



Technical Specification

for connecting to the

Integrated Services Digital Network (ISDN)

using

Primary Rate Access

IDA TS ISDN PRA
Issue 1 Rev 1, May 2011

Infocomm Development Authority of Singapore
Resource Management & Standards
10 Pasir Panjang Road
#10-01 Mapletree Business City
Singapore 117438

© Copyright of IDA, 2011

This document may be downloaded from the IDA website at <http://www.ida.gov.sg> and shall not be distributed without written permission from IDA

Contents

		Page
Part A	Introduction	3
1	Scope	3
2	General Requirements	5
3	Electromagnetic Compatibility & Electrical Safety Requirements	6
Part B	Primary Rate User-Network Interface – Layer 1 Specification (ITU-T Rec. I.431 03/1993 & Amendment 1 06/1997)	7
Part C	ISDN User-Network Interface – Data Link Layer (ITU-T Rec. Q.921 09/1997 & Amendment 1 06/2000)	9
Table 1	Frame structure for peer-to-peer communication	9
Table 2	Elements of procedure and formats of field for data link layer peer-to-peer communication	9
Table 3	Elements for layer-to-layer communication	10
Table 4	Procedures for use by the data link layer	10
Table 5	Annexes and Appendices	12
Part D	ISDN User-Network Interface Layer 3 Specification for Basic Call Control (ITU-T Rec. Q.931 05/1998 & Amendment 1 12/2002)	13
Table 1	Overview of call control	13
Table 2	Message functional definitions and content	14
Table 3	General message format and information elements coding	15
Table 4	Circuit-switched call control procedures	16
Table 5	List of system parameters	18
Table 6	Packet communication procedures	18
Table 7	User signalling bearer service call control procedures	18
Table 8	Circuit-mode multirate (64 kbit/s base rate) procedures	18
Table 9	Annexes and Appendices	19
Annex A.1	ISDN Basic Access Implementation Options	20
	Optional Layer 1 Requirements	20
	Optional Layer 2 Requirements	20
	Optional Layer 3 Requirements	20
Annex A.2	Guide to the recognised Information Elements	23
Annex B	References	37
Annex C	Corrigendum / Addendum	38

NOTICE

This Specification is subject to review and revision.
--

Part A Introduction

1 Scope

- 1.1 This Specification identifies the minimum technical requirements for connecting to the Integrated Services Digital Network (ISDN) at the T interface, using Primary Rate Access (PRA).

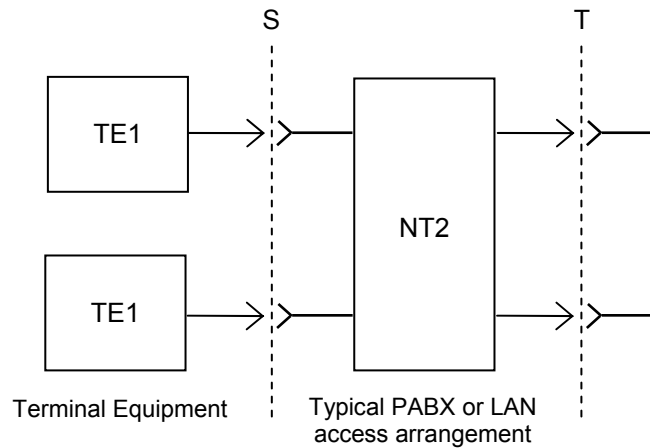


Figure 1:
Reference Configuration for Multiple Connections
 (Figure 1/I.412)

- 1.2 The ISDN PRA equipment connected to the T interface (see Figure 1) shall have the NT2 function. Suppliers shall demonstrate that the equipment has been tested to comply with the requirements defined in Part A, B, C and D of this Specification.

Part B –	Physical layer requirements based on ITU-T Rec. I.431, Primary Rate User-Network Interface – Layer 1 Specification
Part C –	Link Access Procedure on the D-channel, LAPD based on ITU-T Rec. Q.921, ISDN User-Network Interface – Data Link Layer Specification
Part D –	Network layer requirements based on ITU-T Rec. Q.931, ISDN User-Network Interface Layer 3 Specification for Basic Call Control

- 1.3 Specific local network implementations are attached as annexes to this Specification where network operators will indicate their selected options for service provision e.g. refer to Annex A.1 and A.2 for SingTel and StarHub's ISDN implementation options.

1.4 **Notations used in the Specification**

The use of the term TE within the Specification refers to a Terminal Equipment Type 1 (TE1), a Terminal Adaptor (TA) or a Network Termination 2 (NT2).

The following notations are used in the Specification :		
CR		<u>Conformance Requirement</u> defines features and functions that must be supported at minimum.
	M	<u>Mandatory</u> requirement is where the TE implementation shall conform to those clauses in that section relating to the operation of Layer 1, Layer 2 and Layer 3 protocol in the TE.
	O	<u>Optional</u> requirement means it is optional whether TE implements that function but if function is implemented, it shall conform to the clauses in that section relating to the operation of the TE Layer 1, Layer 2 and Layer 3 protocol. However, the use of optional functions is possible only if the network operators have implemented these options in their networks.
	NA	<u>Not Applicable</u> is where the requirements specified in that section on the TE shall not be applicable for attachment.
	GID	The section provides <u>General Information and Definitions</u> .

2 General Requirements

2.1	Design of Equipment	CR
Power supply	A.C. mains supply of 230 V \pm 10%, 50 Hz \pm 2%	Note 1
	External A.C. adapter	Note 1
Identification of equipment	Equipment shall be marked with:	
	(a) supplier's or manufacturer's name or identification mark	M
	(b) supplier's or manufacturer's model or type reference	M
	The markings shall be legible, indelible and readily visible	M
Keypad Dialling	(a) Keypads used in equipment for dialling shall be alphanumeric keypads and the relationships between the letters and the digits shall comply with ITU-T Rec E.161 as shown in figure 1.	M
	(b) The associated letters must not impair the legibility of the digit (§ 3.1.1, ITU-T Rec. E.161).	M
	(c) The tactile identifier on the "5" button shall be provided (§ 3.6, ITU-T Rec. E.161).	M
2.2	Analogue Interface When provided, the equipment has the TA function for connecting analogue equipment at the R interface as shown Figure 2.	–
Connector	2 wire, 6 pin modular RJ 11 jack	Note 2
Feed voltage	\leq 40 V d.c.	Note 2
Line extension	Interworking with loop resistance up to 500 Ω	Note 2
MFPB receiver	(a) Level range: 0 to –26 dBm	Note 2
	(b) Signal detection: min 40 ms	Note 2
	(c) Interdigit pause : min 40 ms	Note 2
	(d) Frequency deviation: \pm 1.8%	Note 2
Ringing current transmit	(a) Frequency: 24 Hz	Note 2
	(b) Periodicity for normal ringing: 0.4 s (on), 0.2 s (off), 0.4 s (on), 2.0 s (off)	Note 2
	(c) Periodicity for duplex/distinctive ringing: 1.2 s (on), 3.0 s (off)	Note 2
	(d) Voltage: \leq 75 V	Note 2
Dial tone transmit	425 Hz continuous tone	Note 2
Busy tone transmit	(a) 425 Hz	Note 2
	(b) Periodicity: 0.75 s (on), 0.75 s (off)	Note 2
Output level	Analogue output signal level shall not exceed –6 dBm averaged over any 10 s period	Note 2
A/D/A companding	Digital telephones and other customer equipment providing acoustic interfaces to the digital bit stream shall comply with ITU-T G.711 (A law).	Note 2
2.3	Characteristics of Telephone	–
SLR	In the range 5 to 11 dB	Note 3
RLR	In the range –1 to 5 dB	Note 3
STMR	In the range 10 to 15 dB	Note 3
<p>Note 1: Either one of these options must be applied.</p> <p>Note 2: Requirement is 'NA' if TE does not have TA function for connecting analogue equipment to the R interface. If applicable, equipment shall be tested</p> <p>Note 3: Requirement is 'NA' if TE does not have telephone handset function. If applicable, equipment shall be tested</p>		

1	2 ABC	3 DEF
4 GHI	5 JKL	6 MNO
7 PQRS	8 TUV	9 WXYZ
*	0	#

Figure 2: **Alphanumeric Keypad Layout** (ITU-T Rec. E.161)

3 **Electromagnetic Compatibility & Electrical Safety Requirements**

- 3.1 The equipment shall comply with the limits for conducted disturbance at the mains terminals and telecommunication ports, and the limits for radiated disturbance defined in the IEC CISPR 22.
- 3.2 The equipment shall comply with the IEC 60950-1 safety standard¹. The requirements in IEC 60950-1 that are applicable to the equipment [e.g. class of equipment, type of telecommunication network voltage (TNV) circuit and types of components] shall be identified and complied with.

¹ The safety standard includes, among others, protection of telecommunications network service personnel and users of other equipment connected to the network from hazards in the equipment.

PART B Primary Rate User-Network Interface – Layer 1 Specification (ITU-T Recommendation I.431 03/1993 & Amendment 1 06/1997)

Title	ITU-T Rec. I.431	ETSI TBR 4	CR	Remarks
Introduction	1	–	GID	Supports user-network interface at 2048 kbit/s
Type of configuration	2	–	M	Primary rate access at the T reference point shall support the point-to-point configuration only. Electrical characteristics are defined in ITU-T Rec. G.703.
Functional characteristics	3	–	–	Heading
Summary of functions (Layer 1)	3.1	–	M	– B-channel (64 kbit/s)
			O	– H0-channel
			O	– H1-channel
			M	– D-channel (64 kbit/s)
			M	– Bit timing
			M	– Octet timing
			M	– Frame alignment
			O	– Power feeding
			M	– Maintenance
			M	– CRC procedure
Interchange circuits	3.2	–	M	Two interchange circuits, one for each direction, are used for the transmission of digital signals
Activation/deactivation	3.3	–	M	Active at all times
Operational functions	3.4	–	GID	Heading
Definitions of signals at the interface	3.4.1	9.5.1	GID	
Definitions of state tables at network and user sides	3.4.2	–	GID	
Layer 1 states on the user side of the interface	3.4.3	9.5.2	M	
Layer 1 states at the network side of the interface	3.4.4	–	NA	Network side
Definition of primitives	3.4.5	–	GID	
State tables	3.4.6	9.5.3	M	Table 2/I.431 is applicable
Interface at 1544 kbit/s	4	–	NA	
Interface at 2048 kbit/s	5	–	–	Heading
Electrical characteristics	5.1	9.2 9.3	M	(a) 120 Ω symmetrical pair interface (b) ITU-T Rec. G.703 section 6
Frame structure	5.2	9.4	M	Note 1
Jitter	5.4	9.3.3	M	
Tolerable longitudinal voltage	5.5	9.3.4	M	
Output signal balance	5.6	–	M	f=1 MHz; ≥ 40 dB 1 MHz < f \leq 30 MHz; decreasing from 40 dB at 20 dB/decade
Impedance towards ground	5.7	9.2.2 9.3.5	M	10 Hz < f \leq 1 MHz; > 1000 Ω

Title	ITU-T Rec. I.431	ETSI TBR 4	CR	Remarks
Interface procedures	5.8	9.5.5	M	
Maintenance at the interface	5.9	9.5.4	M	On the user side
Connector	6	–	M	ISO/IEC standards and permanent wiring are permitted
Interface wiring impedance	7	–	M	120 $\Omega \pm 20\%$, 200 kHz - 1 MHz 120 $\Omega \pm 10\%$, 1 MHz Two symmetrical pair connections shall be provided. No power feeding is available in either direction.
Power feeding to the NT	8	–	O	Provision of power using a separate pair of wires, is optional.
Timeslot assignment for interfaces having only H0 channels	Annex A	–	Note 2	
Timeslot assignment for 2048 kbits/s interface having H11 channel	Annex B	–	Note 3	
<p>Note 1: H-channels may not be supported depending on local implementation.</p> <p>Note 2: 'M' if H0 channels are supported.</p> <p>Note 3: 'M' if H11 channels are supported.</p> <p>Note 4: The use of optional functions is possible only if the network operators have implemented these options in their networks.</p>				

Part C ISDN User-Network Interface – Data Link Layer

(ITU-T Recommendation Q.921 09/1997 & Amendment 1 06/2000)

Table 1: Frame structure for peer-to-peer communication				
Title	ITU-T Rec. Q.921	ETSI TBR 4	CR	Remarks
General	1	–	GID	
Frame structure for peer-to-peer communication	2	10.1	–	Heading
General	2.1	10.1.1	M	
Flag sequence	2.2	10.1.2	M	
Address field	2.3	10.1.3	M	
Control field	2.4	10.1.4	M	
Information field	2.5	10.1.5	M	
Transparency	2.6	10.1.6	M	
FCS field	2.7	10.1.7	M	
Format convention	2.8	10.1.8	M	
Invalid frames	2.9	10.1.9 Note 1	M	
Frame abort	2.10	–	M	Not a TBR 4 requirement

Note 1: TBR 4 includes a frame, which contains a TEI that is not assigned to the TE as invalid.

Table 2 : Elements of procedure and formats of field for data link layer peer-to-peer communication				
Title	ITU-T Rec. Q.921	ETSI TBR 4	CR	Remarks
Elements of procedure and formats of field for data link layer peer-to-peer communication	3	10.2	–	Heading
General	3.1	10.2.1	GID	
Address field format	3.2	10.2.2	M	
Address field variables	3.3	10.2.3	M	Note 2
Control field formats	3.4	10.2.4	M	
Control field parameters and associated state variables	3.5	10.2.5	M	
Poll/Final (P/F) bit	3.5.1	10.2.5.1	M	
Multiple frame operation – variables and sequence numbers	3.5.2	10.2.5.2	M	
Unacknowledged operation – variables and parameters	3.5.3	–	GID	One parameter is defined, N201 (see 5.9.3).
Frame types	3.6	10.2.6	–	Heading
Commands and responses	3.6.1	10.2.6.1 Note 3	M	Refer to Table 5/Q.921
Information (I) command	3.6.2	10.2.6.2	M	
Set Asynchronous Balanced Mode Extended (SABME) command	3.6.3	10.2.6.3	M	
Disconnect (DISC) command	3.6.4	10.2.6.4	M	
Unnumbered Information (UI) command	3.6.5	10.2.6.5	M	
Receive Ready (RR) command/response	3.6.6	10.2.6.6	M	

Table 2 : Elements of procedure and formats of field for data link layer peer-to-peer communication (continued)				
Title	ITU-T Rec. Q.921	ETSI TBR 4	CR	Remarks
Reject (REJ) command/response	3.6.7	10.2.6.7	M	
Receive Not Ready (RNR) command/response	3.6.8	10.2.6.8	M	
Unnumbered Acknowledgement (UA) response	3.6.9	10.2.6.9	M	
Disconnected Mode (DM) response	3.6.10	10.2.6.10	M	
Frame Reject (FRMR) response	3.6.11	–	O	Note 3
Exchange Identification (XID) command/response	3.6.12	–	O	Note 3
Note 2: Value '0' is allocated to TEI. Other values are not used in PRA.				
Note 3: TBR 4 does not support FRMR response and XID command/response.				

Table 3 : Elements for layer-to-layer communication				
Title	ITU-T Rec. Q.921	ETSI TBR 4	CR	Remarks
Elements for layer-to-layer communication	4	–	GID	

Table 4 : Procedures for use by the data link layer				
Title	ITU-T Rec. Q.921	ETSI TBR 4	CR	Remarks
Definition of peer-to-peer procedures for the data link layer	5	–	GID	
Procedures for the use of P/F bit	5.1	–	–	Heading
Unacknowledged information transfer	5.1.1	10.4.1	NA	NA to PRA
Acknowledged multiple frame information transfer	5.1.2	10.6 and 10.7	M	
Procedure for unacknowledged information transfer	5.2	10.4	NA	NA to PRA
TEI management procedures	5.3	10.5	NA	NA to PRA
Initialisation of data link layer parameters	5.4	–	GID	Note 4
Procedure for establishment and release of multiple frame operation	5.5	10.6	M	
Procedure for information transfer in multiple frame operation	5.6	10.7	M	
Re-establishment of multiple frame operation	5.7	–	M	
Exception condition reporting and recovery	5.8	10.9 Note 5	M	Multiple TEI assignment is not applicable.

Table 4 : Procedures for use by the data link layer (continued)				
Title	ITU-T Rec. Q.921	ETSI TBR 4	CR	Remarks
List of system parameters	5.9	10.10	GID	
Timer T200	5.9.1	10.10.1	M	The default value shall be 1 s.
Max number of retransmissions (N200)	5.9.2	10.10.2	M	The default value shall be 3.
Max number of octets in an information field (N201)	5.9.3	10.10.3	M	The default value shall be 260 octets.
Max number of transmission of the TEI identity request message (N202)	5.9.4	10.10.4	NA	NA to PRA
Max number of outstanding I frames (k)	5.9.5	10.10.5	M	For a SAP supporting primary rate signalling, the value is 7.
Timer T201	5.9.6	–	NA	NA to PRA
Timer T202	5.9.7	10.10.6	NA	NA to PRA
Timer T203	5.9.8	–	O	The default value is 10 s.
–	–	10.10.7 Note 6	GID	Layer 2 response time
Data link monitor function	5.10	–	O	
<p>Note 4: The data link layer parameters shall be initialised to default values.</p> <p>Note 5: TBR 4 considers the receipt of an invalid N(R) as the only condition for frame rejection.</p> <p>Note 6: The maximum time between receipt of an incoming frame and generation of a response shall not exceed 500 ms, operating in a point-to-point signalling connection.</p>				

Table 5: Annexes and Appendices				
Title	ITU-T Rec. Q.921	ETSI TBR 4	CR	Remarks
Provision for point-to-point data link connection	Annex A	10.3	M	For single point-to-point signalling connection at layer 3, TEI value 0 shall be used in combination with SAPI 0.
An SDL representation of the point-to-point procedures of data link layer	Annex B	–	GID	
SDL representation of the broadcast procedures of the data link layer	Annex C	–	GID	
State transition table of the point-to-point procedures of the data link layer	Annex D	–	GID	
Provision of multi-selective reject option	Annex E	–	GID	
Protocol Implementation Conformance Statement (PICS) to Recommendation Q.921 for Basic Rate (User-side)	Annex F	–	GID	
Protocol Implementation Conformance Statement (PICS) to Recommendation Q.921 for Basic Rate (Network-side)	Annex G	–	GID	
Protocol Implementation Conformance Statement (PICS) to Recommendation Q.921 for Primary Rate (User-side)	Annex H	–	GID	
Protocol Implementation Conformance Statement (PICS) to Recommendation Q.921 for Primary Rate (Network-side)	Annex I	–	GID	
Inter-exchange signalling data link layer protocol in Private Integrated Services Networks (PISNs)	Annex J (Q.921 Amendment 1)	–	GID	Applicability and additions to frame structure, elements of procedures, formats of fields, elements for layer-to-layer communication, peer-to-peer procedures to accommodate PISN inter-exchange requirements
Retransmission of REJ response frame	Appendix I	–	O	
Occurrence of MDL-ERROR-INDICATION within the basic states & actions to be taken by the management entity	Appendix II	–	GID	
Optional basic access deactivation procedures	Appendix III	–	NA	May be used by network side system management to control deactivation of access
Automatic negotiation of data link layer parameters	Appendix IV	–	O	
Inter-exchange signalling data link layer protocol in PISNs	Appendix V (Q.921 Amendment 1)	–	GID	Occurrence of the MDL-ERROR indication primitive in the data link layer protocol for the support of Inter-exchange signalling in PISNs

Part D ISDN User-Network Interface Layer 3 Specification for Basic Call Control

(ITU-T Recommendation Q.931 05/1998 & Amendment 1 12/2002)

Table 1: Overview of call control				
Title	ITU-T Rec. Q.931	ETSI TBR 4	CR	Remarks
General	1	–	GID	
Overview of call control	2	–	GID	
Circuit switched calls	2.1	–	GID	
Call states at the user side of the interface	2.1.1	11.1.1	GID	
Null state (U0)	2.1.1.1	11.1.1.1	M	
Call initiated (U1)	2.1.1.2	11.1.1.2	M	
Overlap sending (U2)	2.1.1.3	11.1.1.3	O	See Note 1
Outgoing call proceeding (U3)	2.1.1.4	11.1.1.4	M	See Note 1
Call delivered (U4)	2.1.1.5	11.1.1.5	M	See Note 1
Call present (U6)	2.1.1.6	11.1.1.6	M	Transitory state
Call received (U7)	2.1.1.7	11.1.1.7	O	M if alerting is used
Connect request (U8)	2.1.1.8	11.1.1.8	M	
Incoming call proceeding (U9)	2.1.1.9	11.1.1.9	O	M if call proc. is used
Active (U10)	2.1.1.10	11.1.1.10	M	
Disconnect request (U11)	2.1.1.11	11.1.1.11	M	
Disconnect indication (U12)	2.1.1.12	11.1.1.12	M	
Suspend request (U15)	2.1.1.13	11.1.1.13	NA	NA to PRA
Resume request (U17)	2.1.1.14	11.1.1.14	NA	NA to PRA
Release request (U19)	2.1.1.15	11.1.1.15	M	
Overlap receiving (U25)	2.1.1.16	11.1.1.16	O	
Call states at the network side of the interface	2.1.2	11.1.2	GID	
Packet mode access connections	2.2	–	O	
Temporary signalling connections	2.3	–	O	
States associated with the global call reference	2.4	11.1.3	M	
Call states at the user side of the interface	2.4.1	11.1.3.1	GID	
Null (Rest 0)	2.4.1.1	11.1.3.1.1	M	
Restart request (Rest 1)	2.4.1.2	11.1.3.1.2	O	
Restart (Rest 2)	2.4.1.3	11.1.3.1.3	M	
Call states at the network side of the interface	2.4.2	11.1.3.2	NA	
Note 1: TE may not need this call state, but to fulfil procedures specified in ITU-T Rec. Q.931 section 5 and all its subsections, all TEs must implement the call state.				

Table 2: Message functional definitions and content				
Title	ITU-T Rec. Q.931	ETSI TBR 4	CR	Remarks
Message functional definitions and content	3	11.2	GID	Note 2
Messages for circuit mode connection control	3.1	–	GID	
ALERTING	3.1.1	11.2.1	M	Note 3
CALL PROCEEDING	3.1.2	11.2.2	M	Note 3
CONNECT	3.1.3	11.2.3	M	
CONNECT ACKNOWLEDGE	3.1.4	11.2.4	M	Note 3
DISCONNECT	3.1.5	11.2.5	M	
INFORMATION	3.1.6	11.2.6	O	Note 3
NOTIFY	3.1.7	11.2.7	O	Note 3
PROGRESS	3.1.8	11.2.8	O	Note 3
RELEASE	3.1.9	11.2.9	M	
RELEASE COMPLETE	3.1.10	11.2.10	M	
RESUME	3.1.11	11.2.11	NA	NA to PRA
RESUME ACKNOWLEDGE	3.1.12	11.2.12	NA	NA to PRA
RESUME REJECT	3.1.13	11.2.13	NA	NA to PRA
SETUP	3.1.14	11.2.14	M	
SETUP ACKNOWLEDGE	3.1.15	11.2.15	M	Note 3 - network to user only
STATUS	3.1.16	11.2.16	M	
STATUS ENQUIRY	3.1.17	11.2.17	M	Note 3
SUSPEND	3.1.18	11.2.18	NA	NA to PRA
SUSPEND ACKNOWLEDGE	3.1.19	11.2.19	NA	NA to PRA
SUSPEND REJECT	3.1.20	11.2.20	NA	NA to PRA
Messages for packet mode connection control	3.2	–	O	Note 4
Messages for user signalling bearer service control	3.3	–	O	
Messages used with the global call reference	3.4	11.2.21	–	Heading
RESTART	3.4.1	11.2.21.1	O	
RESTART ACKNOWLEDGE	3.4.2	11.2.21.2	M	
STATUS	3.4.3	–	O	
<p>Note 2: For specific local network implementations (optional messages and information supported by the local networks) refer to the annexes of this Specification.</p> <p>Note 3: It is optional whether a TE ever transmits this message but all TEs must be able to receive the message and handle it correctly as defined in the procedures specified in ITU-T Rec. Q.931 section 5 and all its subsections.</p> <p>Note 4: The message shall be used if Case B (packet switched access to an ISDN virtual circuit service) as defined in ITU-T Rec. Q.931 section 6 is implemented.</p>				

Table 3: General message format and information element coding				
Title	ITU-T Rec. Q.931	ETSI TBR 4	CR	Remarks
General message format and information element coding	4	11.3	GID	Note 5
Overview	4.1	11.3.1	M	
Protocol discriminator	4.2	11.3.2	M	
Call reference	4.3	11.3.3	M	One octet call reference for PRA is not supported.
Message type	4.4	11.3.4	M	
Other information elements	4.5	11.3.5	–	Heading
Coding rules	4.5.1	11.3.5.1	M	
Extensions of codesets	4.5.2	11.3.5.2	O	
Locking shift procedure	4.5.3	11.3.5.3	O	
Non-locking shift procedure	4.5.4	11.3.5.4	O	
Bearer capability	4.5.5	11.3.5.5	M	
Call identity	4.5.6	11.3.5.6	NA	NA to PRA
Call state	4.5.7	11.3.5.7	M	
Called party number	4.5.8	11.3.5.8	M	
Called party subaddress	4.5.9	11.3.5.9	O	
Calling party number	4.5.10	–	O	
Calling party subaddress	4.5.11	–	O	
Cause	4.5.12	11.3.5.10	M	Note 6
Channel identification	4.5.13	11.3.5.11	M	Note 6
Congestion level	4.5.14	–	O	
Date/time	4.5.15	–	O	Note 7
Display	4.5.16	–	O	Note 7
High layer compatibility	4.5.17	11.3.5.12	O	Note 8
Keypad facility	4.5.18	–	O	
Low layer compatibility	4.5.19	11.3.5.13	O	Note 8
More data	4.5.20	–	O	
Network-specific facilities	4.5.21	–	O	
Notification indicator	4.5.22	11.3.5.14	O	
Progress indicator	4.5.23	11.3.5.15	O	Note 6
Repeat indicator	4.5.24	–	O	
Restart indicator	4.5.25	11.3.5.16	M	
Segmented message	4.5.26	–	O	
Sending complete	4.5.27	11.3.5.17	O	Note 9
Signal	4.5.28	–	O	
Transit network selection	4.5.29	–	O	
User to user	4.5.30	–	O	
Information elements for packet communications	4.6	–	O	

Note 5: For the contents of each information element supported by the local networks, refer to the annexes of this Specification. If optional messages are implemented, the corresponding information elements shall be implemented.

Note 6: It is optional whether a TE ever transmits this information element but all TEs must be able to receive the information element and handle it correctly as defined in the procedures specified in ITU-T Rec. Q.931 section 5 and all its subsections.

Note 7: It is mandatory that the TE recognises the information element but it is optional whether the contents of the information element are displayed.

Note 8: Support of the HLC/LLC information elements is optional. However, ITU-T Rec. relating to a specific terminal type may require the support to be mandatory for those specific types of terminals.

Note 9: It is optional for a TE to generate this information element, but TEs which implement the Overlap receiving procedure shall recognise the information element and handle it correctly as defined in the procedures specified in ITU-T Rec. Q.931 section 5 and all its subsections.

Table 4: Circuit-switched call control procedures

Title	ITU-T Rec. Q.931	ETSI TBR 4	CR	Remarks
Circuit-switched call control procedures	5	–	M	Note 10
Call establishment at originating interface	5.1	11.4.1	M	
Call request	5.1.1	11.4.1.1	M	
B-channel selection - originating	5.1.2	–	M	
Overlap sending	5.1.3	11.4.1.2	O	Note 11
Invalid call information	5.1.4	–	NA	
Call proceeding	5.1.5	11.4.1.3	–	Heading
Call proceeding, enbloc sending	5.1.5.1	11.4.1.3.1	O	
Call proceeding, overlap sending	5.1.5.2	11.4.1.3.2	O	Note 11
Notification of interworking at the originating interface - receipt of - generation of	5.1.6	–	M O	
Call confirmation indication	5.1.7	11.4.1.4	M	
Call connected	5.1.8	11.4.1.5	M	
Call rejection	5.1.9	–	NA	
Transit network selection	5.1.10	–	O	
Call establishment at destination interface	5.2	11.4.2	M	
Incoming call	5.2.1	11.4.2.1	M	
Compatibility checking	5.2.2	11.4.2.2	M	
B-channel selection - destination	5.2.3	11.4.2.3	–	Heading
SETUP message delivered by point-to-point data link	5.2.3.1	11.4.2.3.1	M	
SETUP message delivered by broadcast data link	5.2.3.2	11.4.2.3.2	NA	NA to PRA
Overlap receiving	5.2.4	11.4.2.4	O	
Call confirmation	5.2.5	–	–	Heading
Response to enbloc SETUP or completion of overlap receiving	5.2.5.1	11.4.2.5.1	M	

Table 4: Circuit-switched call control procedures (continued)				
Title	ITU-T Rec. Q.931	ETSI TBR 4	CR	Remarks
Receipt of CALL PROCEEDING and ALERTING	5.2.5.2	–	NA	
Called user clearing during incoming call establishment	5.2.5.3	–	NA	
Call failure	5.2.5.4	–	NA	
Notification of interworking at terminating interface - receipt of - generation of	5.2.6	–	M O	
Call accept	5.2.7	11.4.2.6	M	
Active indication	5.2.8	11.4.2.7	M	
Non-selected user clearing	5.2.9	11.4.2.8	M	
Call clearing	5.3	11.4.3	–	Heading
Terminology	5.3.1	11.4.3.1	GID	
Exception conditions	5.3.2	11.4.3.2	M	
Clearing initiated by the user	5.3.3	11.4.3.3	M	
Clearing initiated by the network	5.3.4	11.4.3.4	M	
Clearing when tones/ announcements provided	5.3.4.1	11.4.3.4.1	O	
Clearing when tones/ announcement not provided	5.3.4.2	11.4.3.4.2	O	
Completion of clearing	5.3.4.3	11.4.3.4.3	M	
Clear collision	5.3.5	11.4.3.5	M	
In-band tones and announcements	5.4	–	NA	Refer to network operations
Restart procedure	5.5	11.4.8	M	
Sending RESTART message	5.5.1	–	O	
Receipt of RESTART message	5.5.2	–	M	
Status	5.5.3	–	O	
Call re-arrangements	5.6	11.4.4	NA	NA to PRA (Note 12)
Call collision	5.7	11.4.5	GID	
Handling of error conditions	5.8	11.4.6	M	
User notification procedure - Receipt of - Generation of	5.9	11.4.7	NA	NA to PRA (Note 13)
Basic telecommunication service identification and selection	5.10	–	O	
Signalling procedures for bearer capability selection	5.11	–	O	
Signalling procedures for high layer compatibility selection	5.12	–	O	
<p>Note 10: This section is mandatory except for information related to supplementary services, inter ISPBX application, packet calls and the use of the segmentation procedure.</p> <p>Note 11: TEs which use the overlap sending procedures must be able to receive the SETUP ACKNOWLEDGE message and handle it correctly as defined in section 5.1.3.</p> <p>Note 12: The use of call re-arrangement procedure is restricted to basic access, i.e. it will not be available for primary rate access.</p> <p>Note 13: It is optional whether a TE ever transmits a NOTIFY message but all TEs must be able to receive and handle it correctly as defined in the procedures specified in section 5 and its subsections of ITU-T Rec. Q.931.</p>				

Table 5: List of system parameters				
Title	ITU-T Rec. Q.931	ETSI TBR 4	CR	Remarks
List of system parameters	9		GID	
Timers in the network side	9.1		NA	
Timers in the user side	9.2	Table F.3	–	Refer to Table 9-2/Q.931
T301			O	Note 14
T302			O	Note 14
T303			O	Note 14
T304			O	Note 14
T305			M	30 s
T308			M	4 s
T309			O	Note 14
T310			O	Note 14
T313			M	4s
T314			O	Note 14
T316			O	Note 14 (2 min)
T317			O	Note 14 (< T316)
T318		–	NA	NA to PRA
T319		–	NA	NA to PRA
T321		–	O	Note 14 (30 s)
T322		–	O	Note 14 (4 s)
Note 14: Mandatory if the corresponding procedure is implemented, otherwise not applicable.				

Table 6: Packet communication procedures				
Title	ITU-T Rec. Q.931	ETSI TBR 4	CR	Remarks
Packet communication procedures	6	–	O	Circuit-switched access to PSPDN services (Case A)
			O	Packet switched access to an ISDN virtual circuit service (Case B) using B-channel
			O	Packet switched access to an ISDN virtual circuit service (Case B) using D-channel

Table 7: User signalling bearer service call control procedures				
Title	ITU-T Rec. Q.931	ETSI TBR 4	CR	Remarks
User signalling bearer service call control procedures	7	–	O	

Table 8: Circuit-mode multirate (64 kbit/s base rate) bearer capability				
Title	ITU-T Rec. Q.931	ETSI TBR 4	CR	Remarks
Circuit-mode multirate (64 kbit/s base rate) bearer capability	8	–	O	

Table 9: Annexes and Appendices				
Title	ITU-T Rec. Q.931	ETSI TBR 4	CR	Remarks
User side and network side SDL diagrams	Annex A	–	GID	Note 15
Compatibility and address checking	Annex B	–	M	Note 16
Transit network selection	Annex C	–	O	
Extension for symmetric call operation	Annex D	–	GID	Not applicable to the user-network interface
Network specific facility selection	Annex E	–	O	
D channel backup procedures	Annex F	–	O	For non-associated signalling applied to multiple primary rate access arrangements only
Use of progress indicators	Annex G	–	M	
Message segmentation procedures	Annex H	–	O	
Low layer information coding principles	Annex I	–	M	
Low layer compatibility negotiation	Annex J	–	O	
Procedure for establishment of bearer connection prior to call acceptance	Annex K	–	O	Network option
Optional procedures for bearer service change	Annex L	–	O	
Additional basic call signalling requirements for the support of private network inter-connection for Virtual Private Network applications	Annex M	–	O	
Flexible channel selection	Annex N	–	O	Network option
Definition of cause values	App. I	–	GID	
Example message flow diagrams and example conditions for cause mapping	App. II	–	GID	
Summary of assigned information element identifier and message type code points for the Q.93X - series and Q.95X - series of ITU-T Recommendations	App. III	–	GID	
<p>Note 15: SDL diagrams are used to describe the Q.931 protocol control for circuit switched basic calls. In the event of conflict, the procedures given in section 5 of Q.931 should take precedence.</p> <p>Note 16: The bearer service requested by the calling user in the Bearer Capability information element shall match the bearer services provided to that user by the network. If a mismatch is detected, the network shall reject the call using one of the causes listed in clause 5.1.5.2. At the called side, the user shall be able to support the bearer service offered by the network in the Bearer Capability information element. If a mismatch is detected, the user shall either ignore or reject the offered call using cause number 88, incompatible destination.</p>				

Annex A.1: ISDN Primary Rate Access Implementation Options

Optional Layer 1 Requirements	ITU-T Rec. I.431 (03/93)	SingTel's Option	StarHub's Option
Summary of functions (Layer 1)	3.1	H-channels are not supported. Power feeding is not supported.	Supported partially, AUXP and M-channels are not supported.
B-channel and H-channels	5.2.4.3	H-channels are not supported.	H-channels are not supported.
Power feeding to the NT	8	Not supported	Not supported
Timeslot assignment for interfaces having only H0 channels	Annex A	Not supported	Not supported
Timeslot assignment for 2048 kbit/s interface having H11 channel	Annex B	Not supported	Not supported

Optional Layer 2 Requirements	ITU-T Rec. Q.921 (09/97)	SingTel's Option	StarHub's Option
Frame Reject (FRMR) response	3.6.11	Supported	Not supported
Exchange Identification (XID) command/response	3.6.12	Not supported	Not supported
Data link monitor function	5.10	Supported	Supported
Retransmission of REJ response frame	App. I	Not supported	Not supported
Automatic negotiation of data link layer parameters	App. IV	Not supported	Not supported

Optional Layer 3 Requirements	ITU-T Rec. Q.931 (05/98)	Singtel's Option	StarHub's Option
Overlap sending (U2)	2.1.1.3	Supported	Supported
Call received (U7)	2.1.1.7	Supported	Supported
Incoming call proceeding (U9)	2.1.1.9	Supported	Supported
Overlap receiving (U25)	2.1.1.16	U25 and N25 states are not supported.	U25 and N25 states are not supported.
Packet mode access connections	2.2	Not supported	Not supported
Temporary signalling connections	2.3	Not supported	Not supported
Restart request (Rest 1)	2.4.1.2	Supported	Supported
INFORMATION	3.1.6	Supported	Supported
NOTIFY	3.1.7	Not supported	Not supported
PROGRESS	3.1.8	Not supported	Not supported
Messages for packet mode connection control	3.2	Not supported	Not supported
Messages for user to user signalling not associated with circuit switched calls	3.3	Not supported	Not supported
RESTART	3.4.1	Supported	Supported
STATUS (with global call reference)	3.4.3	Supported	Supported
Extension of codesets	4.5.2	Not supported	Not supported
Locking shift procedure	4.5.3	Not supported	Not supported
Non-locking shift procedure	4.5.4	Not supported	Not supported
Called party subaddress	4.5.9	Supported	Supported
Calling party number	4.5.10	Supported	Supported
Calling party subaddress	4.5.11	Supported	Supported
Congestion level	4.5.14	Not supported	Not supported

Optional Layer 3 Requirements (continued)	ITU-T Rec. Q.931 (05/98)	Singtel's Option	StarHub's Option
Date/time	4.5.15	Supported	Supported
Display	4.5.16	Supported	Supported
High layer compatibility	4.5.17	Supported	Supported
Keypad facility	4.5.18	Supported	Not supported
Low layer compatibility	4.5.19	Supported	Supported
More data	4.5.20	Not supported	Not supported
Network-specific facilities	4.5.21	Not supported	Not supported
Notification indicator	4.5.22	Not supported	Not supported
Progress indicator	4.5.23	Supported	Supported
Repeat indicator	4.5.24	Not supported	Not supported
Segmented message	4.5.26	Not supported	Not supported
Sending complete	4.5.27	Supported	Supported
Signal	4.5.28	Supported	Not supported
Transit network selection	4.5.29	Not supported	Not supported
User to user	4.5.30	Supported	Supported
Information elements for packet communications	4.6	Not supported	Not supported
Overlap sending	5.1.3	Supported	Supported
Call proceeding, enbloc sending	5.1.5.1	Supported	Supported
Call proceeding, overlap sending	5.1.5.2	Supported	Supported
Transit network selection	5.1.10	Not supported	Not supported
Overlap receiving	5.2.4	Not supported	Not supported
Clearing when tones/ announcements provided	5.3.4.1	Supported	Supported
Clearing when tones/ announcement not provided	5.3.4.2	Supported	Supported
Basic telecommunication service identification and selection	5.10	Not supported	Not supported
Signalling procedures for bearer capability selection	5.11	Not supported	Not supported
Signalling procedures for high layer compatibility selection	5.12	Not supported	Not supported

Optional Layer 3 Requirements (continued)	ITU-T Rec. Q.931 (05/98)	Singtel's Option	StarHub's Option
Packet communication procedures	6	Not supported	Not supported
User signalling bearer service call control procedures	7	Not supported (as Q.931 clause 2.3 is not supported)	Not supported
Circuit-mode multirate (64 kbit/s base rate bearer capability)	8	Not supported	Not supported
Timers in the user side	9.2	T301, T302, T314 and T321 are not supported. T303, T304, T309, T310, T316, T317, T318, T319 and T322 are supported.	T314, T318, T319, T321 are not supported. T301, T302, T303, T304, T309, T310, T316, T317, T322 are supported.
Transit network selection	Annex C	Not supported	Not supported
Network specific facility selection	Annex E	Not supported	Not supported
D-channel backup procedures	Annex F	Not supported	Not supported
Message segmentation procedures	Annex H	Not supported	Not supported
Low layer compatibility negotiation	Annex J	Not supported	Not supported
Procedures for establishment of bearer connection prior to call acceptance	Annex K	Not supported	Not supported
Optional procedures for bearer service change	Annex L	Not supported	Not supported
Additional basic call signalling requirements for the support of private network inter-connection for Virtual Private Network applications	Annex M	Not supported	Not supported
Flexible channel selection	Annex N	Not supported	Not supported

Annex A.2: Guide to the Recognised Information Elements

Bearer capability (Q.931 clause 4.5.5)

Octet	Field	Value(s) recognised	SingTel's option	StarHub's option
3	Extension bit	Last octet	Supported	Supported
	Coding standard	ITU-T standardised coding	Supported	Supported
		ISO/IEC standard	Not supported	Not supported
		National standard	Not supported	Not supported
		Standard defined for the network (either public or private) present on the network side of the interface	Not supported	Not supported
	Information transfer capability	Speech	Supported	Supported
		Unrestricted digital information	Supported	Supported
		Restricted digital information	Not supported	Not supported
		3.1 kHz audio	Supported	Supported
		Unrestricted digital information with tones/announcements	Not supported	Not supported
	Video	Not supported	Supported	
4	Extension bit	Last octet	Supported	Supported
	Transfer mode	Circuit mode	Supported	Supported
		Packet mode	Not supported	Not supported
	Information transfer rate	This code shall be used for packet mode calls.	Not supported	Not supported
		64 kbit/s	Supported	Supported
		2 x 64 kbit/s	Not supported	Not supported
		384 kbit/s	Not supported	Not supported
		1536 kbit/s	Not supported	Not supported
1920 kbit/s		Not supported	Not supported	
Multirate (64 kbit/s base rate)	Not supported	Not supported		
5*	Extension bit	Last octet	Supported	Supported
		Octet continues through the next octet	Supported	Supported
	User information layer 1 protocol	ITU-T standardised rate adaptation V.110/X.30 (Octet 5a is required. Octets 5b, 5c and 5d are optional.)	Supported	Supported
		Rec. G.711 μ -law	Not supported	Not supported
		Rec. G.711 A-law	Supported	Supported
		Rec. G.721 32 kbit/s ADPCM and Rec. I.460	Not supported	Supported
		Rec. H.221 and H.242	Not supported	Not supported
		Rec. H.223 and H.245	Not supported	Not supported
		Non-CCITT standardized rate adaption.	Not supported	Supported
		ITU-T standardised rate adaption V.120 (Octets 5a and 5b are required, octets 5c and 5d are optional.)	Supported	Not supported
	ITU-T standardised rate adaption X.31 HDLC flag stuffing.	Not supported	Supported	

Bearer capability (Q.931 clause 4.5.5 continued)

Octet	Field	Value(s) recognised	SingTel's option	StarHub's option
5a* (Note 1)	Extension bit	Last octet	Supported	Note 2
		Octet continues through the next octet	Supported	Note 2
	Synchronous / Asynchronous	Synchronous	Supported	Note 2
		Asynchronous	Supported	Note 2
	Negotiation	In-band negotiation not possible	Supported	Note 2
		In-band negotiation possible	Supported	Note 2
User rate	(as specified in Table 4-6/Q.931 on user rate octet 5a)	Supported	Note 2	
5b* (for V.110 / X.30 rate adaption)	Extension bit	Last octet	Supported	Note 2
		Octet continues through the next octet	Supported	Note 2
	Intermediate rate	Not used	Supported	Note 2
		8 kbit/s	Supported	Note 2
		16 kbit/s	Supported	Note 2
		32 kbit/s	Supported	Note 2
	Network Independent Clock (NIC) on transmission (Tx)	Not required to send data with network independent clock	Supported	Note 2
		Required to send data with network independent clock	Supported	Note 2
	Network Independent Clock (NIC) on reception (Rx)	Cannot accept data with network independent clock	Supported	Note 2
		Can accept data with network independent clock	Supported	Note 2
	Flow control on transmission (Tx)	Not required to send data with flow control mechanism	Supported	Note 2
		Required to send data with flow control mechanism	Supported	Note 2
	Flow control on reception (Rx)	Cannot accept data with flow control mechanism	Supported	Note 2
		Can accept data with flow control mechanism	Supported	Note 2

Bearer capability (Q.931 clause 4.5.5 continued)

Octet	Field	Value(s) recognised	SingTel's option	StarHub's option
5b [*] (V.120 rate adaption)	Rate adaption header / no header	Rate adaption header not included	Supported	Note 2
		Rate adaption header included	Supported	Note 2
	Multiple frame establishment support in data link	Multiple frame establishment is not supported. Only UI frames are allowed.	Supported	Note 2
		Multiple frame establishment supported	Supported	Note 2
	Mode of operation	Bit transparent mode of operation	Supported	Note 2
		Protocol sensitive mode of operation	Supported	Note 2
	Logical Link Identifier (LLI) negotiation	Default, LLI=256 only	Supported	Note 2
		Full protocol negotiation (A connection over which protocol negotiation will be executed is indicated in bit 2 of octet 5b.)	Supported	Note 2
	Assignor/assignee	Message originator is "Default assignee"	Supported	Note 2
		Message originator is "Assignor only"	Supported	Note 2
	In-band/out-band negotiation	Negotiation is done with USER INFORMATION messages on a temporary signalling connection	Supported	Note 2
		Negotiation is done in-band using logical link zero	Supported	Note 2
5c [*] (Note 1)	Extension bit	Last octet	Supported	Note 2
		Octet continues through the next octet	Supported	Note 2
	Number of stop bits	Not used	Supported	Note 2
		1 bit	Supported	Note 2
		1.5 bits	Supported	Note 2
		2 bits	Supported	Note 2
	Number of data bits excluding parity bit if present	Not used	Supported	Note 2
		5 bits	Supported	Note 2
		7 bits	Supported	Note 2
		8 bits	Supported	Note 2
	Parity information	Odd	Supported	Note 2
		Even	Supported	Note 2
		None	Supported	Note 2
		Forced to 0	Supported	Note 2
Forced to 1		Supported	Note 2	
5d [*] (Note 1)	Extension bit	Last octet	Supported	Note 2
	Duplex mode	Half duplex	Supported	Note 2
		Full duplex	Supported	Note 2
	Modem type	Coded according to network specific rules (as specified in Table 4-6/Q.931 on modem type octet 5d)	Supported	Note 2
6 [*]	Extension bit	Last octet	Supported	Note 2
	Layer 2 identification	Layer 2 identification code	Supported	Note 2
	User information layer 2 protocol	Rec. Q.921	Supported	Note 2
		Rec. X.25, link level	Supported	Note 2
	LAN logical link control (ISO/IEC 8802-2)	Not supported	Note 2	

Bearer capability (Q.931 clause 4.5.5 continued)

Octet	Field	Value(s) recognised	SingTel's option	StarHub's option
7	Extension bit	Last octet	Supported	Note 2
	Layer 3 identification	Layer 3 identification code	Supported	Note 2
	User information layer 3 protocol	Rec. Q.931	Supported	Note 2
		Rec. X.25, packet layer	Supported	Note 2
		ISO/IEC TR 9577 (Protocol identification in the network layer)	Not supported	Note 2

Note 1: This octet may be present if octet 3 indicates *unrestricted digital information* and octet 5 indicates either of the ITU-T standardised rate adaption V.110/X.30 or V.120. It may also be present if octet 3 indicates 3.1 kHz audio and octet 5 indicates G.711.

Note 2: Octets 5a to 7 are passed through without checking.

Call identity (Q.931 clause 4.5.6)

Call identity information element is not applicable in ISDN PRA (for identifying the suspended call in call re-arrangement, which is restricted to ISDN BA).

Call State (Q.931 clause 4.5.7)

Octet	Field	Value(s) recognised	SingTel's option	StarHub's option
3	Coding standard	ITU-T standardised coding	Supported	Supported
		ISO/IEC standard	Not supported	Not supported
		National standard	Not supported	Not supported
		Standard defined for the network (either public or private) present on the network side of the interface	Not supported	Not supported
	Call state value	Null	Supported	Supported
		Call initiated	Supported	Supported
		Overlap sending	Supported	Supported
		Outgoing call proceeding	Supported	Supported
		Call delivered	Supported	Supported
		Call present	Supported	Supported
		Call received	Supported	Supported
		Connect request	Supported	Supported
		Incoming call proceeding	Supported	Supported
		Active	Supported	Supported
		Disconnect request	Supported	Supported
		Disconnect indication	Supported	Supported
		Suspend request	Supported	Supported
		Resume request	Supported	Supported
	Release request	Supported	Supported	
	Global interface state value	Null	Supported	Supported
		Restart request	Supported	Supported
		Restart	Supported	Supported

Called party number (Q.931 clause 4.5.8)

Octet	Field	Value(s) recognised	SingTel's option	StarHub's option
3	Extension bit	Last octet	Supported	Supported
	Type of number (Note 1)	Unknown (Note 2)	Supported	Supported
		International number (Note 3)	Supported	Supported
		National number	Supported	Supported
		Network specific number	Not supported	Not supported
		Subscriber number (Note 3)	Supported	Supported
		Abbreviated number	Not supported	Not supported
		Reserved for extension	Not supported	Not supported
	Numbering plan identification	Unknown (Note 2)	Supported	Supported
		ISDN/telephony numbering plan (Rec. E.164)	Supported	Supported
		Data numbering plan (Rec. X.121)	Not supported	Not supported
		Telex numbering plan (Rec. F.69)	Not supported	Not supported
		National standard numbering plan	Not supported	Not supported
		Private numbering plan	Not supported	Not supported
Reserved for extension		Not supported	Not supported	
4, etc.	Number digits (IA5 characters)	Decimal digits 0 - 9 (The number digits appear in multiple octet 4's in the same order in which they would be entered, that is, the number digit which would be entered first is located in the first octet 4.)	Supported	Supported

Note 1: For the definition of "number", see ITU-T Rec. I.330.

Note 2: The type of number "unknown" is used when the user or the network has no knowledge of the type of number, e.g. international number, national number, etc. In this case the number of digits field is organized according to the network dialling plan; e.g. prefix or escape digits might be present.

Note 3: Prefix or escape digits shall not be included.

Called party subaddress (Q.931 clause 4.5.9)

Octet	Field	Value(s) recognised	SingTel's option	StarHub's option
3	Extension bit	Last octet	Supported	Note 2
	Type of subaddress	NSAP(X.213/ISO 8348 AD2)	Supported	Note 2
		User specified	Supported	Note 2
	Odd/even indicator	Even number of address signals	Supported	Note 2
Odd number of address signals		Supported	Note 2	
4, etc.	Subaddress information	The NSAP X.213/ISO 8348 AD2 address shall be formatted as specified by octet 4 which contains the Authority and Format Identifier (AFI). The encoding is made according to the "preferred binary encoding" as defined in NSAP X.213/ISO 8348 AD2. For the definition of this type of subaddress, see Rec. 1.334. For user specified subaddress, this field is encoded according to the user specification, subject to a maximum length of 20 octets. When interworking with X.25 networks BCD coding should be applied.	Supported	Note 2

Note 1: It is recommended that users apply the NSAP subaddress type since this subaddress type allows the use of decimal, binary and IA5 characters syntax using digits 0-9.

Note 2: Octets are passed through without checking.

Calling party number (Q.931 clause 4.5.10)

Octet	Field	Value(s) recognised	SingTel's option	StarHub's option
3	Extension bit	Last octet	Supported	Supported
		octet continues through the next octet	Supported	Supported
	Type of number (Note 1)	Unknown (Note 2)	Supported	Supported
		International number (Note 3)	Supported	Supported
		National number (Note 3)	Supported	Supported
		Network specific number (Note 4)	Not supported	Not supported
		Subscriber number (Note 3)	Supported	Supported
		Abbreviated number (Note 5)	Not supported	Not supported
		Reserved for extension	Not supported	Not supported
	Numbering plan identification	Unknown (Note 2)	Supported	Supported
		ISDN/telephony numbering plan (Rec. E.164)	Supported	Supported
		Data numbering plan (Rec. X.121)	Not supported	Not supported
		Telex numbering plan (Rec. F.69)	Not supported	Not supported
		National standard numbering plan	Not supported	Not supported
		Private numbering plan	Not supported	Not supported
		Reserved for extension	Not supported	Not supported
3a*	Extension bit	Last octet	Supported	Supported
	Presentation indicator (If octet 3a is omitted "Presentation allowed" is assumed.)	Presentation allowed	Supported	Supported
		Presentation restricted	Supported	Supported
		Number not available due to interworking	Supported	Supported
		Reserved	Supported	Not supported
	Screening indicator (If octet 3a is omitted "User-provided, verified and passed" is assumed.)	User-provided, not screened	Supported	Supported
		User-provided, verified and passed	Supported	Supported
		User-provided, verified and failed	Supported	Supported
		Network provided	Supported	Supported
	4, etc.	Number digits	Decimal digits 0 - 9 (This field is coded with IA5 characters, according to the formats specified in the appropriate numbering / dialling plan.)	Supported

Note 1: For the definition of "number", see ITU-T Rec. I.330.

Note 2: The type of number "unknown" is used when the user or the network has no knowledge of the type of number, e.g. international number, national number, etc. In this case the number of digits field is organized according to the network dialling plan; e.g. prefix or escape digits might be present.

Note 3: Prefix or escape digits shall not be included.

Note 4: The type of number "network specific number" is used to indicate administration/service number specific to the serving network, e.g. used to access an operator.

Note 5: The support of this code is network dependent. The number provided in this information element presents a shorthand representation of the complete number in the specified numbering plan as supported by the network.

Calling party subaddress (Q.931 clause 4.5.11)

Octet	Field	Value(s) recognised	SingTel's option	StarHub's option
3	Extension bit	Last octet	Supported	Note 3
	Type of subaddress	NSAP (X.213/ISO 8348 AD2)	Supported	Note 3
		User specified	Supported	Note 3
	Odd/even indicator (Note 1)	Even number of address signals	Supported	Note 3
Odd number of address signals		Supported	Note 3	
4, etc.	Subaddress information	<p>The NSAP X.213/ISO 8348 AD2 address shall be formatted as specified by octet 4 which contains the Authority and Format Identifier (AFI). The encoding is made according to the "preferred binary encoding" as defined in NSAP X.213/ISO 8348 AD2. For the definition of this type of subaddress, see Rec. I.334.</p> <p>For user specified subaddress, this field is encoded according to the user specification, subject to a maximum length of 20 octets. When interworking with X.25 networks BCD coding should be applied.</p>	Supported	Note 3

Note 1: The odd/even indicator is used when the type of subaddress is "user specified" and the coding is BCD.

Note 2: It is recommended that users apply the NSAP subaddress type since this subaddress type allows the use of decimal, binary and IA5 characters in a standardised manner.

Note 3: Octets are passed through without checking.

Cause (Q.931 clause 4.5.12)

Octet	Field	Value(s) recognised	SingTel's option	StarHub's option
3	Extension bit	Last octet	Supported	Supported
		octet continues through the next octet	Supported	Supported
	Coding standard	ITU-T standardised coding	Supported	Supported
	Location Note: Depending on location of users, the local public network and the remote public network may be the same network.	User	Supported	Supported
		Private network serving the local user	Supported	Not supported
		Public network serving the local user	Supported	Supported
		Transit network	Supported	Supported
		Public network serving the remote user	Supported	Supported
		Private network serving the remote user	Supported	Supported
		International network	Supported	Supported
Network beyond interworking point		Supported	Supported	
3a	Extension bit	Last octet	Supported	Supported
	Recommendation	Q.931	Supported	Supported
4	Extension bit	Last octet	Supported	Supported
	Cause value	<p>The cause value is divided in two fields, a class (bits 5 through 7) and a value within the class (bits 1 through 4).</p> <p>The class indicates the general nature of the event.</p> <p>The cause values are defined in Appendix I of Q.931.</p>	Supported	Supported
5	Diagnostics	Diagnostic information is not available for every cause. The inclusion of diagnostics is optional. When available the coding of diagnostic(s) is the same as for the corresponding information element identifier or message type code.	Supported	Supported

Channel identification (Q.931 § 4.5.13)

Octet	Field	Value(s) recognised	SingTel's option	StarHub's option
3	Extension bit	Last octet	Supported	Supported
	Interface identifier present (Note 1)	Interface implicitly identified (including the D-channel carrying this information element)	Supported	Supported
		Interface explicitly identified in one or more octets, beginning with octet 3.1	Supported	Not supported
	Interface type	Reserved (for basic interface in ISDN BA)	Supported	Not supported
		Primary rate interface	Supported	Supported
	Preferred / Exclusive (has significance only for B-channel selection)	Indicated channel is preferred	Not supported	Supported
		Exclusive, only the indicated channel is acceptable	Supported	Supported
	D-channel indicator (has significance in D-channel used)	The channel identified is not the D-channel	Supported	Supported
		The channel identified is the D-channel	Supported	Not supported
	Information channel selection	No channel	Supported	Not supported
		As indicated in the following octets	Supported	Supported
		Reserved	Supported	Not supported
		Any channel	Supported	Supported
	3.1*	Extension bit	Octet continues through the next octet	Supported
Interface identifier		Binary code assigned to interface at the time of subscription	Supported	Not supported
3.2* (Note 2)	Extension bit	Last octet	Supported	Supported
	Coding standard	ITU-T standardised coding	Supported	Supported
		ISO/IEC standard	Not supported	Not supported
		National standard	Not supported	Not supported
		Standard defined for the network (either public or private) present on the network side of the interface	Not supported	Not supported
	Number/Map	Channel is indicated by the number in the following octet	Supported	Supported
		Channel is indicated by the slot map in the following octet(s)	Supported	Not supported
	Channel type / Map element type	B-channel units	Supported	Supported
		H0-channel units	Not supported	Not supported
		H11-channel units	Not supported	Not supported
H12-channel units		Not supported	Not supported	
3.3* (Note 2)	Channel number / Slot map	Channel number - Binary number assigned to the channel. For B-channels, the number equals the time slot number.	Supported	Supported
		Slot map	Supports Figure 4-19/Q.931 a) only	Not supported

Note 1: When the "interface identifier present" field in octet 3 indicates "interface implicitly identified" octet 3.1 is omitted. When octet 3.1 is present, it may be extended by using the extension bit (bit 8).

Note 2: When the "interface type" field in octet 3 indicates "basic interface", octets 3.2 and 3.3 are functionally replaced by the "information channel selection" field in octet 3, and thus omitted.

Congestion level (Q.931 clause 4.5.14)

The purpose of the Congestion level information element is to describe the congestion status of the call. It is a single octet information element coded as shown in Figure 4-20/Q.931 and Table 4-14/Q.931.

Congestion level information element is not supported in SingTel's ISDN.

Date/time (Q.931 clause 4.5.15)

Octet	Field	Value(s) recognised	SingTel's option	StarHub's option
3	Year	This field is binary coded.	Supported	Supported
4	Month	This field is binary coded.	Supported	Supported
5	Day	This field is binary coded.	Supported	Supported
6	Hour	This field is binary coded.	Supported	Supported
7	Minute	This field is binary coded.	Supported	Supported
8	Second	This field is binary coded.	Not supported	Not supported

Display (Q.931 clause 4.5.16)

Octet	Field	Value(s) recognised	SingTel's option	StarHub's option
3	Display information	The display information element is coded in IA5 characters and has a network dependent default maximum length of 34 or 82 octets.	Supported	Supported

High layer compatibility (Q.931 clause 4.5.17)

The purpose of the High layer compatibility information element is to provide a means, which should be used by the remote user for compatibility checking. See Annex B/Q.931.

The High layer compatibility information element is coded as shown in Figure 4-23/Q.931 and Table 4-15/Q.931.

The maximum length of this information element is five octets.

Note: The high layer compatibility information element is transported transparently by an ISDN between a call originating entity, e.g., a calling user and the addressed entity, e.g., a remote user or a high layer function network node addressed by the call originating entity.

Keypad facility (Q.931 clause 4.5.18)

Octet	Field	Value(s) recognised	SingTel's option	StarHub's option
3	Keypad facility information	IA5 characters entered by means of a terminal keypad	Supported	Not supported

Low layer compatibility (Q.931 clause 4.5.19)

The purpose of the Low layer compatibility information element is to provide a means which should be used for capability checking by an addressed entity (e.g. a remote user or an interworking unit or a high layer function network node addressed by the calling user). The low layer information element is transferred transparently by an ISDN between the call originating entity (e.g., the calling user) and the addressed entity. See Annex B and Annex I.

The Low layer compatibility information element is coded as shown in Figure 4-25/Q.931 and Table 4-16/Q.931. The maximum length of this information element is 18 octets.

More data (Q.931 clause 4.5.20)

The More data information element is sent by the user to the network in a USER INFORMATION message, and delivered by the network to the destination user(s) in the corresponding USER INFORMATION message. The presence of the More data information element indicates to the destination user that another USER INFORMATION message will follow, containing information belonging to the same block.

The network does not supervise the use of the More data information element.

The More data information element is coded as shown in Figure 4-26/Q.931. The length of this information element is one octet.

More data information element is not supported in SingTel ISDN.

Network-specific facilities (Q.931 clause 4.5.21)

The purpose of the Network-specific facilities information element is to indicate which network facilities are to be invoked. The Network-specific facilities information element is coded as shown in Figure 4-27/Q.931 and Table 4-18/Q.931. No more than four Network-specific facilities information elements may be included in a single message.

The maximum length of this information element is network dependent.

Network-specific facilities information element is not supported in SingTel ISDN.

Notification indicator (Q.931 clause 4.5.22)

Notification indicator information element is not applicable to PRA.

Progress indicator (Q.931 clause 4.5.23)

Octet	Field	Value(s) recognised	SingTel's option	StarHub's option
3	Extension bit	Last octet	Supported	Supported
	Coding standard	ITU-T standardised coding	Supported	Supported
		ISO/IEC standard	Not supported	Not supported
		National standard	Not supported	Not supported
	Location	Standard specific to identified location	Not supported	Not supported
		User	Supported	Supported
		Private network serving the local user	Supported	Not supported
		Public network serving the local user	Supported	Supported
		Transit network	Supported	Supported
		Public network serving the remote user	Supported	Supported
4	Extension bit	Last octet	Supported	Supported
	Progress description	Call is not end-to-end ISDN; further call progress information may be available in-band	Supported	Supported
		Destination address is non ISDN	Supported	Supported
		Origination address is non ISDN	Supported	Supported
		Call has returned to the ISDN	Supported	Supported
		Interworking has occurred and has resulted in a telecommunication service change	Not supported	Supported
		In-band information or an appropriate pattern is now available	Supported	Supported

Repeat indicator (Q.931 clause 4.5.24)

The purpose of the Repeat indicator information element is to indicate how repeated information elements shall be interpreted, when included in a message. The Repeat indicator information element is included before the first occurrence of the information element which will be repeated in a message. The Repeat indication information element is coded as shown in Figure 4-30/Q.931 and Table 4-21/Q.931.

The length of this information element is one octet.

Repeat indicator information element is not supported in SingTel ISDN.

Restart indicator (Q.931 clause 4.5.25)

Octet	Field	Value(s) recognised	SingTel's option	StarHub's option
3	Extension bit	Last octet	Supported	Supported
	Class	Indicated channels	Supported	Supported (Note 1)
		Single interface	Not supported	Supported
		All interfaces	Not supported	Supported

Note 1: The channel identification information element must be included and indicate which channels to be restarted, i.e. RESTART (R1="Indicated channels", CI(channel 1, 2, 3n).

Segmented message (Q.931 clause 4.5.26)

The purpose of the Segmented message information element is to indicate that the transmission in which it appears is part of a segmented message, in addition to the use of message type SEGMENT. When included in a message segment, it appears directly after the Message type information element (see Annex H/Q.931).

The Segmented message information element is coded as shown in Figure 4-32/Q.931 and Table 4-23/Q.931. The length of this information element is four octets.

Segmented message information element is not supported in SingTel ISDN.

Sending complete (Q.931 clause 4.5.27)

The purpose of the Sending complete information element is to optionally indicate completion of called party number.

It is a single octet information element coded as shown in Figure 4-33/Q.931.

Signal (Q.931 clause 4.5.28)

Octet	Field	Value(s) recognised	SingTel's option	StarHub's option
3	Signal value	Convey information to user regarding tones and alerting signals (see clause 7)	Supported	Not supported

Transit network selection (Q.931 clause 4.5.29)

The purpose of the Transit network selection information element is to identify one requested transit network. The Transit network selection information element may be repeated in a message to select a sequence of transit networks through which a call must pass (see Annex C/Q.931).

The Transit network selection information element is coded as shown in Figure 4-35/Q.931 and Table 4-25/Q.931. The maximum length of this information element is network dependent.

Transit network selection information element is not supported in SingTel ISDN.

User-user (Q.931 clause 4.5.30)

The purpose of the User-user information element is to convey information between ISDN users. This information is not interpreted by the network, but rather is carried transparently and delivered to the remote user(s).

The User-user information element is coded as shown in Figure 4-36/Q.931 and Table 4-26/Q.931. There are no restrictions on content of the user information field.

Annex B: References

For the technical requirements captured in this Specification, reference has been made to the following documents:

ITU-T Rec. I.431 (03/93)	Primary Rate User-Network Interface – Layer 1 Specification
ITU-T Rec. I.431 Amendment 1 (06/97)	Primary Rate User-Network Interface – Layer 1 Specification Amendment 1
ITU-T Rec. Q.921 (09/97)	ISDN User-Network Interface – Data Link Layer Specification
ITU-T Rec. Q.921 Amendment 1 (02/2000)	ISDN User-Network Interface – Data Link Layer Specification Amendment 1
ITU-T Rec. Q.931 (05/98)	ISDN User-Network Interface Layer 3 Specification for Basic Call Control
ITU-T Rec. Q.931 Amendment 1 (05/98)	ISDN User-Network Interface Layer 3 Specification for Basic Call Control Amendment 1 Extensions for the support of digital multiplexing equipment
Erratum1 (02/2003) to ITU-T Rec. Q.931	ISDN User-Network Interface Layer 3 Specification for Basic Call Control
ITU-T Rec. G.961 03/93	Digital Transmission System on Metallic Local Lines for ISDN Basic Rate Access
ETSI TBR 4 Nov 95	Attachment requirements for terminal equipment to connect to an ISDN using ISDN primary rate access
ETSI TBR 4 A1 Dec 97	This amendment A1 modifies the TBR 4 (1995)
IEC 60950-1: 2001	Information Technology Equipment – Safety
IEC CISPR 22: 2003-04	Information Technology Equipment – Radio disturbance characteristics – Limits and methods of measurement

Note:

ETSI	European Telecommunications Standards Institute
ETR	ETSI Technical Report
IEC	International Electro-technical Commission
ITU-T	International Telecommunication Union – Telecommunication Sector
TBR	Technical Basis for Regulation

Annex C: Corrigendum / Addendum

Changes to IDA TS ISDN PRA Issue 1, Jul 05			
Page	TS Ref.	Items Changed	Effective Date
–	–	Change of IDA's address at cover page to Mapletree Business City.	1 May 11

Changes to IDA TS ISDN 2 Issue 1 Rev 4			
Page	TS Ref.	Items Changed	Effective Date
–	–	<p>Title of Specification has been renamed as "Technical Specification for connecting to the Integrated Services Digital Network (ISDN) using Primary Rate Access" (IDA TS ISDN PRA Issue 1).</p> <p>The Technical Specification, IDA TS ISDN PRA Issue 1 has superseded the IDA TS ISDN 2 Issue 1 Rev 4. It has also incorporated the EMC requirements, previously published under the IDA TS EMC Issue 1 Rev 1.</p> <p>Changes are mainly editorial in nature, in which the essential technical requirements for compliance remain unchanged.</p>	21 Jul 05