Q.931 signalling will not be used.

Once a circuit-switched bearer has been established between a user and a RFH, one or more frame relay virtual circuits may be established within the circuit-switched bearer. ITU-T Rec. X.36 is used between an ISDN user and a RFH to establish, maintain and release a frame relay switched virtual circuit (SVC) with a remote FR DTE. Instead of SVC, frame relay permanent virtual circuits (PVC) between an ISDN user and a remote FR DTE may be used. Frame relay PVCs are established, maintained and released using network administrative mechanisms.



Two-step signalling:

– Step 1: Circuit-switched bearer establishment between NT2/TE1 and the RFH using Q.931 signalling between NT2/TE1 and the local ET. Note this step is not required if a semi-permanent connection established with administrative means exists already between NT2/TE1 and the RFH.

– Step 2: Frame relay signalling between NT2/TE1 and RFH using X.36 signalling to establish a frame relay virtual circuit between NT2/TE1 and the FR DTE. Multiple frame relay virtual circuits may be established within one bearer circuit between NT2/TE1 and the RFH.

Figure 1/Q.933 – Two-step frame mode call establishment

7 Frame relay call control procedures

This clause describes the signalling procedures to support frame relay calls. It describes the two-step signalling process for the establishment of circuit-switched bearers and frame relay virtual circuits and for related call control functions.

The user may access a RFH by means of a circuit-switched bearer (ISDN B or H channel). This circuit-switched bearer may be initiated by the user or the RFH. The term "user" refers to the user equipment which may consist of an ISDN frame relay terminal (TE1), an ISDN NT2 or a combination of an existing data terminating equipment (TE2) attached to a terminal adaptor (TA).

7.1 Outgoing call

7.1.1 Circuit-switched access to a Remote Frame Handler

A circuit-switched bearer between the originating user and the RFH must be in place before the frame relay virtual circuits can be established. ITU-T Rec. Q.931 shall be used to establish this circuit-switched bearer.

Unless the circuit-switched bearer between the ISDN user and the RFH is a semi-permanent bearer, the originating user shall initiate the establishment of the circuit-switched bearer prior to establishing a frame relay virtual circuit. It does so by sending a SETUP message on the D-channel in which the Called party number information element is coded with the address of the RFH and the Bearer capability information element is coded with:

– information transfer capability set to "unrestricted digital information";

– transfer mode set to "circuit mode"; and

– information transfer rate set to the bit rate of the bearer channel.

The Low layer compatibility information element is optionally included in the SETUP message.

Once establishment of the circuit-switched bearer is complete, if layer 2 in-channel signalling is to be used, the originating user proceeds with any desired initialization procedure (e.g., XID exchange, SABME/UA) on the logical link identified with a data link connection identifier DLCI = 0 within the circuit-switched bearer between itself and the RFH. The link layer protocol employed on the DLCI = 0 logical link is that defined in ITU-T Rec. Q.922. The originating user then proceeds with the establishment of the frame relay virtual circuit. The different establishment scenarios of the circuit-switched bearer and frame relay virtual circuits are shown in Table 1.

Table 1/Q.933 – Establishment of access bearer and frame relay virtual circuits

	Demand access bearer	**Semi-permanent access bearer**
Establishment of access bearer	Circuit-switched access bearers are established with Q.931 signalling at the ISDN user-network interface.	Semi-permanent access bearers are established using administrative procedures.
Establishment of frame relay virtual circuits	– Frame relay SVCs are established using X.36 signalling on DLCI = 0 in the circuit-switched bearer. – Frame relay PVCs are established using frame relay administrative procedures.	

7.1.2 Frame relay virtual circuit establishment

ITU-T Rec. X.36, where SVC signalling is defined, is used between an ISDN user and RFH to set up frame relay SVC. In the SETUP message, the called party refers to the remote frame relay DTE (see Figure 1).

X.36 messages are carried in the circuit-switched bearer channel established between the ISDN user and the RFH embedded in Q.922 frames with DLCI = 0. One or more frame relay virtual circuits identified with different DLCIs may be established within a circuit-switched bearer.

7.2 Incoming call

7.2.1 Access from a Remote Frame Handler

An incoming call is initiated by a RFH and is established between a RFH and an ISDN user. A circuit-switched bearer between the RFH and the called user must be in place before frame relay virtual circuits can be established. If a semi-permanent bearer is used, it is established using network management procedures instead of Q.931 signalling.

If a circuit-switched bearer is not already established, the RFH shall initiate the establishment of the circuit-switched bearer relay. Q.931 procedures are followed. In this case, the Bearer capability information element included in the SETUP message shall be coded as specified for outgoing calls.

Once establishment of the circuit-switched bearer is complete, the RFH performs any layer 2 initialization procedure (e.g., optionally XID exchange, SABME/UA) on the logical link using DLCI = 0 within the bearer channel between itself and the ISDN called user, the link layer protocol employed on the DLCI logical link is that defined in ITU-T Rec. Q.922. The RFH then establishes a frame relay virtual circuit with the called user as described in the following subclause.

7.2.2 Frame relay virtual circuit establishment

X.36 signalling protocol is used between a RFH and an ISDN user to set up the frame relay SVC. Note in X.36 SETUP message, the called party refers to the ISDN user (see Figure 1).

X.36 messages are carried in the circuit-switched bearer established between the RFH and the ISDN user embedded in Q.922 frames with DLCI = 0. One or more frame relay virtual circuits may be established within a circuit-switched bearer.

7.3 Frame relay data transfer phase protocol

Upon establishing the frame relay virtual circuit, the frame relay data transfer phase shall be followed according to ITU-T Rec. X.36.

In some cases there may be a delay between when a connect confirmation is received and when the actual virtual circuit is established. It may be necessary to verify the establishment of the end-to-end virtual circuit prior to the beginning of data transfer. This can be accomplished between the users in the user plane.

7.4 Call clearing

Under normal conditions, clearing of a frame relay virtual circuit shall precede clearing of the corresponding circuit-switched bearer. However, if a circuit-switched bearer has been cleared first, the segments of a frame relay virtual circuit between a RFH and a FR DTE shall be cleared explicitly using X.36 signalling between a FR DCE and a DTE and internal signalling between a RFH and a FR DCE (see Figure 1). However, since the circuit-switched bearer has been cleared between an ISDN user and a RFH, the frame relay virtual circuit segment established between them can only be cleared internally in the ISDN user and the RFH without the exchange of any frame relay signalling messages.

Clearing of frame relay switched virtual circuits follows the procedures of ITU-T Rec. X.36. It is not required to clear the circuit-switched bearer after all frame relay virtual circuits within the bearer have been cleared. A circuit-switched bearer may remain established between an ISDN user and the RFH in the absence of any frame relay virtual circuit established within it.

7.5 Restart procedures

X.36 restart procedures for frame relay SVC apply.

For the circuit-switched bearer, the procedures of ITU-T Rec. Q.931 apply.

When the circuit-switched bearer is released by the restart procedures, all frame relay virtual circuits on that bearer (with the associated call reference value(s) and DLCI value(s)) are released, in a manner identical to that discussed in 7.4. Q.931 restart procedures do not apply to semi-permanently established bearers.

7.6 Handling of error conditions

Q.931 and X.36 procedures for handling of error conditions shall be followed.

7.7 Timers

Q.931 and X.36 timers are used.

Annex A

Additional procedures for Permanent Virtual Connection (PVC) status management (using Unnumbered Information frames)

This annex describes the means for notification of outage of a Permanent Virtual Connection, and recovery from such a condition. For implementations supporting only PVCs, the procedures given in this annex are applicable. These procedures may be initiated by a user equipment that supports PVCs and only Unnumbered Information (UI) frame transfer only. Optionally, these procedures may be initiated by the network for those networks that implement bidirectional status enquiry. These procedures are intended to be used only for operational purposes (rather than maintenance and management).

For implementation that requires coexistence of Switched Virtual Connections (SVC) and PVC on the same interface, the procedures of this annex are also used.

The procedures include:

a) notification of the addition of a PVC;

b) detection of the deletion of a PVC;

c) notification of the availability (active) or unavailability (inactive) state of a configured PVC:
   - inactive means that the PVC is configured but is not available to be used;
   - active means that the permanent virtual connection is available to be used;

d) link integrity verification.

The layer 3 messages are transferred across the bearer channel using layer 2 unnumbered information frames (as defined in ITU-T Rec. Q.922) on DLCI 0, with the poll bit set to 0. The forward explicit congestion notification, backward explicit congestion notification, and the discard eligibility indicator bits shall be set to 0 on transmission.

NOTE – Clause 11/X.36 defines functionality that is technically aligned with this annex although the wording is not identical. Additionally, the X.36 PVC signalling capabilities have been enhanced by the development of a segmentation capability. Equipment manufacturers and network service providers are encouraged to adopt clause 11/X.36 as the reference to the PVC management procedures in their product and service specifications.

Recognizing that this annex is extensively referenced in industry documentation, to ensure that existing implementations can claim compliance, the procedures defined in this annex remain in force. In the cases where clause 11/X.36 has been used as the definitive reference in equipment and network service specifications, compliance to clause 11/X.36 implies compliance to this annex.

A.1 Messages used for PVC status

The messages that use the dummy call reference for permanent virtual connection support in the frame relay service are STATUS and STATUS ENQUIRY. The messages used for PVC status are sent using the dummy call reference (see 4.3/Q.931) on DLCI = 0.

A.1.1 STATUS

This message is sent in response to a STATUS ENQUIRY message to indicate the status of permanent virtual connections or for a link integrity verification. Optionally, it may be sent at any time to indicate the status of a single PVC. See Table A.1.

Table A.1/Q.933 – STATUS message

Message Type: STATUS **Direction: Both** **Significance: Local**				
Information element	**Reference**	**Direction**	**Type**	**Length**
Protocol discriminator	4.2/Q.931	Both	M	1
Call reference	4.3/Q.931	Both	M	1
Message type	4.4/Q.931	Both	M	1
Report type	A.3.1	Both	M	3
Link integrity verification	A.3.2	Both	O (Note 1)	4
PVC status (Note 2)	A.3.3	Both	O (Note 3)	5-7 (Note 2)
NOTE 1 – Mandatory if the type of report is *full status* or *link integrity verification only*. Not included in the optional asynchronous status message (report type equal to single PVC asynchronous status). NOTE 2 – Included in the case of a full status message. This is a STATUS message that contains the status of all PVCs on the bearer channel. There is one PVC status information element for each permanent virtual circuit configured on that bearer channel. The PVC status information elements are arranged in the message in ascending order of DLCIs; the PVC with the lowest DLCI is first, the second lowest DLCI is second, and so on. The maximum number of PVCs that can be indicated in a message is limited by the maximum frame size. The optional asynchronous STATUS message contains a single PVC status information element. NOTE 3 – Mandatory if the report type information element indicated *full status* or *single PVC asynchronous status* and the bearer channel has PVCs configured.				

A.1.2 STATUS ENQUIRY

This message is sent to request the status of permanent virtual connections or to verify link integrity. Sending a STATUS message in response to a STATUS ENQUIRY message is mandatory. See Table A.2

Table A.2/Q.933 – STATUS ENQUIRY message

Message type: STATUS ENQUIRY **Direction: Both** **Significance: Local**				
Information element	**Reference**	**Direction**	**Type**	**Length**
Protocol discriminator	4.2/Q.931	Both	M	1
Call reference	4.3/Q.931	Both	M	1
Message type	4.4/Q.931	Both	M	1
Report type	A.3.1	Both	M	3
Link integrity verification	A.3.2	Both	M	4

A.2 Information elements

A.2.1 Protocol discriminator

See 4.2/Q.931.

A.2.2 Call reference

The dummy call reference value is used for these procedures. See 4.3/Q.931.

A.2.3 Message type

See 4.4/Q.931.

A.3 Information elements

A.3.1 Report type

The purpose of the Report type information element is to indicate the type of enquiry requested when included in a STATUS ENQUIRY message or the contents of the STATUS message. The length of this information element is 3 octets. See Figure A.1.

8	7	6	5	4	3	2	1	Octet
Report type information element identifier								
0	1	0	1	0	0	0	1	1
Length of report type contents								2
Type of report								3

Type of report (octet 3)

Bits

8765 4321

0000 0000 Full status (status of all PVCs on the bearer channel)

0000 0001 Link integrity verification only

0000 0010 Single PVC asynchronous status

All other values are reserved.

Figure A.1/Q.933 – Report type information element

A.3.2 Link integrity verification

The purpose of the link integrity verification information element is to exchange sequence numbers between the network and the user equipment on a periodic basis. The length of this information element is 4 octets. See Figure A.2.

8	7	6	5	4	3	2	1	Octet
Link integrity verification information element identifier								
0	1	0	1	0	0	1	1	1
Length of link integrity verification contents								2
Send sequence number								3
Receive sequence number								4

Send sequence number (octet 3)

The current send sequence number of the originator of the message. It is binary encoded.

Receive sequence number (octet 4)

The send sequence number received in the last received message. It is binary encoded.

Figure A.2/Q.933 – Link integrity verification information element

A.3.3 PVC status

The purpose of the PVC status information element is to indicate the status of existing PVCs on the bearer channel. This information element can be repeated, as necessary, in a message to indicate the status of all PVCs on the bearer channel. The length of this information element depends on the length of the DLCIs being used on the channel. The length of this information element is 5 octets when a default address format (2 octet) is used. See Figure A.3.

NOTE – Support of single PVC status is for further study.

8	7	6	5	4	3	2	1	Octet
	PVC status information element identifier							
0	1	0	1	0	1	1	1	1
Length of PVC status contents								2
ext. 0	Spare 0	Data link connection identifier (Most significant 6 bits)						3 (Note 1)
ext. 1	Data link connection identifier (2nd most significant 4 bits)				Spare 0	0	0	3a (Note 2)
ext. 1	Spare 0	0	0	New	Delete	Active	Reserved 0	4

NOTE 1 – Bit 6 of octet 3 is the most significant bit in the data link connection identifier.

NOTE 2 – When address extension octets are implemented, the format for octets 3b and 3c given in Figure 10.16/X.36 shall apply.

Data link connection identifier (octet 3 bits 6-1 and 3a bits 7-4)

Data link connection identifier is coded in binary.

New (octet 4)

Bit

4

0 PVC is already present

1 PVC is new

NOTE 3 – This bit has no significance in a single PVC asynchronous status.

Delete (octet 4)

Bit

3

0 PVC is configured

1 PVC is deleted

NOTE 4 – The delete bit is only applicable for timely notification using the optional single PVC asynchronous status report.

NOTE 5 – When this bit is set to "1", the new and active bits have no significance and shall be set to zero. The delete bit shall be set to "0" when the new or active bits have significance and are set to "1".

Active (octet 4)

Bit

2

0 PVC is inactive

1 PVC is active

NOTE 6 – If the A bit is set to zero in a PVC status information element, the end user should stop using the specified PVC. The network sets this bit to zero when the network determines that the PVC is not operational.

Figure A.3/Q.933 – PVC status information element for default 2-octet address

A.4 Procedures

These procedures use periodic polling to determine the status of PVC connections and to verify the integrity of the link.

A.4.1 Periodic polling

The user equipment initiates the polling described below. In the optional case where the procedures are initiated by the network, similar procedures apply with administration of sequence numbers as indicated in A.6.

If bidirectional procedures are implemented by the network, the network shall use STATUS ENQUIRY messages, and users shall respond with STATUS messages, as specified in these procedures.

1) Every T391 seconds, the user equipment sends a STATUS ENQUIRY message to the network and resets its polling timer (T391). The T391 interval between such messages is called the polling interval.

2) The STATUS ENQUIRY message typically requests a link integrity verification exchange only, (report type equal "0000 00001"). Every N391 polling cycles, the user equipment requests full status of all PVCs (report type equal "0000 0000").

3) The network responds to each STATUS ENQUIRY message with a STATUS message and resets the T392 timer, which is used by the network to detect errors (see A.5). If the STATUS ENQUIRY requests full status, it must be responded to with a STATUS message with the type of report specifying full status. The STATUS message sent in response to a STATUS ENQUIRY contains the link integrity verification and report type information elements. If the content of the report type information element specifies *full status*, then the STATUS message must contain one PVC status information element for each PVC configured on the bearer channel.

4) The user equipment shall parse the STATUS message depending upon the type of report. The network may respond to any poll with a full status message in case of a PVC status change or to report a newly added PVC on the bearer channel. If it is a full status message, the user equipment should update the status of each configured PVC.

5) The user equipment shall interpret the omission of a previously reported PVC from the full status message as an indication that the PVC is no longer provisioned for the bearer channel.

NOTE – The optional single PVC asynchronous STATUS message is not part of the periodic polling process.

A.4.2 Link integrity verification

The purpose of the link integrity verification information element is to allow the network and the user equipment to determine the status of the in-channel signalling link (DLCI 0). This is necessary since these procedures use unnumbered information (UI) frames at layer 2.

The user and the network maintain the following internal counters:

– the send sequence counter maintains the value of the send sequence number field of the last link integrity verification information element sent;

– the receive sequence counter maintains the value of the last received send sequence number field in the link integrity verification information element and maintains the value to be placed in the next transmitted received sequence number field.

The following procedure is used:

1) Before any messages are exchanged, the network and the user device set the send sequence counter and receive sequence counter to zero.

2) Each time the user equipment sends a STATUS ENQUIRY message, it increments the send sequence counter and places its value into the send sequence number field. It also places the current value of the receive sequence counter into the receive sequence number field of the link integrity verification information element. The user equipment increments the send sequence counter using modulo 256. The value zero is skipped.

3) When the network receives a STATUS ENQUIRY from the user equipment, the network checks the receive sequence number received from the user equipment against its send sequence counter. The handling of error conditions is described in A.5.

   The received send sequence number is stored in the receive sequence counter. The network then increments its send sequence counter and places its current value in the send sequence number field and the value of the receive sequence counter (the last received send sequence number) into the receive sequence number field of the outgoing link integrity verification information element. The network then transmits the completed STATUS message back to the user equipment. The network equipment increments the send sequence counter using modulo 256. The value zero is skipped.

4) When the user equipment receives a STATUS from the network in response to a STATUS ENQUIRY, the user equipment checks the receive sequence number received from the network against its send sequence counter. The handling of error conditions is described in A.5. The received send sequence number is stored in the receive sequence counter.

NOTE – The value zero in the receive sequence number indicates that the field contents are undefined, this value is normally used after initialization. The value zero shall not be sent in the send sequence number field so that the receive sequence number shall never contain the value zero to differentiate the undefined condition from the normal modulo round off.

A.4.3 Reporting new PVCs

One of the functions of periodic polling is to notify the user equipment of newly added permanent virtual circuits using a full status message. The PVC reporting procedure using a full status message ensures that a permanent virtual circuit cannot be deleted and another added using the same DLCI without the user equipment detecting the change. The PVC reporting procedures are defined as follows:

1) When a new permanent virtual circuit has been added, the network sets the new bit to 1 in the PVC status information element for that PVC in a full status STATUS message.

2) The network shall not clear the new bit in the PVC status information element until it receives a STATUS ENQUIRY message containing a receive sequence number equal to the send sequence counter (i.e., the send sequence number transmitted in the last STATUS message).

3) When the user equipment receives a full status message containing a PVC status information element identifying an unknown DLCI and the new bit is set to 1, the user equipment marks this PVC as new and adds it to its list of PVCs.

NOTE – The procedures for reporting of new PVCs are not supported by asynchronous status messages.

A.4.4 Reporting the availability of a PVC

The user equipment uses the PVC status message to detect a change in status of configured PVCs. As described in A.4.1, every N391 polling interval the user equipment sends a STATUS ENQUIRY message with a report type of full status. The network responds with a STATUS message containing a PVC status information element for each PVC configured on that bearer channel. Each PVC status information element contains an active bit indicating the availability or unavailability of that PVC.

The action of the user equipment based on the value of the active bit is independent of the action based on the new bit. The user equipment could get a PVC status information element with the new bit set to 1 and the active bit set to 0.

If the user equipment receives a PVC status information element with the active bit set to 0, the user equipment shall stop transmitting frames on the PVC until it receives a PVC status information element for that PVC with the active bit set to 1. Other action taken by the user equipment is implementation dependent.

Since there is a delay between the time the network makes a PVC available and the time it transmits a PVC status information element notifying the user equipment, there is a possibility of the user equipment receiving frames on a PVC marked as unavailable. The action the user equipment takes on receipt of frames on an unavailable PVC is implementation dependent.

Since there is a delay between the time the network detects that a PVC has become unavailable and the time it transmits a PVC status information element notifying the user equipment, there is a possibility of the network receiving frames on an unavailable PVC. The action the network takes on receipt of frames for an unavailable PVC is network dependent and may include the dropping of frames on the unavailable PVC.

See the following clause for conditions under which the network sets the active bit to zero.

A.5 Error conditions

The frame relay network and the user equipment use the information provided by periodic polling for error monitoring. The network and user equipment detect the following error conditions:

– In-channel signalling link (DLCI 0) reliability errors (i.e., non-receipt of STATUS/STATUS ENQUIRY messages or invalid sequence numbers in a link integrity verification information element).

– Signalling link protocol errors. See 10.10/X.36 (i.e., protocol discriminator, message type, call reference and mandatory information element errors). Ignore messages (including their sequence numbers) containing these errors.

NOTE – If the user or network were to count an error once when receiving a message that it does not recognize, and a second time for non-receipt of a STATUS or STATUS ENQUIRY message, the user or network would have counted the same error twice, inflating the user or network error counts. No errors should be counted in this case.

Errors are detected as anomalies in the timing or content of events.

The network and user equipment can also detect and act on errors not described in this clause (e.g., layer 1 errors, frame check sequence errors, and protocol errors with each PVC).

A.5.1 Network operation errors

The network shall set the active bit to 0 if it detects a service affecting condition within the network (not defined here).

The network increments the error count when any of the following reliability errors are encountered:

– Non-receipt of a STATUS ENQUIRY within T392, which results in restarting T392.

– Invalid contents of a link integrity verification information element. This consists of an invalid receive sequence number. The received receive sequence number is not valid when it is not equal to the last transmitted send sequence number. Follow the procedures in A.4.2, item 2 (as a result, the receive send sequence number is processed, allowing the user to accept the STATUS message. Note that the error count is incremented). Reply with the requested type of report and restart T392.

When a signalling link protocol error occurs, the user ignores the entire message. As a result, T391 expires and the user increments the error count.

A.5.2 User equipment operation errors

The user equipment detects the following errors at the user-to-network interface:

– On receipt of a STATUS message with type of report set to link integrity verification in response to a STATUS ENQUIRY message with type of report set to full status, the message is ignored. When timer T391 expires, the user increments the error count.

– Upon receipt of an unsolicited STATUS message with type of report set to full status or link integrity verification, the message shall be ignored, and the error count shall be incremented.

– Non-receipt of a STATUS message with type of report equal to full status or link integrity verification in a polling interval (within T391 seconds) after transmission of a STATUS ENQUIRY. When timer T391 expires, increment the error count.

  NOTE 1 – If the unanswered STATUS ENQUIRY requested full status, the user equipment shall again request full status.

– Invalid contents of a link integrity verification information element. This consists of detecting an invalid receive sequence number. The received receive sequence number is not valid if it is not equal to the last transmitted send sequence number. Ignore messages containing this error. As a result, timer T391 expires and the user then increments the error count.

NOTE 2 – Using the send sequence number of a STATUS message containing an invalid receive sequence number may cause the user to acknowledge a STATUS message containing a full status report that has been ignored (i.e., acknowledgment of the new bit and deletion status).

NOTE 3 – Asynchronous status messages do not satisfy the requirement for a STATUS message in a given polling interval.

In addition to the above error conditions, when a signalling link protocol error occurs, the user ignores the entire message. As a result, T391 expires and the user increments the error count.

The loss of a frame at layer 2 (e.g., CRC error) will be detected by non-receipt of a STATUS or STATUS ENQUIRY.

An event is defined as transmission of a STATUS ENQUIRY message.

Following the detection of a service affecting condition at the user-network interface, the user equipment should stop transmission of frames on all PVCs on the bearer channel. The user equipment should continue link verification procedures to detect service restoration. One method of determining a service affecting condition is by detecting N392 errors in the last N393 events. The user equipment also may use other methods for detecting service affecting conditions.

When the user equipment detects that the service affecting condition is cleared, it resumes normal operation of active PVCs on the bearer channel. One method to detect service restoration is by detecting that N392 consecutive events have occurred without error.

This procedure detects problems with the in-channel signalling link (DLCI 0) and does not detect problems with individual PVCs.

If the user equipment receives a PVC status information element for a PVC not currently defined and the new bit is set to 0, the user equipment records this as an error and adds the PVC to the active PVCs. Other actions taken by the user equipment are implementation dependent.

If the user equipment receives a full status STATUS message from the network that is missing a PVC status information element for a PVC that the user equipment currently is using, the user equipment shall remove that PVC from its list of PVCs.

A.6 Optional bidirectional network procedures

Bidirectional procedures at the UNI are optional for both the user and network. Use of these procedures must be bilaterally agreed between user and network.

Bidirectional procedures mean that there is symmetrical operation on the bearer channel where both the "user side" procedures and "network side" procedures defined in this annex are operating concurrently on each end of the bearer channel.

Two sets of local in-channel signalling parameters are administered for a given bearer channel as shown below:

- User side procedures – T391, N391, N392 and N393.
- Network side procedures – T392, N392 and N393.

One set of parameters is used when the network or user equipment is providing the "user side procedures" which sends the polling messages (status enquiries). The other set of parameters is used when the network or user equipment is providing the "network side procedures" which sends a response (status message) to each polling message.

Both ends of the bearer channel are required to initiate STATUS ENQUIRY messages based on T391. A full status report is requested every N391 (default 6) polling cycles. This periodic polling process is described in A.4.1 and A.4.2.

When it is first activated, the user equipment (or network) shall consider the bearer channel to be non-operational. When the user equipment (or network) observes one of the following events on the bearer channel, it shall consider that bearer channel to be operational:

- N393 consecutive valid polling cycles occur.
- As an alternative, one valid polling cycle occurs. That is, if the first polling cycle constitutes a valid exchange of sequence numbers, then the bearer channel shall be considered operational. If the first polling cycle results in an error, then the bearer channel shall be considered non-operational until N393 consecutive valid polling cycles occur at the local interface.

Later (after it has once been considered operational), the bearer channel is considered non-operational following detection of a service affecting condition (see A.5) at the user-to-network interface, and it is considered operational following detection of service restoration.

The network shall report a PVC as "active" to the local user (i.e., active bit = 1) only if all the following criteria are met:

1) The PVC is configured in the network.
2) The network considers the bearer channel to be operational, as specified above.
3) The PVC is operational within the network (i.e., no service affecting condition exists within the network or at the remote user-to-network interface).
4) The remote user, when required to support bidirectional procedures, reports that the PVC is active by setting the active bit = 1 in a PVC status information element.

Whenever these criteria are not fully met, the PVC status information element active bit indication shall be set to 0.

The PVC status information element active bit indication sent by a user shall be propagated by the network towards the remote user associated with the PVC (in conjunction with the four points defined above).

The presence or absence of a PVC status information element in a full status report sent by a user indicates the presence or absence of the user's DLCI within the bearer channel.

A full status report sent by the user must contain one PVC status information element for each PVC configured by the user equipment on the bearer channel. The network shall update the active status of each PVC configured by the network on the bearer channel, and shall interpret the omission of a previously reported PVC from the full status report as an indication that the PVC is no longer configured by the user equipment on the bearer channel. Removal of a PVC configuration by the user does not necessarily cause the network or the remote user to remove its configuration.

If the network detects that a user has deleted a PVC status information element from a full status report, then an inactive status is propagated by the network to the remote user associated with the PVC (i.e., the PVC status information element active bit indication is set to 0).

The network operation error conditions described in A.5.1 apply to the network side procedures. The user equipment operation errors described in A.5.2 apply to the user side procedures.

A.7 System parameters

Tables A.3 and A.4 summarize the acceptable values for the configurable parameters described in these procedures. Parameter values other than the default values are a subscription option.

Table A.3/Q.933 – System parameters – Counters

Counter	Description	Range	Default	Usage	User or Network
N391	Full status (status of all PVCs) polling counter	1-255	6	Polling cycles	User and network (Note 3)
N392	Error threshold	1-10 (Note 1)	3	Errors	Both
N393	Monitored events count	1-10 (Note 2)	4	Events	Both
NOTE 1 – N392 should be less than or equal to N393. NOTE 2 – If N393 is set to a value much less than N391, then the link could go in and out-of-error condition without the user equipment or network being notified. NOTE 3 – N391 always applies to the user equipment. It applies to the user and network if the optional bidirectional network procedures are invoked (see A.6).					

Table A.4/Q.933 – System parameters – Timers

Timer	Description	Range (seconds)	Default (seconds)	Started	Stopped	Actions taken when expired
T391 (Note 2)	Link integrity verification polling timer	5-30	10	Transmit STATUS ENQUIRY	–	Transmit STATUS ENQUIRY. Record error if STATUS message not received
T392 (Note 3)	Polling verification timer	5-30 (Note 1)	15	Transmit STATUS	Receive STATUS ENQUIRY	Record error by incrementing N392. Restart
NOTE 1 – T392 should be greater than T391. NOTE 2 – T391 always applies to the user. It applies to the user and network if the optional bidirectional network procedures are invoked (see A.6). NOTE 3 – T392 always applies to the network. It applies to the network and user equipment if the optional bidirectional network procedures are invoked (see A.6).						

A.8 Annex A SDL specification

These SDLs are intended to complement, not replace or substitute the narrative description contained in A.1 and A.7. Should any discrepancy arise, the text from A.1 to A.7 shall take precedence.

NOTE – The following is a summary of the abbreviations used in the SDLs.

The two sides of communication are called A and B respectively. A is the User side and B is the Network side.

For the case of Annex A/Q.933 bidirectional procedures, both A and B sides of the interface implement the polling (Enquiry) and polled (Response) procedures of this Annex A/Q.933.

The following naming conventions are used:

Ae	A side using Enquiry (e) message
Br	B side replies with Status Response message (r)
LIV	The Link Integrity Verification Information Element in SE or S messages
LIV.rsn	The field of receive sequence number in LIV
LIV.ssn	The field of send sequence number in LIV
RcvSeqCnt	Receive Sequence Counter
RT	The Report Type in SE or S messages
S	Status message
SE	Status Enquiry message
SndSeqCnt	Send Sequence Counter

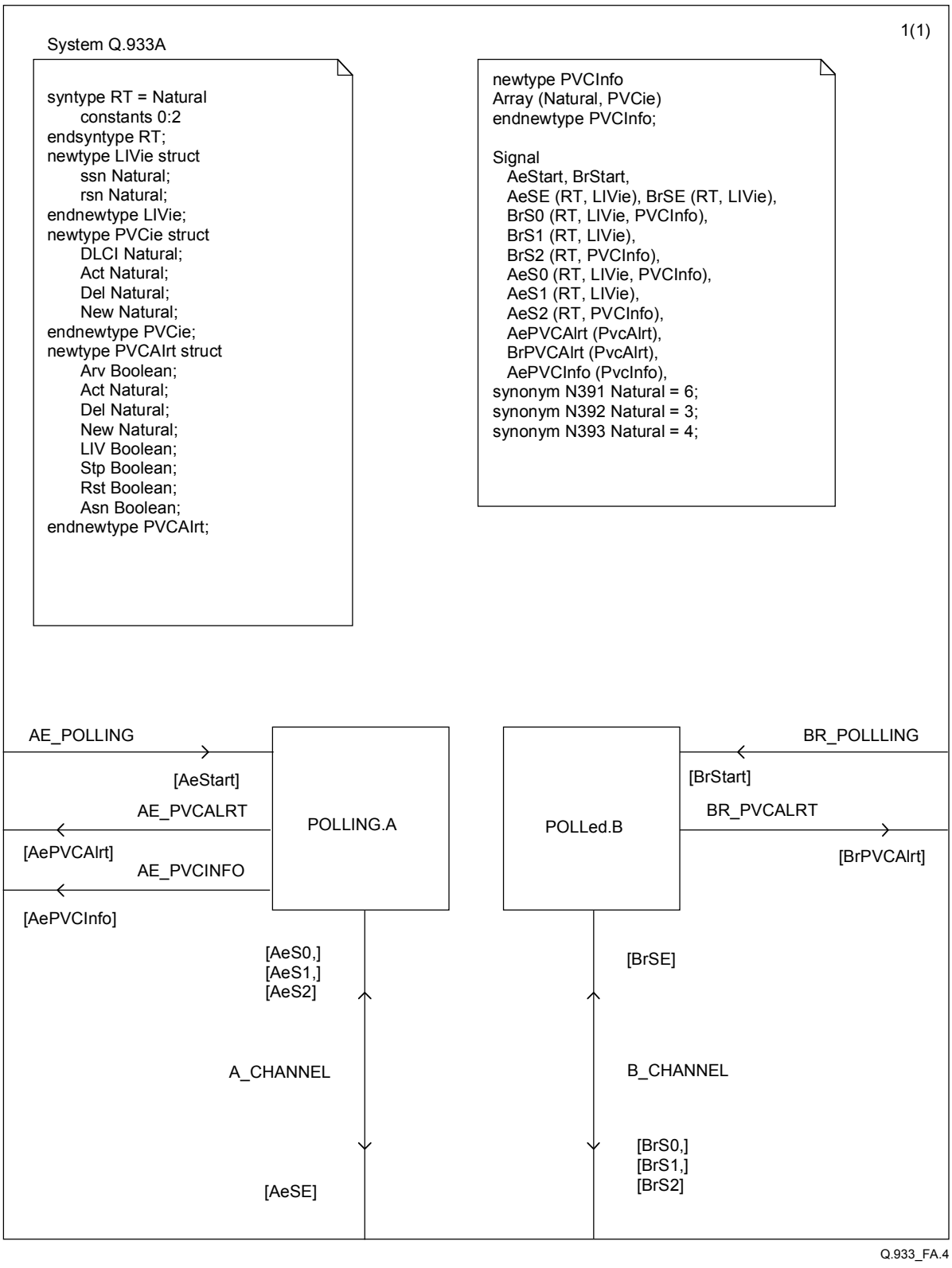


Figure A.4/Q.933 – System Q.933A

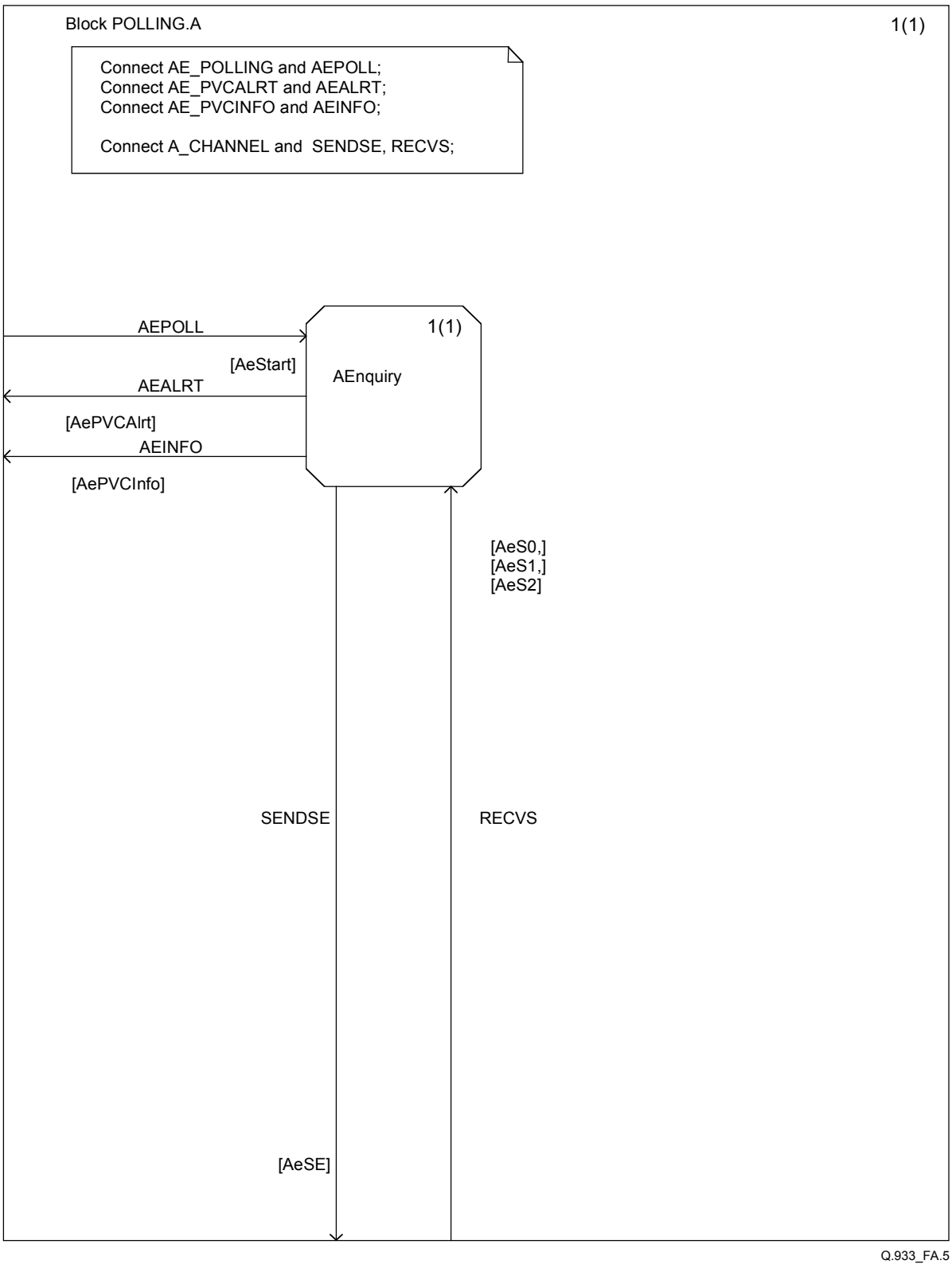


Figure A.5/Q.933 – Block POLLING.A

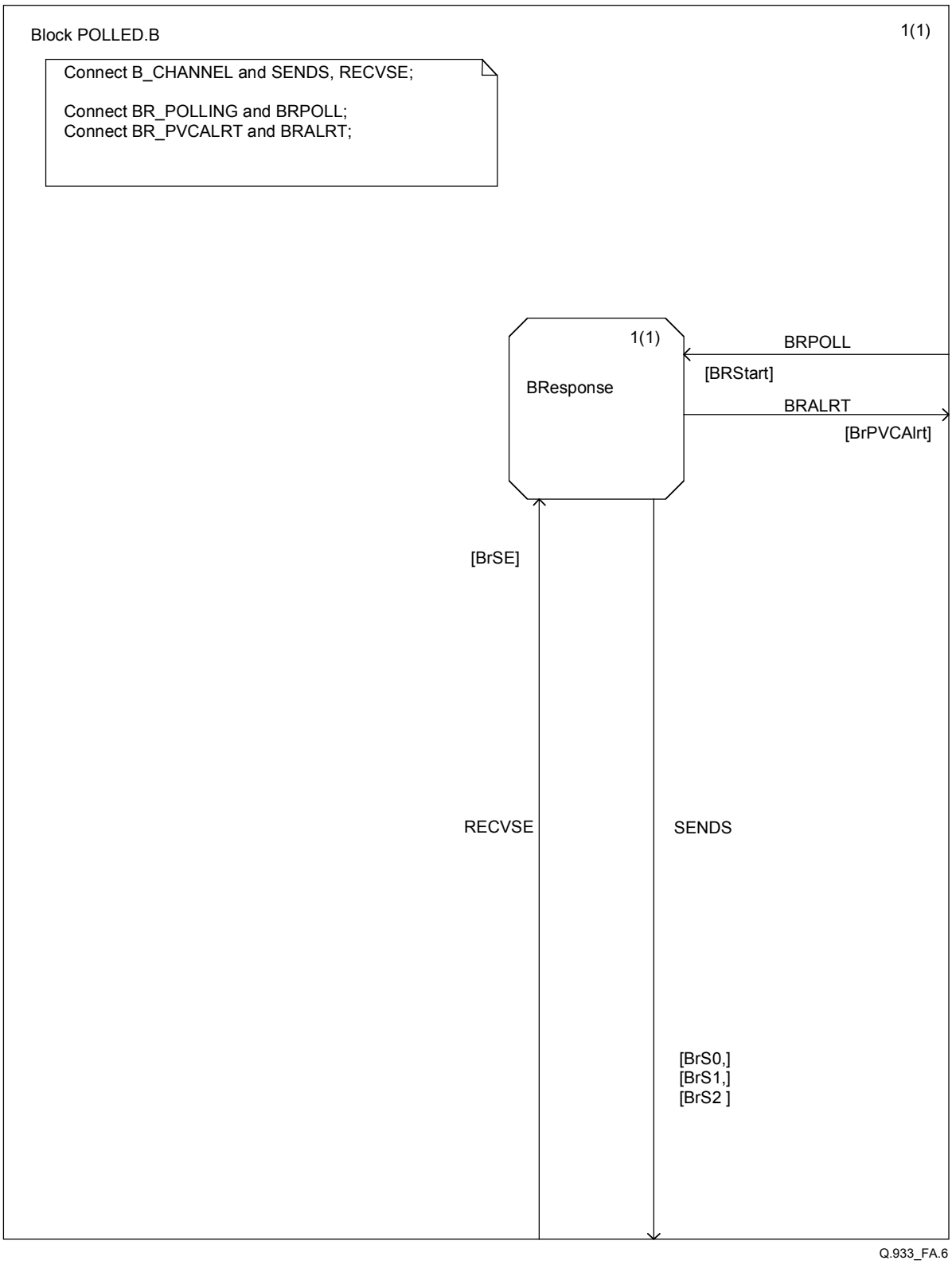


Figure A.6/Q.933 – Block POLLED.B

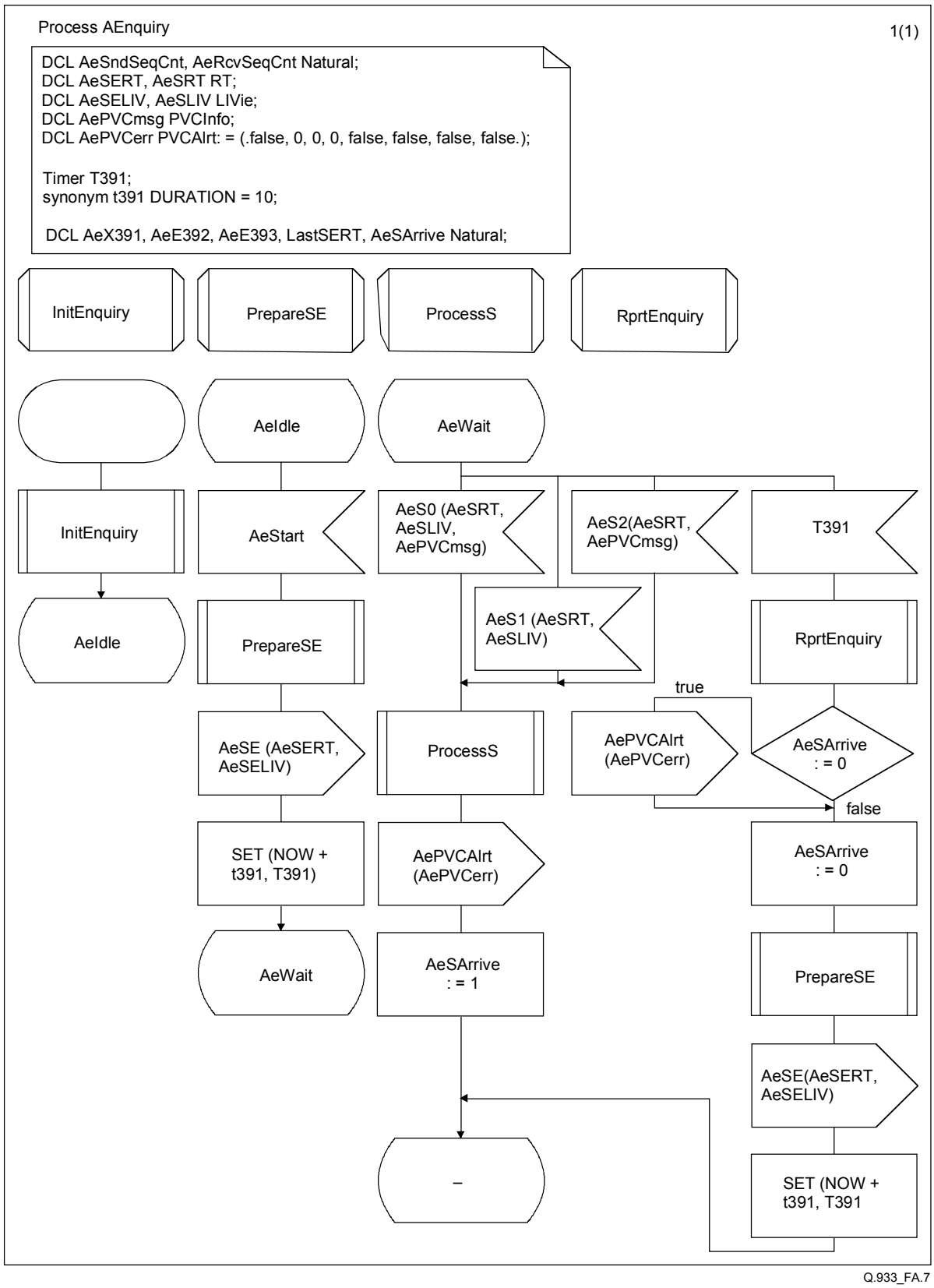


Figure A.7/Q.933 – Process AEnquiry

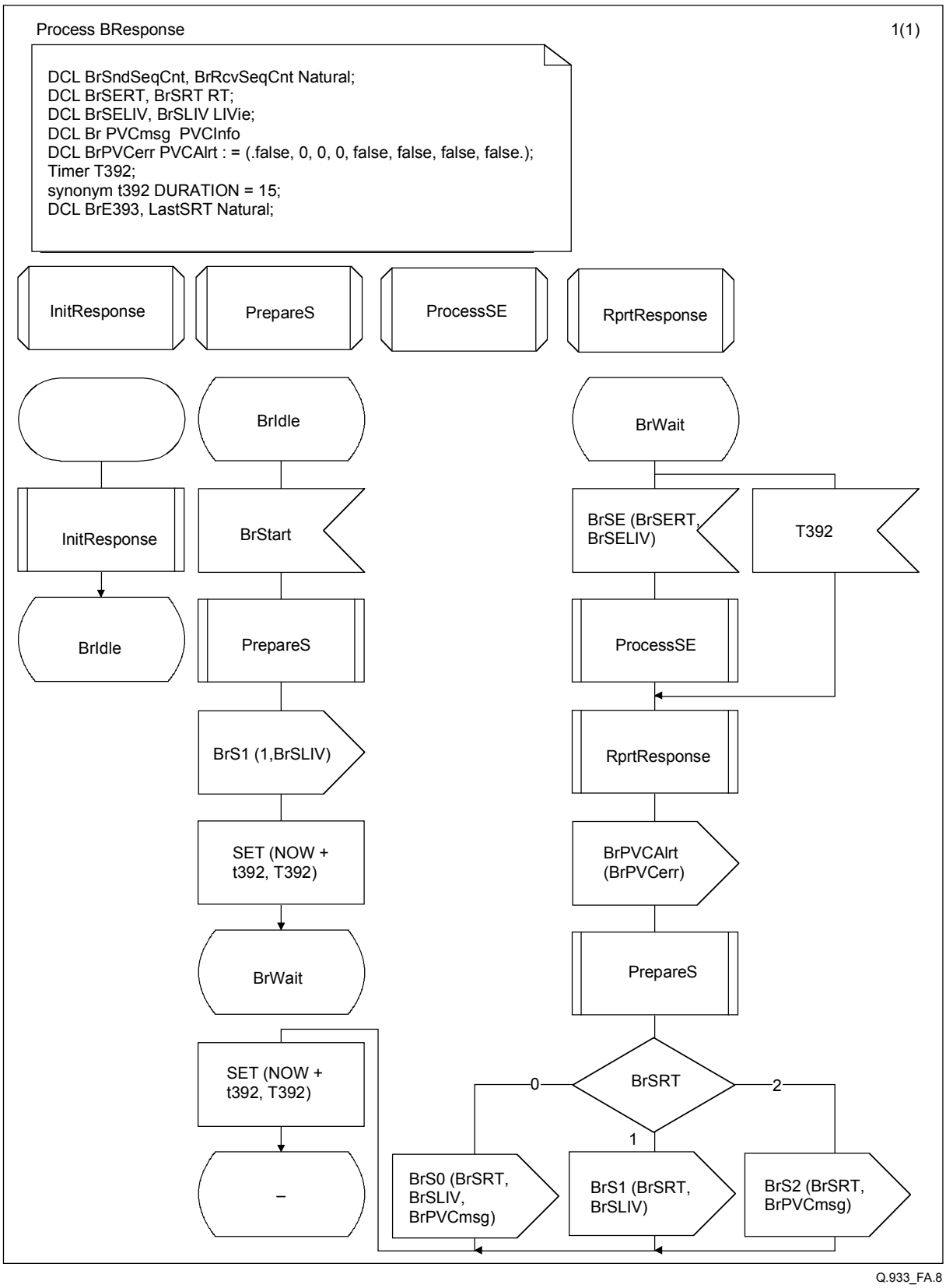


Figure A.8/Q.933 – Process BResponse

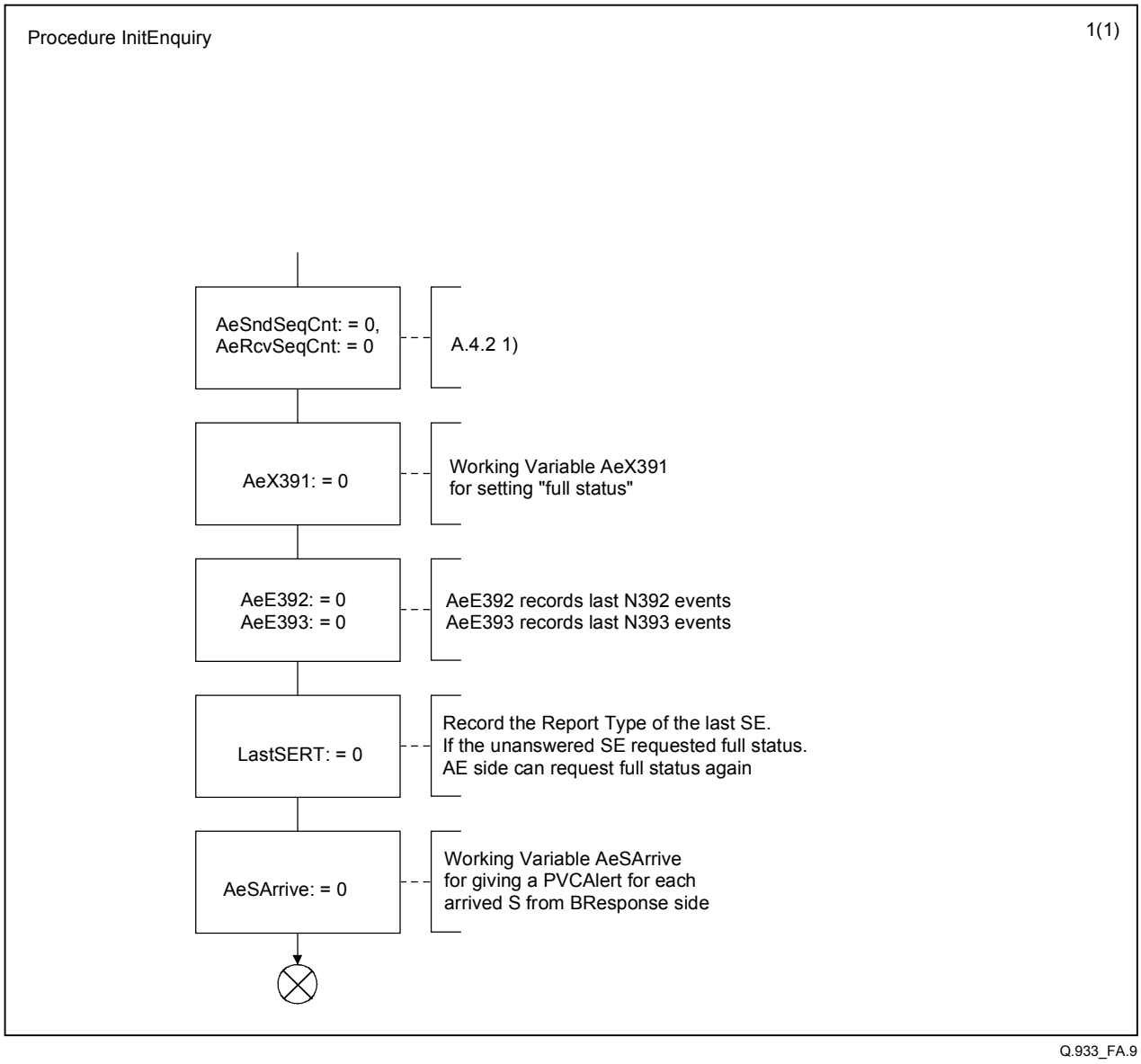


Figure A.9/Q.933 – Procedure InitEnquiry

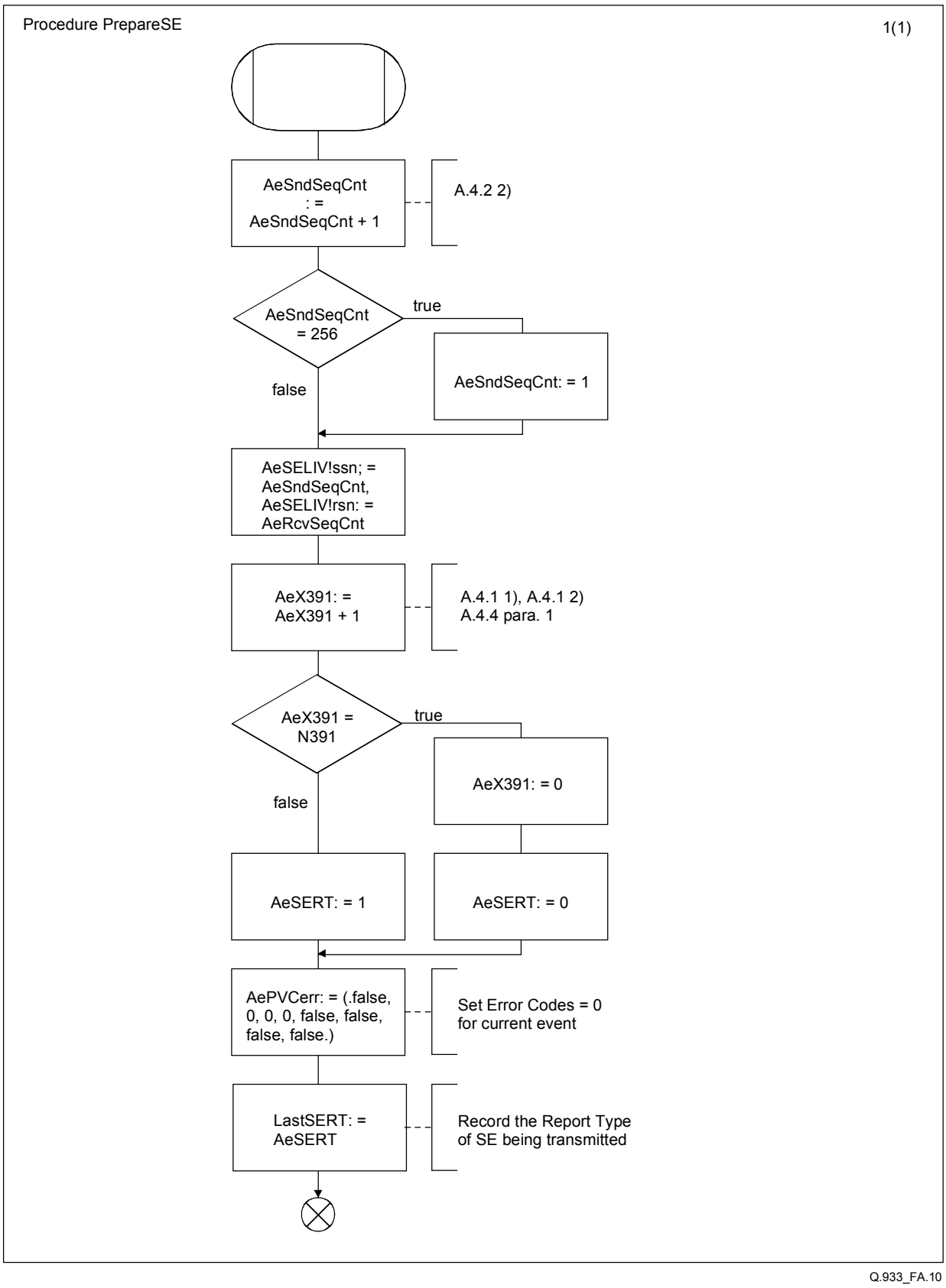


Figure A.10/Q.933 – Procedure PrepareSE

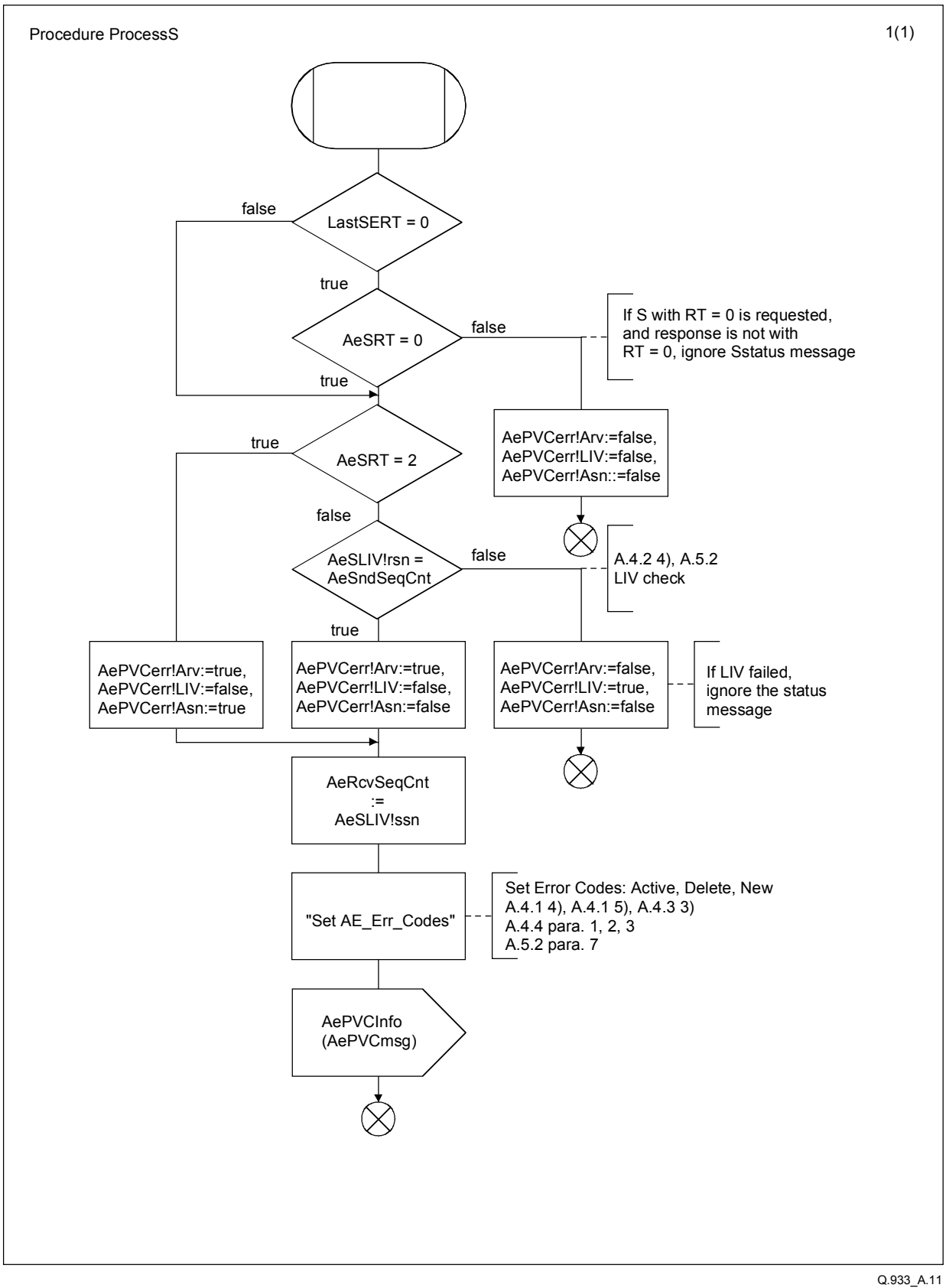


Figure A.11/Q.933 – Procedure ProcessS

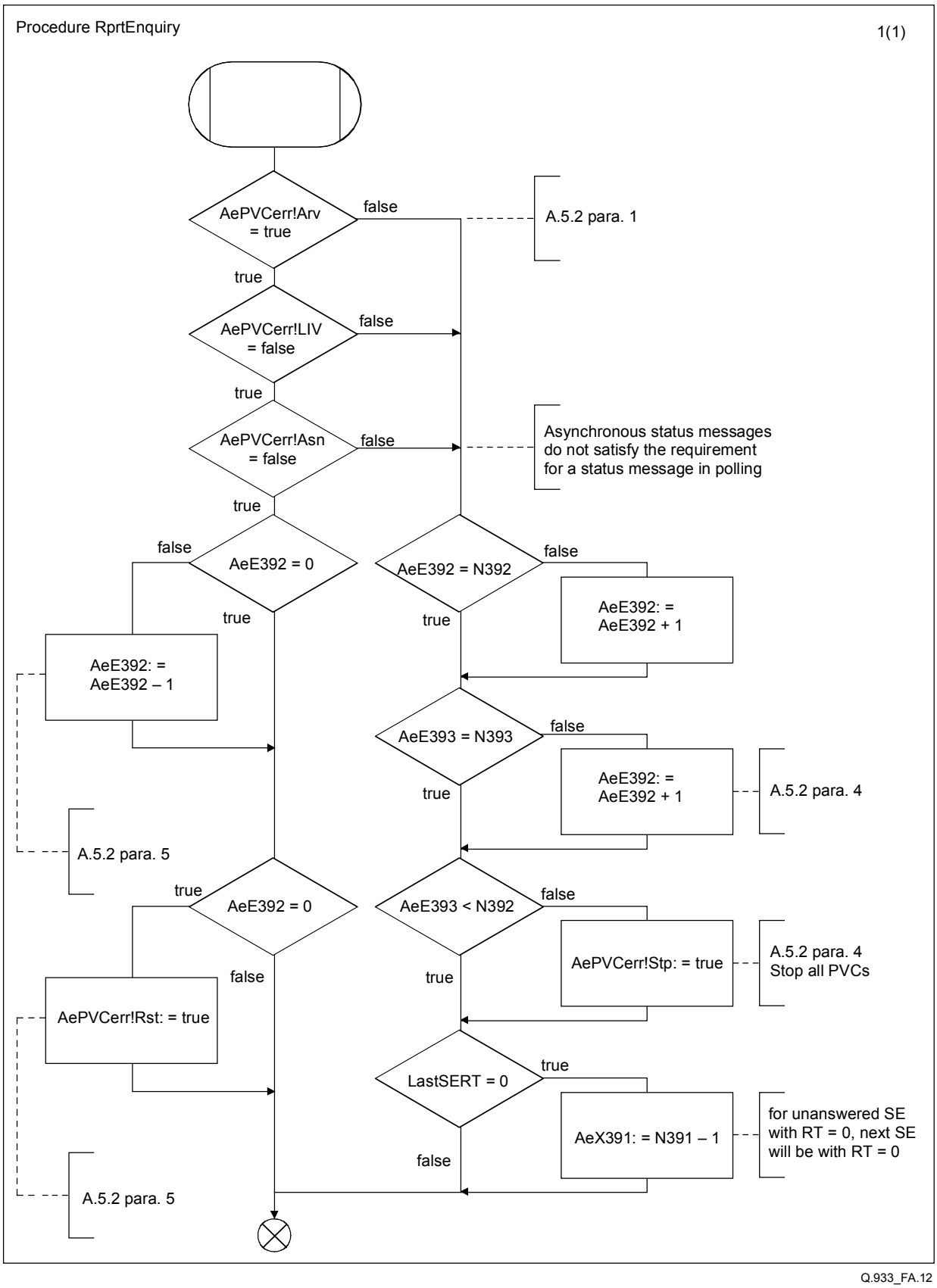


Figure A.12/Q.933 – Procedure RprtEnquiry

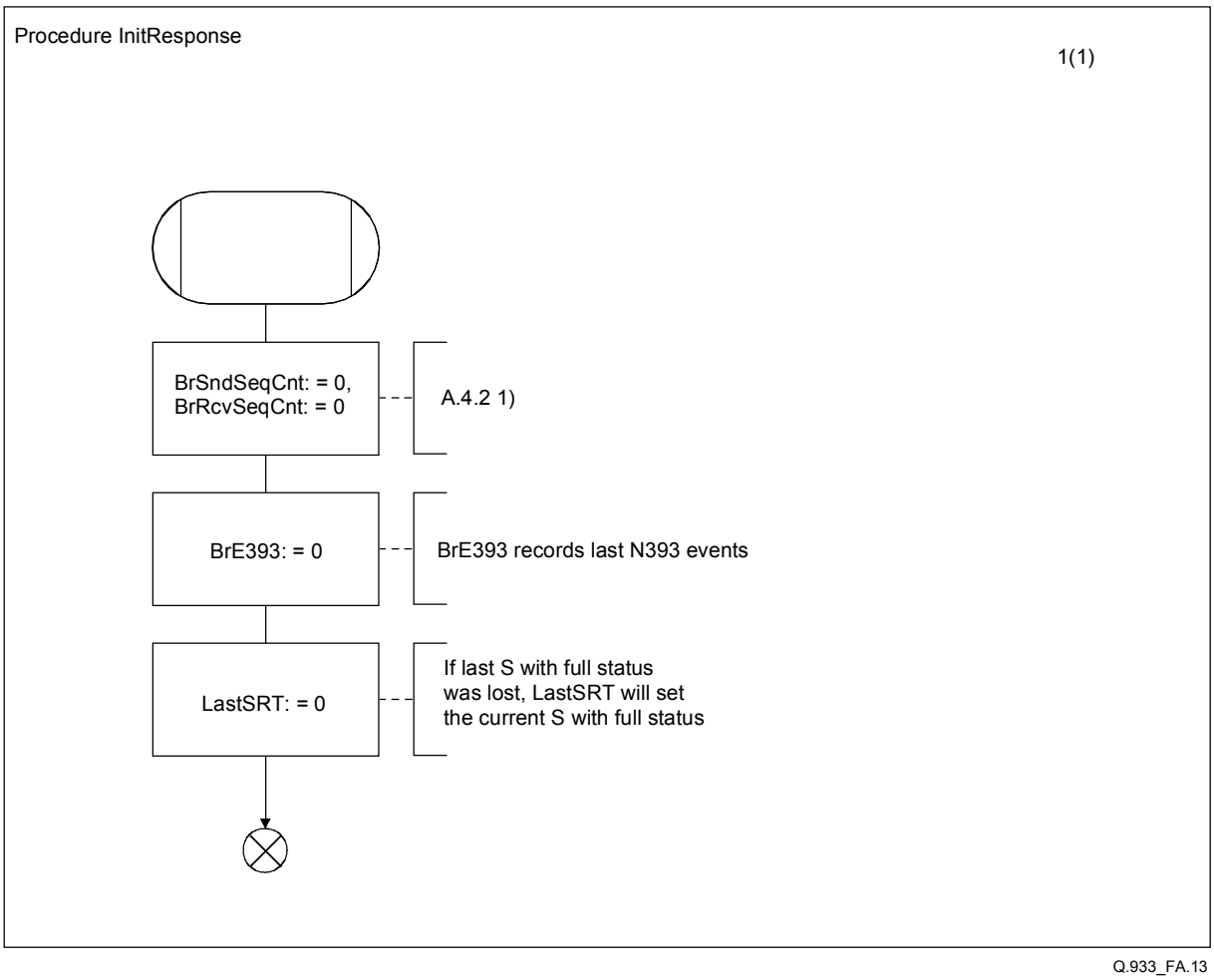


Figure A.13/Q.933 – Procedure InitResponse

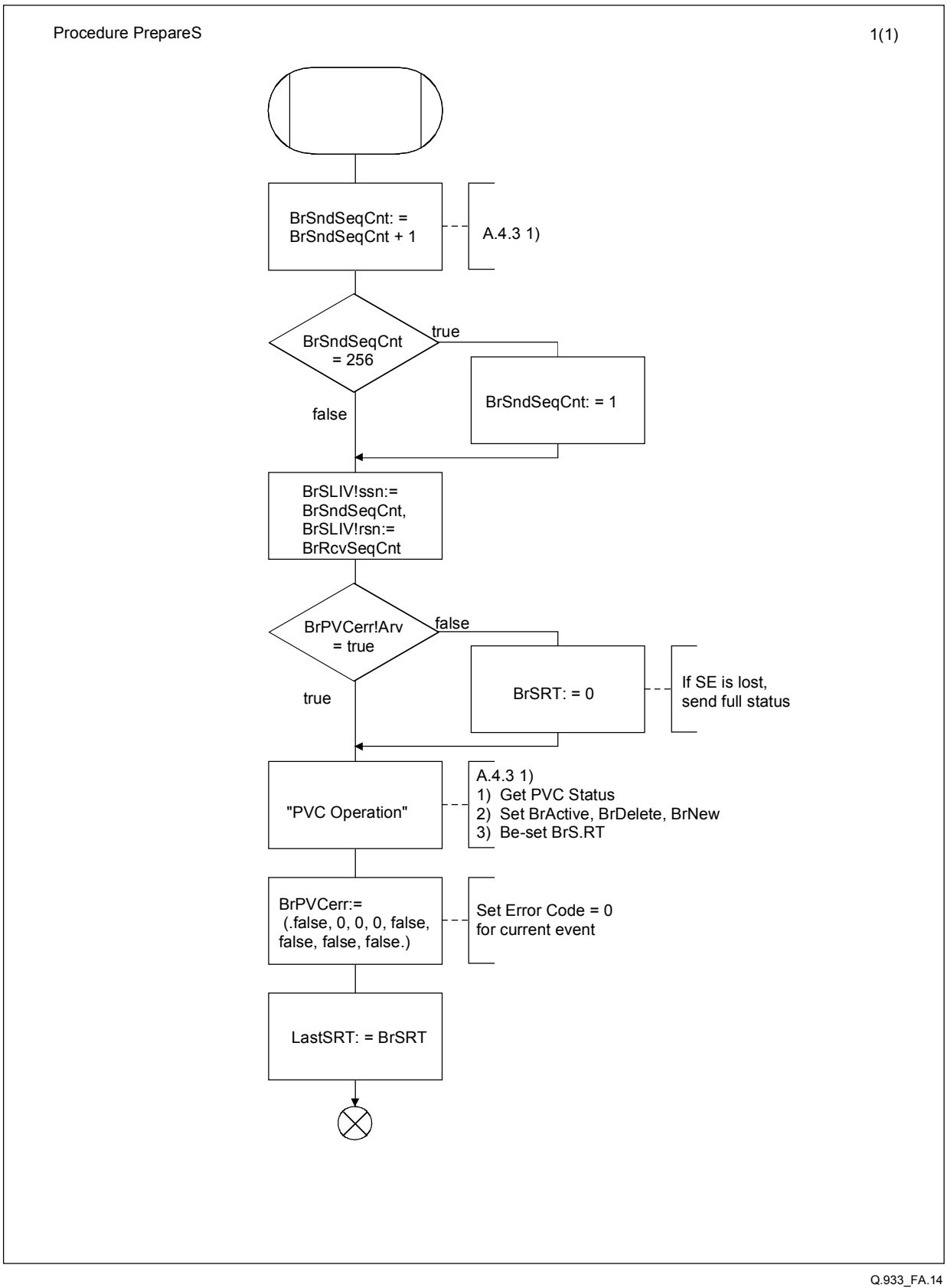


Figure A.14/Q.933 – Procedure PrepareS

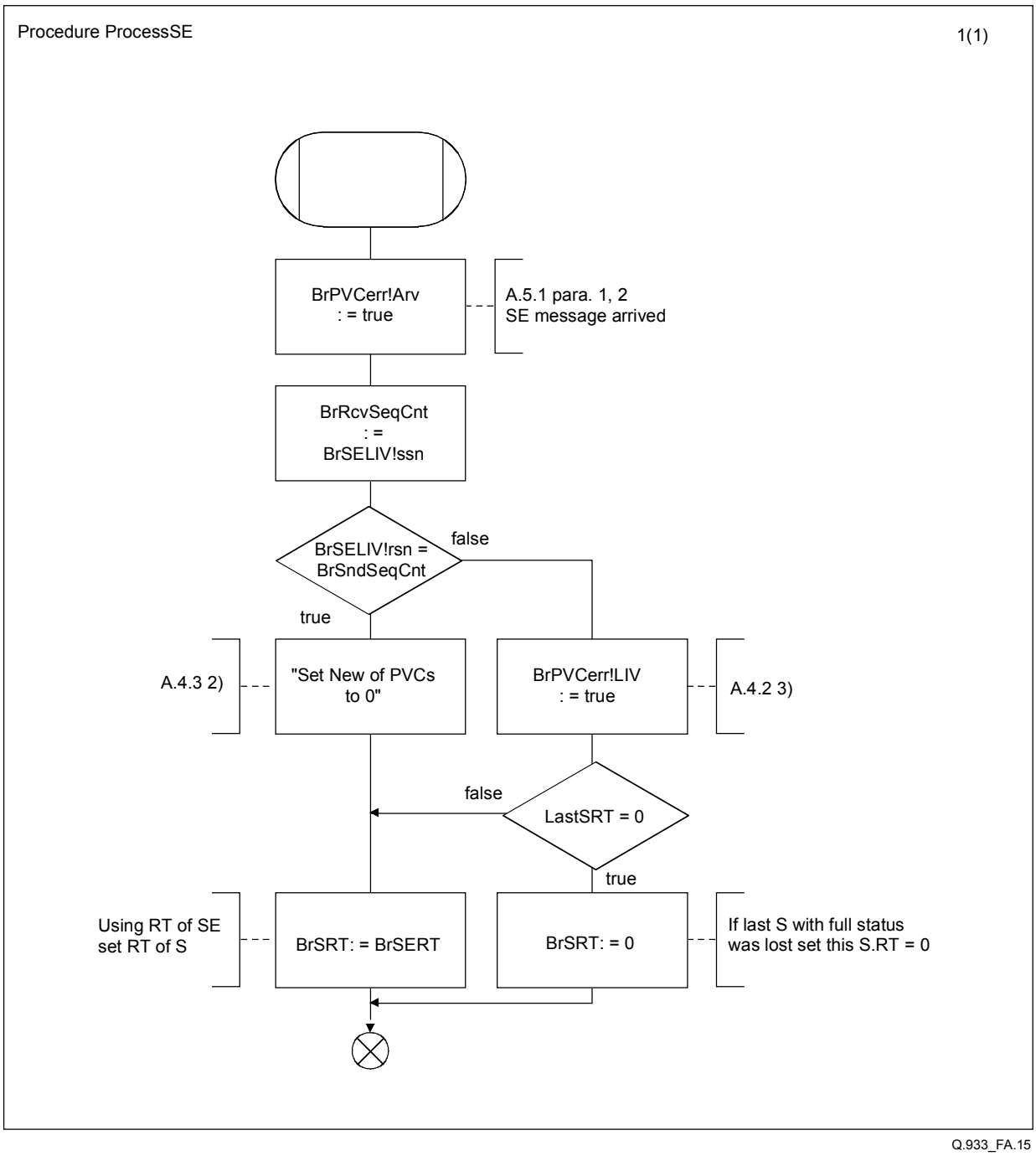


Figure A.15/Q.933 – Procedure ProcessSE

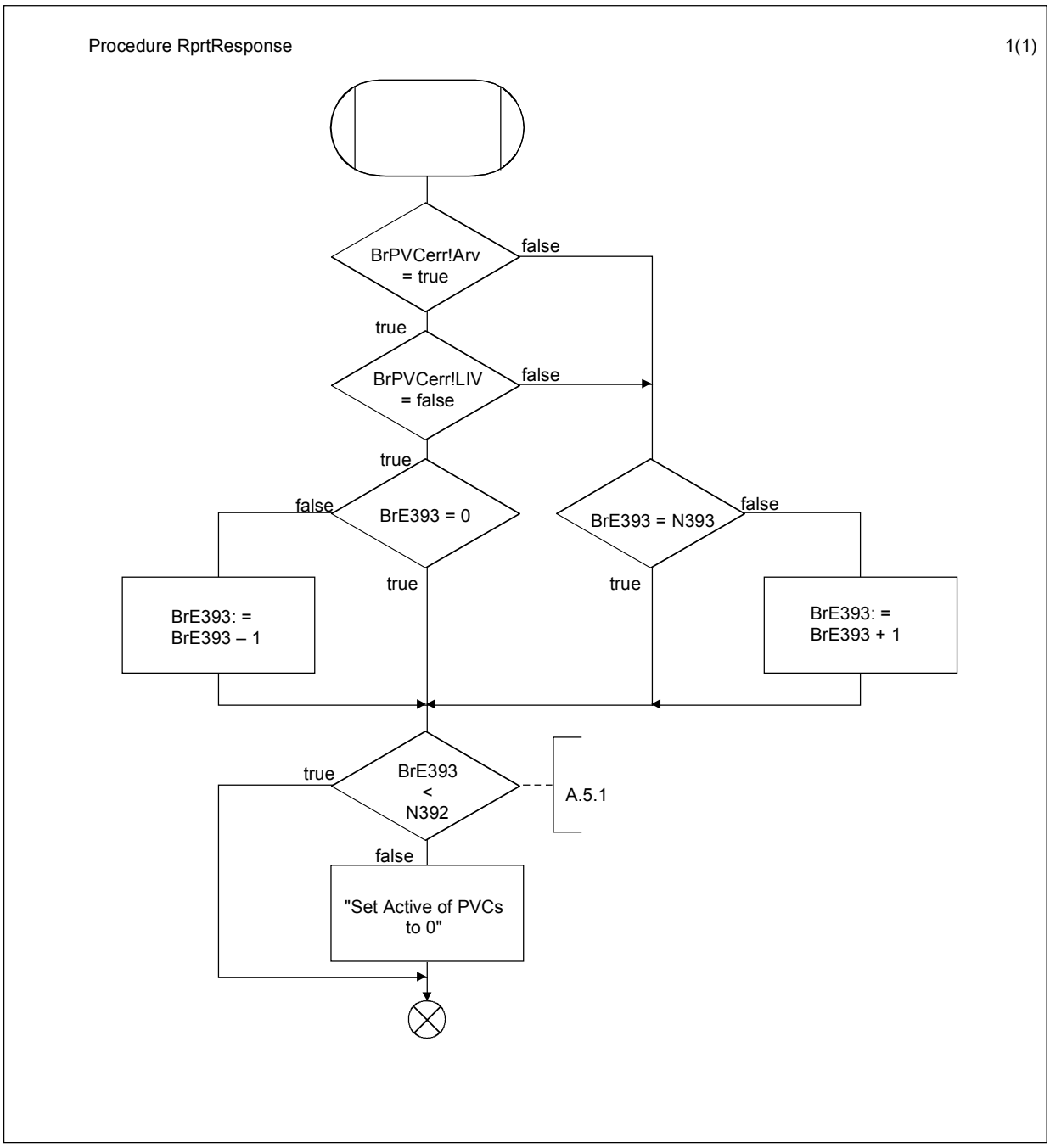


Figure A.16/Q.933 – Procedure RprtResponse

Annex B

Additional procedures for permanent frame relay connection using acknowledged mode of operation

(This annex in ITU-T Rec. Q.933 (1993) has been deleted and is no longer part of this Recommendation)

Annex C

Provision of OSI connection mode network services (NC-establishment and release phases)

(This annex in ITU-T Rec. Q.933 (1995) has been deleted and is no longer part of this Recommendation)

Annex D

PICS proforma for Annex A[1)]

D.1 Introduction

The supplier of a protocol implementation claiming to conform to Annex A/Q.933 shall complete the following Protocol Implementation Conformance Statement (PICS) proforma and accompany it by the information necessary to identify fully both the supplier and the implementation.

The PICS is a document specifying the capabilities and options which have been implemented, and any features which have been omitted, so that the implementation can be tested for conformance to relevant requirement only.

This PICS has several uses, the most important are the static conformance review and test case selection in order to identify which conformance tests are applicable to this product. The PICS proforma is a document, in the form of a questionnaire, normally designed by the protocol specifier or conformance test suite specifier which, when completed for an implementation or system, becomes the PICS.

This PICS proforma applies to both network side and user side of implementations.

D.1.1 Abbreviations and special symbols

This annex uses the following terms defined in ITU-T Rec. X.290 | ISO/IEC 9646-1.

C	Conditional.
IUT	Implementation Under Test – An implementation of one or more OSI protocols in an adjacent user/provider relationship, being that part of an open system which is to be studied by testing.
M	Mandatory.
N/A	Not applicable.
No	Not supported.

1) Copyright Release for PICS proformas: Users of this Recommendation may freely reproduce the PICS proforma in this annex, so that it can be used for its intended purpose, and may further publish the completed PICS.

O	Optional.
o.<n>	Optional, but support required for either at least one or only one of the options in the group labelled with the same numeral <n>.
PICS proforma	A PICS proforma is a document, in the form of a questionnaire, designed by the protocol specifier or conformance test suite specifier, which when completed for an OSI implementation or system becomes the PICS.
PICS	A Protocol Implementation Conformance Statement (PICS) is a statement made by the supplier of an OSI implementation or system, stating which capabilities have been implemented, for a given OSI protocol.
S/E	Supplementary/Exceptional implementation information.
SCR	A Static Conformance Review (SCR) is a review of the extent to which the static conformance requirements are met by the IUT, accomplished by comparing the PICS with the static conformance requirements expressed in the relevant OSI International Standard(s) or ITU-T Recommendation(s).
SCS	A System Conformance Statement (SCS) is a document supplied by the client or product supplier that summarizes which OSI International Standards or ITU-T Recommendations are implemented, and to which conformance is claimed.
sp.<n>	Status predicate – The status of this item is conditional based on the expression indicated by <n> in the predicate list.
SUT	System Under Test – The open system in which the IUT resides.
X	Prohibited use.
Yes	Supported.

D.1.2 Instructions for completing the PICS proforma

D.1.2.1 Identification of the implementation

Identification of the Implementation Under Test (IUT) and the system in which it resides (the System Under Test or SUT) should be filled out to provide as much detail as possible regarding version numbers and configuration options.

The product supplier and client information should both be filled out if they are not one and the same.

A person who can answer queries regarding information supplied in the PICS should be named in the contact person section.

The PICS/SCS section should describe the relationship of this PICS to the SCS.

D.1.2.2 Global statement of conformance

If the answer to the statement in this section is "Yes", all subsequent sections shall be completed to facilitate selection of test cases for optional functions.

If the answer to the statement in this section is "No", all subsequent sections should be completed, and all non-supported mandatory capabilities shall be identified and explained in the comments section of each table.

D.1.2.3 Filling out the PICS proforma

The main part of the PICS proforma is a fixed-format questionnaire, divided into two sections. Answers to the questionnaire are to be provided in the right most column. Answering "Yes" to a particular question states that the implementation supports all the mandatory procedures for

transmission and receipt of that function defined in the indicated references of Annex A/Q.933 (1993). Answering "No" to a particular question in this section states that the implementation does not support that function of the protocol.

A supplier may also provide additional information, categorized as either exceptional information or supplementary information. When present, each kind of additional information is to be provided as items labelled as E.<i> or S.<i> for cross reference purposes, where <i> is any unambiguous identification for the item. An exception item should contain the appropriate rationale. The supplementary information is not mandatory and the PICS is complete without such information.

The presence of optional, supplementary or exceptional information should not affect test execution, and will in no way affect static conformance verification.

D.2 Identification of the implementation

Implementation Under Test (IUT) Identification

IUT Name:

_____

_____

IUT Version:

_____

System Under Test (SUT) Identification

SUT Name:

_____

_____

Hardware Configuration:

_____

_____

_____

Operating System:

_____

_____

Product Supplier

Name:

_____

Address:

_____

_____

Telephone Number:

_____

Facsimile Number:

_____

Additional Information:

Client

Name:

Address:

Telephone Number:

Facsimile Number:

Additional Information:

PICS Contact Person

Name:

Telephone Number:

Facsimile Number:

Additional Information:

PICS/System Conformance Statement: Provide the relationship of the PICS with the System Conformance Statement for the system:

D.3 Identification of the protocol

This PICS proforma applies to the following Recommendation:

- ITU-T Recommendation Q.933 (1993), *Digital Subscriber Signalling System No. 1 (DSS1) – Signalling specification for frame mode basic call control, Annex A.*

D.4 Global statement of conformance

The implementation described in this PICS meets all of the mandatory requirements of the referenced ITU-T Recommendation.

__ Yes

__ No

NOTE – Answering "No" indicates non-conformance to the specified protocol standard. Non-supported mandatory capabilities are to be identified in the following tables, with an explanation in the comments section of each table of why the implementation is non-conforming.

D.5 Procedures for frame relay PVC management

D.5.1 IUT configuration characteristics

Item #	Protocol feature	Status	Predicate	References	Support
C.1	Does the IUT support network side procedures?	o.1			Yes: __ No: __ S/E: __
C.2	Does the IUT support user side procedures?	o.1			Yes: __ No: __ S/E: __
o.<n> (s): o.1 Support of at least one of these options is required.					
Comments:					

D.5.2 Annex A procedures

Item #	Protocol feature	Status	Predicate	References	Support
AD.1	Frames carrying Layer 3 messages				
AD.1.1	Does the SUT transmit and receive the Annex A messages using Q.922 UI frames with the Poll bit set to 0?	M		Annex A – Introduction	Yes: __ No: __ S/E: __
AD.1.2	Does the SUT transmit and receive the frames on DLCI 0?	M		Annex A – Introduction	Yes: __ No: __ S/E: __
AD.1.3	Does the SUT set the FECN, BECN and DE frame bits to 0 when transmitting Annex A messages?	M		Annex A – Introduction	Yes: __ No: __ S/E: __
AD.1.4	Does the SUT set the C/R bit to 0 when transmitting UI frame?	M		Annex A – Introduction	Yes: __ No: __ S/E: __

Item #	Protocol feature	Status	Predicate	References	Support
AD.2	Procedures – Does the IUT support the following Annex A procedures?				
AD.2.1	Network side procedures				
AD.2.1.1	Periodic Polling – IUT responds to a STATUS ENQUIRY with a STATUS message	C	sp.1	A.4.1	Yes: __ No: __ S/E: __
AD.2.1.2	Link Integrity Verification – IUT modifies sequence numbers based on receipt of STATUS ENQUIRY and transmission of STATUS messages	C	sp.1	A.4.2, A.5.1	Yes: __ No: __ S/E: __
AD.2.1.3	IUT reports new PVCs to the user via the PVC Status New bit	C	sp.1	A.4.3	Yes: __ No: __ S/E: __
AD.2.1.4	IUT reports the availability of PVCs to the user via the PVC Status Active bit	C	sp.1	A.4.4	Yes: __ No: __ S/E: __
AD.2.1.5	Network equipment operation errors	C	sp.1	A.5.1	Yes: __ No: __ S/E: __
AD.2.1.6	IUT responds to a STATUS ENQUIRY/Report Type = link integrity verification only with a STATUS/Report Type = Full status	C	sp.2	A.4.1 4)	Yes: __ No: __ S/E: __
AD.2.1.7	IUT reports PVC information via STATUS/Report Type = single PVC asynchronous status	C	sp.2	A.1.1, A.5.1	Yes: __ No: __ S/E: __
AD.2.2	User side procedures				
AD.2.2.1	Periodic Polling – IUT initiates polling via the STATUS ENQUIRY message	C	sp.3	A.4.1	Yes: __ No: __ S/E: __
AD.2.2.2	Link Integrity Verification – IUT modifies sequence numbers based on receipt of STATUS and transmission of STATUS ENQUIRY message	C	sp.3	A.4.2, A.5.2	Yes: __ No: __ S/E: __
AD.2.2.3	IUT recognizes new PVCs via the PVC Status New bit	C	sp.3	A.4.3	Yes: __ No: __ S/E: __
AD.2.2.4	IUT recognizes deleted PVCs via absence of PVC status information element	C	sp.3	A.4.1	Yes: __ No: __ S/E: __
AD.2.2.5	IUT accepts PVC availability information via the PVC Status Active bit	C	sp.3	A.4.4	Yes: __ No: __ S/E: __
AD.2.2.6	User equipment operation errors	C	sp.3	A.5.2	Yes: __ No: __ S/E: __

Item #	Protocol feature	Status	Predicate	References	Support
AD.2.2.7	IUT accepts PVC availability information via STATUS/Report Type = single PVC asynchronous status	C	sp.4	A.5.1	Yes: __ No: __ S/E: __
AD.2.2.8	IUT accepts a STATUS/Report Type = full status in response to STATUS ENQUIRY/Report Type = link integrity verification only	C	sp.4	A.4.1 4)	Yes: __ No: __ S/E: __
AD.3	Supported messages and system parameters				
AD.3.1	Network side – Does the IUT:				
AD.3.1.1	Accept STATUS ENQUIRY messages?	C	sp.1	A.1.1	Yes: __ No: __ S/E: __
AD.3.1.2	Transmit STATUS messages?	C	sp.1	A.1.2	Yes: __ No: __ S/E: __
AD.3.1.3	Implement N392?	C	sp.1	A.7; Table A.1	Yes: __ No: __ S/E: __
AD.3.1.4	Implement N393?	C	sp.1	A.7; Table A.1	Yes: __ No: __ S/E: __
AD.3.1.5	Implement T392?	C	sp.1	A.7; Table A.2	Yes: __ No: __ S/E: __
AD.3.2	User side – Does the IUT:				
AD.3.2.1	Transmit STATUS ENQUIRY messages?	C	sp.3	A.1.1	Yes: __ No: __ S/E: __
AD.3.2.2	Accept STATUS messages?	C	sp.3	A.1.2	Yes: __ No: __ S/E: __
AD.3.2.3	Implement N391?	C	sp.3	A.7; Table A.1	Yes: __ No: __ S/E: __
AD.3.2.4	Implement N392?	C	sp.3	A.7; Table A.1	Yes: __ No: __ S/E: __
AD.3.2.5	Implement N393?	C	sp.3	A.7; Table A.1	Yes: __ No: __ S/E: __
AD.3.2.6	Implement T391?	C	sp.3	A.7; Table A.2	Yes: __ No: __ S/E: __

Predicates

sp.1 If C.1 = Yes then Status = Mandatory else Status = N/A

sp.2 If C.1 = Yes then Status = Optional else Status = N/A

sp.3 If C.2 = Yes then Status = Mandatory else Status = N/A

sp.4 If C.2 = Yes then Status = Optional else Status = N/A

Comments:

D.5.3 Predicate list

sp.1 If C.1 = Yes then Status = Mandatory else Status □ N/A.

sp.2 If C.1 = Yes then Status = Optional else Status □ N/A.

sp.3 If C.2 = Yes then Status = Mandatory else Status □ N/A.

sp.4 If C.2 = Yes then Status = Optional else Status □ N/A.

D.5.4 o.<n> list

o.1 Support of at least one of these options is required.

Annex E

Multiprotocol encapsulation over frame relay

(This annex in ITU-T Rec. Q.933 (1995) has been deleted and is no longer part of this Recommendation. It is replaced by Annex D of ITU-T Rec. X.36)

Appendix I

Window size for a data link layer protocol

(This appendix in ITU-T Rec. Q.933 (1995) has been moved to ITU-T Rec. X.36 Appendix VII)

SERIES OF ITU-T RECOMMENDATIONS

Series A	Organization of the work of ITU-T
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