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SERIES Q: SWITCHING AND SIGNALLING

Broadband ISDN – B-ISDN application protocols for the network signalling

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Extensions to the B-ISDN User Part – Signalling capabilities to support traffic parameters for the Available Bit Rate (ABR) ATM transfer capability

ITU-T Recommendation Q.2723.3
Superseded by a more recent version

(Previously CCITT Recommendation)

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ITU-T RECOMMENDATION Q.2723.3

EXTENSIONS TO THE B-ISDN USER PART – SIGNALLING CAPABILITIES TO SUPPORT TRAFFIC PARAMETERS FOR THE AVAILABLE BIT RATE (ABR) ATM TRANSFER CAPABILITY

Summary

This Recommendation specifies extensions to the broadband ISDN user part protocol to support additional traffic parameters for available bit rate services indication in a point-to-point configuration type. This Recommendation allows for the use of additional traffic parameters beyond the ones already specified by Recommendations Q.2761, Q.2762, Q.2763 and Q.2764 for the B-ISDN basic call at the NNI, in order to support the available bit rate traffic capability.

Source

ITU-T Recommendation Q.2723.3 was prepared by ITU-T Study Group 11 (1993-1996) and was approved under the WTSC Resolution No. 1 procedure on the 12th of September 1997.

FOREWORD

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

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

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

NOTE

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

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As of the date of approval of this Recommendation, the 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.

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EXTENSIONS TO THE B-ISDN USER PART – SIGNALLING CAPABILITIES TO SUPPORT TRAFFIC PARAMETERS FOR THE AVAILABLE BIT RATE (ABR) ATM TRANSFER CAPABILITY

(Geneva, 1997)

1 Scope

This Recommendation specifies extensions to the broadband ISDN user part protocol to support additional traffic parameters for available bit rate services indication in a point-to-point configuration type. This Recommendation allows for the use of additional traffic parameters beyond the ones already specified by Recommendations Q.2761, Q.2762, Q.2763 and Q.2764 for the B-ISDN basic call at the NNI, in order to support the available bit rate traffic capability.

It defines:

– parameter coding needed;

– primitive parameters needed to model the new capabilities according to the specification model for the B-ISDN user part defined in Recommendation Q.2764;

– enhancements to the application process procedures; and

– enhancements to the description of the application service element.

2 References

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

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

[2] ITU-T Recommendation Q.2961.1 (1995), *Digital subscriber Signalling System No. 2 – Additional traffic parameters: Additional signalling capabilities to support traffic parameters for the tagging option and the sustainable cell rate parameter set*.

[3] ITU-T Recommendation F.811 (1996), *Broadband connection-oriented bearer service*.

[4] ITU-T Recommendation Q.2761 (1995), *Functional description of the B-ISDN User Part (B-ISUP) of Signalling System No. 7*.

[5] ITU-T Recommendation Q.2762 (1995), *General functions of messages and signals of the B-ISDN User Part (B-ISUP) of Signalling System No. 7*.

[6] ITU-T Recommendation Q.2763 (1995), *Signalling System No. 7 B-ISDN User Part (B-ISUP) – Formats and codes*.

[7] ITU-T Recommendation Q.2764 (1995), *Signalling System No. 7 B-ISDN User Part (B-ISUP) – Basic call procedures*.

[8] ITU-T Recommendation Q.2650 (1995), *Interworking between Signalling System No. 7 Broadband ISDN User Part (B-ISUP) and Digital Subscriber Signalling System No. 2 (DSS 2).*

[9] ITU-T Recommendation Q.2961.3 (1997), *Digital subscriber Signalling System No. 2 – Additional traffic parameters: Signalling capabilities to support traffic parameters for the Available Bit Rate (ABR) ATM transfer capability*.

[10] ITU-T Recommendation Q.2961.2 (1997), *Digital subscriber Signalling System No. 2 – Additional traffic parameters: Support of ATM transfer capability in the broadband bearer capability information element*.

[11] ITU-T Recommendation Q.2723.1 (1996), *B-ISDN user part – Support of additional traffic parameters for sustainable cell rate and quality of service*.

[12] ITU-T Recommendation Q.2723.2 (1997), *Extensions to the B-ISDN user part – Support of ATM transfer capability in the broadband bearer capability parameter*.

[13] ITU-T Recommendation Q.2725.1 (1996), *B-ISDN user part – Support of negotiation during connection setup*.

3 Abbreviations

This Recommendation uses the following abbreviations:

AAL	ATM Adaptation Layer
ABR	Available Bit Rate
ATC	ATM Transfer Capability
FRT	Fixed Round-trip Time
IAM	Initial Address Message
ICR	Initial Cell Rate
MCR	Minimum Cell Rate
PCR	Peak Cell Rate
RDF	Rate Decrease Factor
RIF	Rate Increment Factor
RM	Resource Management
TBE	Transient Buffer Exposure
VPCI/VCI	Virtual Path Connection Identifier/Virtual Channel Identifier

4 B-ISDN user part messages and parameters

4.1 Parameters and parameter subfields

The following new parameters and parameter subfields are required in B-ISUP.

4.1.1 Additional ATM cell rate

The format of the additional ATM cell rate parameter field as defined by Recommendation Q.2723.1 is extended as shown in Figure 1. The parameter is extended to take into account the indication of forward and backward ABR minimum cell rates.

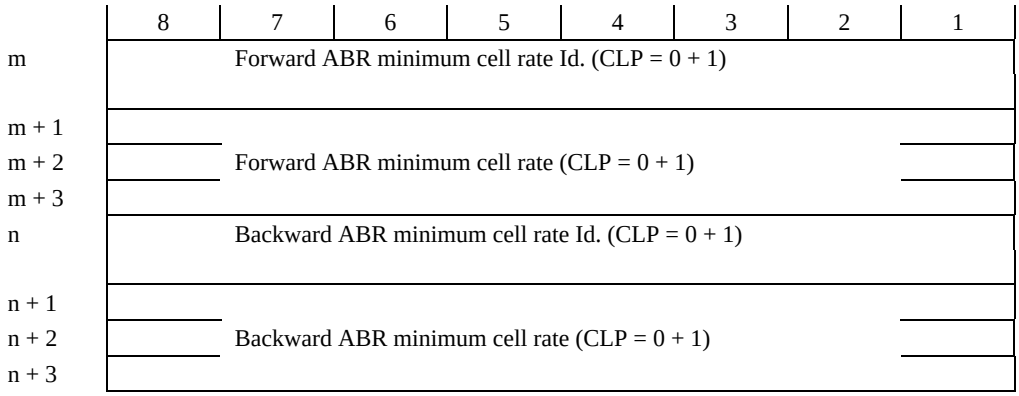

Figure 1/Q.2723.3 – Additional ATM cell rate parameter field

NOTE 1 – Octet groups (or subfields) m and n may be included in any order within the parameter. This general encoding rule applies to all B-ISUP Recommendations whenever octet groups (or subfields) are identified or tagged by a one octet identifier within a parameter.

NOTE 2 – Octet groups (or subfields) tagged by a one octet identifier are not extensible. Although some B-ISUP Recommendations may include octet groups (or subfields) tagged by a one octet field with bit 8 shown as an extension bit, no requirements for their future extension is foreseen. Implementations may therefore safely handle such a bit 8 of an identifier octet as an integral part of the octet group identifier. To ensure backward compatibility, subfield identifiers shall not be defined with bit 8 set to 0.

The following codes are used in the subfields of the Additional ATM cell rate parameter field:

a) *Cell rate identifier*

The following codes are specified:

octet m	10010010	Forward ABR minimum cell rate for cell loss priority = 0 + 1
octet n	10010011	Backward ABR minimum cell rate for cell loss priority = 0 + 1

NOTE 3 – For details on the use of cell loss priority, see Recommendation I.371.

b) *ABR minimum cell rate*

The forward and backward ABR minimum cell rate indicates the minimum cell rate requested. The number of cells per second is coded in 3-octet binary representation. Bit 8 of the first octet (e.g. m + 1 or n + 1) is the most significant and bit 1 of the third octet (e.g. m + 3 or n + 3) is the least significant respectively.

4.1.2 ABR setup parameters

This parameter specifies the set of ABR parameters used during call/connection establishment.

The parameter name code allocated to the ABR setup parameters parameter is 0111 1000.

The format of the ABR setup parameters parameter field is shown in Figure 2.

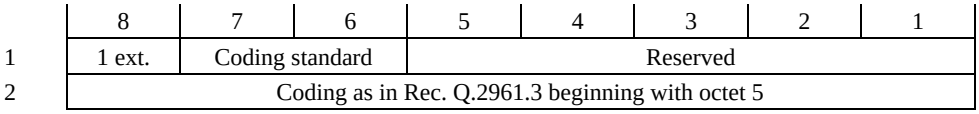

Figure 2/Q.2723.3 – ABR setup parameters parameter field

4.1.3 Broadband bearer capability

The format of the broadband bearer capability parameter defined in Recommendation Q.2763 is modified as shown in Recommendation Q.2723.2.

The coding of subfields for ABR services is given in Recommendation Q.2961.3.

4.1.4 Minimum ATM cell rate

The format of the minimum ATM cell rate parameter field as defined by Recommendation Q.2725.1 is extended as shown in Figure 3. The parameter is extended to enable the negotiation of forward and backward ABR minimum cell rates.

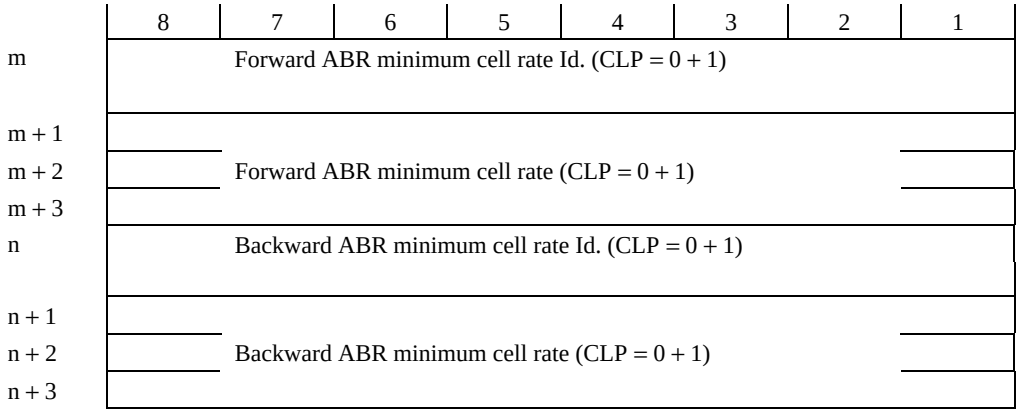

Figure 3/Q.2723.3 – Minimum ATM cell rate parameter field

NOTE 1 – Octet groups (or subfields) m and n may be included in any order within the parameter. This general encoding rule applies to all B-ISUP Recommendations whenever octet groups (or subfields) are identified or tagged by a one octet identifier within a parameter.

NOTE 2 – Octet groups (or subfields) tagged by a one octet identifier are not extensible. Although some B-ISUP Recommendations may include octet groups (or subfields) tagged by a one-octet field with bit 8 shown as an extension bit, no requirements for their future extension is foreseen. Implementations may therefore safely handle such a bit 8 of an identifier octet as an integral part of the octet group identifier. To ensure backward compatibility, subfield identifiers shall not be defined with bit 8 set to 0.

The following codes are used in the subfields of the Minimum ATM cell rate parameter field:

a) *Cell rate identifier*

The following codes are specified:

octet m 10010010 Forward ABR minimum cell rate for cell loss priority = 0 + 1

octet n 10010011 Backward ABR minimum cell rate for cell loss priority = 0 + 1

NOTE 3 – For details on the use of cell loss priority, see Recommendation I.371.

b) *ABR minimum cell rate*

The forward and backward ABR minimum cell rate indicates the minimum cell rate requested. The number of cells per second is coded in 3-octet binary representation. Bit 8 of the first octet (e.g. m + 1 or n + 1) is the most significant and bit 1 of the third octet (e.g. m + 3 or n + 3) is the least significant respectively.

4.2 Messages

In the following, the parameters defined in Recommendations Q.2763, Q.2725.1 and in the Q.2723-Series relevant to ABR and the negotiation procedure and which require coding enhancements are indicated. No new messages are defined.

4.2.1 IAM

The following parameters can be carried in the IAM.

Table 1/Q.2723.3 – Additional parameters to be included in the IAM

IAM
Additional ATM cell rate
ABR setup parameters
Minimum ATM cell rate

4.2.2 ANM

The following parameters can be carried in the ANM.

Table 2/Q.2723.3 – Additional parameters to be included in the ANM

ANM
Additional ATM cell rate
ABR setup parameters
ATM cell rate

5 Application process procedures

5.1 Connection setup

5.1.1 Assignment procedure of VPCI/VCI and bandwidth

See 2.1.2/Q.2764 with the following additions.

If an exchange has to set up a connection for which ABR is indicated in the BTC, it shall:

i) if available, use a VPCI for which it is the assigning exchange and set up the call using the original requested MCR, i.e. a Set_Up request primitive including the connection element identifier parameter is issued. If the requested PCR, ICR, TBE, RIF or RDF cannot be supported, the exchange shall adjust these values according to the rules given in Table 3;

ii) if the original requested MCR cannot be supported using a VPCI for which it is the assigning exchange, do one of the following (depending on routing results):

a) act as the non-assigning exchange, i.e. issue a Set_Up request primitive without the connection element identifier parameter, but using the original requested connection characteristics; or

b) issue a Set_Up request primitive using a VPCI for which it is the assigning exchange, supporting a cell rate between the original requested MCR and the MCR indicated in the minimum ATM cell rate parameter. If the requested PCR, ICR, TBE, RIF or RDF cannot be supported, the exchange shall adjust these values according to the rules given in Table 3;

c) if neither a) nor b) is possible, then the connection shall be released with cause No. 37 "User cell rate not available".

Table 3/Q.2723.3 – Allowed modifications

Parameter for a given direction	Modification by the network
PCR	Decrease only, MCR ≤ PCR (Note 3)
ICR	Decrease only, MCR ≤ ICR ≤ PCR
TBE	Decrease only
RIF	Decrease only (Note 2)
RDF	(Notes 1, 2)
NOTE 1 – The value of RDF may be increased or decreased, subject to the constraint that the ratio RDF/RIF shall not be decreased. (Hence, if RIF is decreased by a factor k, RDF may be decreased by at most a factor k, or it may be increased.) NOTE 2 – The values chosen by a node must obey the above rules, and they need to be chosen in such a way that any combination of the values of these parameters that subsequent nodes are allowed to select according to the negotiation rules will be acceptable to the node. NOTE 3 – If the exchange is not able to provide the PCR which is greater than or equal to MCR, then the connection shall be released.	

5.1.2 Actions required at the originating exchange

The procedures of Recommendation Q.2764 shall apply with the following additions.

The originating exchange will include the ABR setup parameters parameter, additional ATM cell rate parameter, and the minimum ATM cell rate parameter in the Set_Up request primitive only if the broadband bearer capability parameter indicates "ABR service" in the BTC subfield. The ATM cell rate parameter will indicate the peak cell rate of the connection and will always be present.

a) *Assigning exchange*

If the exchange can support the indicated MCR, PCR and ICR, it will include the original requested connection characteristics in the Set_Up request primitive.

If the exchange cannot support the requested MCR and the corresponding minimum ATM cell rate parameter is included in the Set_Up request primitive, then the MCR can be negotiated using the procedures described in Recommendation Q.2725.1 for the minimum ATM cell rate parameter.

If the exchange cannot support the requested MCR and the corresponding minimum ATM cell rate parameter is not included in the Set_Up request primitive, then the connection shall be released with cause No. 37 "User cell rate not available".

If the exchange cannot provide the requested PCR, but is able to provide at least the MCR, the exchange shall progress the call after adjusting the PCR value in the ATM cell rate parameter. The adjusted PCR value will be greater than or equal to the MCR value. Otherwise, the call shall be released with cause No. 37 "User cell rate not available".

The exchange may adjust also the following ABR parameters: ICR, TBE, RIF and RDF.

The FRT shall be increased by the switch internal RM cell delay and the RM cell delay value assigned to the selected VPC to the succeeding exchange.

NOTE – The RM cell delay for the forward and backward direction is added.

b) *Non-assigning exchange*

The exchange passes the received additional ATM cell rate parameter and the ABR setup parameters parameter in the Set-Up request primitive.

The FRT shall be increased by the switch internal RM cell delay.

NOTE – The RM cell delay for the forward and backward direction is added.

5.1.3 Action required at the intermediate national exchange

The procedures of Recommendation Q.2764 shall apply with the following addition.

5.1.3.1 Incoming side of the exchange

a) *Assigning exchange*

If the exchange can support the requested connection characteristics, it will allocate resources accordingly.

If the exchange cannot support the requested MCR and the corresponding minimum ATM cell rate parameter is included in the Set_Up indication primitive, then the MCR can be negotiated using the procedures described in Recommendation Q.2725.1 for the minimum ATM cell rate parameter.

If the exchange cannot support the requested MCR and the corresponding minimum ATM cell rate parameter is not included in the Set_Up request primitive, then the connection shall be released with cause No. 37 "User cell rate not available".

If the exchange cannot provide the requested PCR, but is able to provide at least the MCR, the exchange shall progress the call after adjusting the PCR value in the ATM cell rate parameter. The adjusted PCR value will be greater than or equal to the MCR value. Otherwise, the call shall be released with cause No. 37 "User cell rate not available".

The exchange may adjust also the following ABR setup parameters: ICR, TBE, RIF and RDF.

The FRT shall be increased by the RM cell delay value assigned to the selected VPC to the preceding exchange.

NOTE – The RM cell delay for the forward and backward direction is added.

b) *Non-assigning exchange*

The exchange follows the normal procedures of Recommendation Q.2764.

5.1.3.2 Other actions

The procedures in Recommendation Q.2764 are followed, with additions as in 5.1.2 above.

5.1.4 Actions required at the outgoing international exchange

The procedures of Recommendation Q.2764 shall apply with the additions specified in 5.1.3.

5.1.5 Actions required at the intermediate international exchange

The procedures of Recommendation Q.2764 shall apply with the additions specified in 5.1.3.

5.1.6 Actions required at the incoming international exchange

The procedures of Recommendation Q.2764 shall apply with the additions specified in 5.1.3.

5.1.7 Actions required at the destination exchange

The procedures of Recommendation Q.2764 shall apply with the following addition.

5.1.7.1 Incoming side of the exchange

See 5.1.3.1.

5.1.7.2 Other actions

If the connection is allowed, the destination exchange will map the ABR setup parameters parameter, additional ATM cell rate parameter, and the minimum ATM cell rate parameter into the corresponding information elements in the SETUP message.

5.2 Answer primitive

5.2.1 Actions required at the destination exchange

The procedures of Recommendation Q.2764 shall apply with the following addition.

When the called party answers with the indication of the finally negotiated parameters, the exchange will include the ABR setup parameters parameter, ATM cell rate parameter, and the additional ATM cell rate parameter in the Answer request primitive. It shall modify the allocated bandwidth on those portions of the connection for which it is the assigning exchange according to the reported additional ATM cell rate parameter, if the bandwidth already allocated is different.

When the called party answers without the indication of the MCR finally allocated, the exchange shall put the additional ATM cell rate parameter in the Answer request primitive according to the bandwidth allocation used in that exchange.

5.2.2 Actions required at the intermediate national exchange

The procedures of Recommendation Q.2764 shall apply with the following addition.

Upon receipt of an Answer indication primitive with the ABR setup parameters parameter, ATM cell rate parameter, and the additional ATM cell rate parameter, the exchange will pass the parameters unchanged in the Answer request primitive. It shall modify the allocated bandwidth on those portions of the connection for which it is the assigning exchange according to the reported additional ATM cell rate parameter, if the bandwidth already allocated is different.

Upon receipt of an Answer indication primitive without the additional ATM cell rate parameter, the exchange shall put the additional ATM cell rate parameter in the Answer request primitive according to the bandwidth allocation used in that exchange.

5.2.3 Actions required at the outgoing international exchange

The procedures of Recommendation Q.2764 shall apply with the additions specified in 5.2.2.

5.2.4 Actions required at the intermediate international exchange

The procedures of Recommendation Q.2764 shall apply with the additions specified in 5.2.2.

5.2.5 Actions required at the incoming international exchange

The procedures of Recommendation Q.2764 shall apply with the additions specified in 5.2.2.

5.2.6 Actions required at the originating exchange

The procedures of Recommendation Q.2764 shall apply with the following addition.

Upon receipt of an Answer indication primitive with the ABR setup parameters parameter, ATM cell rate parameter, and the additional ATM cell rate parameter, the exchange will map those parameters into the corresponding information elements in the CONNECT message. It shall modify the allocated bandwidth on those portions of the connection for which it is the assigning exchange according to the reported additional ATM cell rate parameter, if the bandwidth already allocated is different.

Upon receipt of an Answer indication primitive without the additional ATM cell rate parameter, the exchange shall indicate the final bandwidth allocation used in that exchange in the indication returned to the calling user.

6 Application service elements and primitives

The following subclause identifies impacts on the B-ISUP application service elements and the primitives exchanged between ASEs as shown in Recommendation Q.2764.

6.1 Primitives between SACF and application process

6.1.1 Set_Up request/indication primitive

Table 4 shows parameters for the Set_Up request/indication primitive.

Table 4/Q.2723.3 – Parameters for Set_Up request/indication primitive

Set_Up request/indication	B-ISDN	N-ISDN
Additional ATM cell rate	O	–
ABR setup parameters	O	–
Minimum ATM cell rate	O	–

6.1.2 Answer request/indication primitive

Table 5 shows parameters for the Answer request/indication primitive.

Table 5/Q.2723.3 – Parameters for Answer request/indication primitive

Answer request/indication	B-ISDN	N-ISDN
Additional ATM cell rate	O	–
ABR setup parameters	O	–
ATM cell rate	O	–

6.2 Primitives between BCC ASE and SACF

6.2.1 Link_Set_Up request/indication primitive

Table 6 shows parameters for the Link_Set_Up request/indication primitive.

Table 6/Q.2723.3 – Parameters for Link_Set_Up request/indication primitive

Link_Set_Up request/indication
Additional ATM cell rate
ABR setup parameters
Minimum ATM cell rate

6.2.2 Link_Information request/indication primitive

Table 7 shows parameters for the Link_Information request/indication primitive.

Table 7/Q.2723.3 – Parameters for Link_Information request/indication primitive

Link_Information request/indication
Additional ATM cell rate
ABR setup parameters
ATM cell rate

6.3 ASE descriptions

No changes are required to the ASE descriptions for BCC or CC ASEs.

7 Interworking

7.1 Interworking with nodes which do not support procedures described in this Recommendation

As ABR makes use of a new ATC – which is routing relevant, it shall not be routed to an exchange not supporting that service, unless there is an error in routing. If such an error occurs, the following applies.

Nodes not supporting the service do not support the ABR specific parameters and parameter values defined in this Recommendation and the procedures shall be as for the handling of unrecognized signalling information. The instruction indicators for these parameters shall be set so as to release the connection.

NOTE – The instruction indicators should be set as shown in Appendix II/Q.2764 for the B-BC parameter, Appendix I/Q.2723.1 for the additional ATM cell rate parameter, Appendix I/Q.2725.1 for the minimum ATM cell rate parameter and Appendix I for the ABR setup parameters parameter in order to support the correct behaviour.

7.2 Interworking with ISUP

These call/connections are not supported in ISUP and are released at the B-ISUP/ISUP interworking point, with cause No. 63 "Service or option not available, unspecified".

7.3 Interworking with DSS 2

The following mapping of DSS 2 information elements to B-ISUP parameters is followed, in addition to those mappings already shown in Recommendation Q.2650.

SETUP	IAM	SETUP
ATM traffic descriptor	ATM cell rate Additional ATM cell rate (Note)	ATM traffic descriptor
ABR setup parameters	ABR setup parameters	ABR setup parameters
Minimum ATM traffic descriptor	Minimum ATM cell rate	Minimum ATM traffic descriptor

CONNECT	ANM	CONNECT
ATM traffic descriptor	ATM cell rate Additional ATM cell rate (Note)	ATM traffic descriptor
ABR setup parameters	ABR setup parameters	ABR setup parameters

NOTE – Only the ABR minimum cell rate subfields of the ATM traffic descriptor information element are mapped to the additional ATM cell rate parameter. The peak cell rate subfields are mapped to the ATM cell rate parameter as in Recommendation Q.2650.

APPENDIX I

Setting of instruction indicators

The setting of instruction indicators for the ABR setup parameters parameter is as follows:

PARAMETER	Pass on not possible ind.	Discard parameter ind.	Discard message ind.	Send notification ind.	Release call ind.	Transit at intermed. exchange ind.	Broadband/ Narrow-band interworking ind.
ABR setup parameters	Default	Default	Default	Default	Release call	End node interpretation	Release call

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