



Reference Specification

for

Access Network (AN) systems

with

V5.2 Interface (based on 2048 kbit/s)

for connection to the

Digital Local Exchange (LE)

IDA RS PSTN6
Issue 1 Rev 1, 1 December 1999

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NOTICE

This Specification is subject to review and revision.

PART A INTRODUCTION

1 SCOPE

1.1 This Specification defines a V-interface (V5.2) for the connection of an Access Network (AN) to a Local Exchange (LE) for the support of the following access types:

- analogue telephone access, based on IDA TS PSTN 1;
- ISDN basic access with a NT1 separated from the AN, with a line transmission system conforming to ITU-T Recommendation G.960;
- ISDN basic access with a NT1 integrated in the AN, based on IDA TS ISDN 1;
- ISDN primary rate access with a user network interface according to IDA TS ISDN 2 at the user side of the AN (i.e. the interface at the T-reference point);
- other analogue or digital accesses for semi-permanent connections without associated outband signalling information.

with flexible information channel (bearer channel) allocation on a call by call basis which provides concentration capability within the AN and over the V5.2 interface.

NOTE

Terminal equipment connected to the user ports must be IDA type-approved models.

1.2 The V5.2 interface may use up to sixteen 2048 kbit/s links on one interface in comparison with the V5.1 interface which uses one 2048 kbit/s link. It is an extension of the V5.1 interface, and therefore this Specification should be used in conjunction with the Specification for V5.1 interface, IDA RS PSTN 5.

1.3 A link control capability is provided in order to manage the possible multi-link arrangements within a V5.2 interface.

1.4 A protection capability is provided in order to allow the interface to continue functioning in the event of 2048 kbit/s link failures.

1.5 Annex A provides an overview of the service scenarios and architecture taken as the conceptual basis for the specification of the V5.2 interface.

1.6 Annex B defines the use of the protocol information elements for the definition of the national PSTN protocols and information flow diagrams to the PSTN protocol specification. Annex H provides the definition of the Layer 3 PSTN protocol error detection.

1.7 Annex C specifies the basic assumptions of the management function in the LE and the AN to support correct operation and control of the configuration.

1.8 Annex D describes the protocol architecture for the ISDN and PSTN user port status control information transfer.

1.9 Annex E provides an overview of frame formats used in the V5.2 interface and also the message types allocated to the V5.2 interface.

1.10 Abbreviations

AI	Activate Indication
AIS	Alarm Indication Signal
AN	Access Network
AN-FR	AN Frame Relay function
BA	ISDN Basic Access

BCC	Bearer Channel Connection
BECN	Backward Explicit Congestion Notification
C-channel	Communication channel
C-path	Communication path
CRC	Cyclic Redundancy Check
C/R	Command/Response
CTRL	Control protocol message
Cx	Communication channel with index
C64	Communication channel 64 kbit/s
dB	decibel
DDI	Direct-Dialling-In
DE	Discard Eligibility indicator
DI	Deactivate Indication
DL	Primitive between layer 2 and layer 3
DLCI	Data Link Connection Identifier
DTMF	Dual Tone Multiple Frequency
DS	access Digital Section
Ds	D-channel signalling type data
D16	D-channel 16 kbit/s
EA	Address Extension bit
EFaddr	Envelope Function address
EI	Error Indication
ET	Exchange Termination
FCS	Frame Check Sequence
FE	Function Element
FECN	Forward Explicit Congestion Notification
FRI	Frame Relaying Information
FSM	Finite State Machine
H0	Channel with 384 kbit/s accompanied by timing
H12	Channel with 1920 kbit/s accompanied by timing
ID	Interface identifier
ISDN	Integrated Services Digital Network
ISDN-BA	ISDN-Basic Access
ISDN-PRA	ISDN Primary Rate Access
LAPB	Link Access Protocol Balanced for X.25
LAPD	Link Access Protocol for ISDN D-channel
LAP-F	Link Access Protocol for frame mode
LAPV5	Link Access Protocol for V5-interface
LAPV5-DL	LAPV5 Data Link sublayer
LAPV5-EF	LAPV5 Envelope Function sublayer
LC	Line Circuit
LE	Local Exchange
LFA	Loss of Frame Alignment
LOF	Loss of Frame alignment
LOS	Loss of Signal

LT	Line Termination
L1	Layer 1 function
L2	Layer 2 function
L3	Layer 3 function
L3addr	Layer 3 address
M	Mandatory protocol element
MCI	Malicious Call Identification
MDU	Management Data Unit
MDL	Primitive between layer 2 and layer 3 management
MF	Mapping Function
MPH	Primitive between physical layer and layer 2 management
NOF	Normal Operational Frames
NT1	Network Termination 1
NT2	Network Termination 2
O	Optional protocol element
PCM	Pulse Code Modulation
P/F	P-type and/or f-type data
PH	Primitive between physical layer and layer 2
PICS	Protocol Implementation Conformance Statements
PL	Permanent Line capability (service)
PSTN	Public Switched Telephone Network
PABX	Private Automatic Branch eXchange
Q _{AN}	Q-interface at the AN
Q _{LE}	Q-interface at the LE
RAI	Remote Alarm Indication
REQ	Request
SAPI	Service Access Point Identifier
SN	Sequence Number
TE	Terminal Equipment (ISDN or PSTN)
TEI	Terminal Endpoint Identifier
TMN	Telecommunication Management Network
TSSI	Time Slot Sequence Integrity
V5DLaddr	V5-Data Link address
VP(S)	Send state Variable for Protection protocol
VP(R)	Receive state Variable for Protection protocol

2 GENERAL REQUIREMENTS

2.1 Power Supply

AN equipment may be a.c. powered or d.c. powered. For an a.c. powered equipment, the Specification shall be complied with when operating from an a.c. mains supply of voltage, 230V \pm 10% and frequency, 50 Hz \pm 2%. Where external power supply is used, e.g. AC adaptor, it shall not affect the capability of the equipment to meet the Specification.

2.2 Identification of Equipment

The equipment shall be marked with the supplier's or manufacturer's name or identification mark, and the supplier's or manufacturer's model or type reference. The markings required shall be legible, indelible and readily visible.

3	SAFETY OF TERMINAL EQUIPMENT FOR CONNECTION TO TELECOMMUNICATION NETWORKS	CR
3.1	General	–
3.1.1	<p>Equipment (mains or battery powered) shall be designed to comply with the principles of Singapore Standards (SS), International Electrotechnical Commission (IEC) or other safety standards e.g. IEC 60950, EN60950, BS EN41003, SS 337.</p> <p>Requirements applicable to the equipment (e.g. class of equipment, type of TNV circuit and types of components) covered in the following sections of IEC 60950¹ shall be identified and complied with:</p> <p>Scope (1.1 of IEC 60950)</p> <p>Definitions (1.2 of IEC 60950)</p> <p>General requirements (1.3 of IEC 60950)</p> <p>General conditions for test (1.4 of IEC 60950)</p> <p>Components (1.5 of IEC 60950)</p> <p>Power interface (1.6 of IEC 60950)</p> <p>Marking and instructions (1.7 of IEC 60950)</p> <p>Protection from hazards (2 of IEC 60950)</p> <p>Wiring, connections and supply (3 of IEC 60950)</p> <p>Physical requirements (4 of IEC 60950)</p> <p>Thermal and electrical requirements (5 of IEC 60950)</p> <p>Connection to telecommunication networks (6 of IEC 60950)</p>	M
3.2	TNV² circuit characteristics and requirements	–
3.2.1	In a single TNV circuit or interconnected TNV circuits, the voltage between any two conductors of the TNV circuit or circuits and between any one such conductor and earth shall comply with the limits set for TNV-1 ³ circuit (refer to 6.2.1.1 (a) of IEC 60950).	M
3.2.2	Requirements for separation from other circuits and from accessible parts are in accordance with Table 19 of 6.2.1.2, IEC 60950.	M
3.2.3	The equipment shall be able to withstand the operating voltages generated externally as described in 6.2.1.3 of IEC 60950.	M
3.2.4	TNV circuits shall be separated from circuits at hazardous voltages by one or both of the methods given in 6.2.1.4 of IEC 60950.	M
3.2.5	If the TNV circuit is connected to other circuits, the requirements as given in 6.2.1.5 of IEC 60950 shall be complied with.	Note 1

¹ IEC 60950, 2nd Edition, 1991 + Amend. 1, 1992 + Amend. 2, 1993 + Amend. 3, 1995 + Amend. 4, 1996

² Telecommunication Network Voltage (TNV) as defined in 1.2.8.8, IEC 60950 Amend. 4, 1996

³ Only TNV-1 circuits are permitted for connection to the Singapore telecommunication network. Operating voltages of TNV-1 circuits do not exceed 42.4 V peak or 60 V d.c. under normal operating conditions (refer to 1.2.8.9 and 2.3.2 of IEC 60950 Amend. 4, 1996).

3	SAFETY OF TERMINAL EQUIPMENT FOR CONNECTION TO TELECOMMUNICATION NETWORKS (Continued)	CR
3.3	Protection of telecommunication network service personnel, and users of other equipment connected to the network, from hazards in the equipment	–
3.3.1	Circuitry intended to be directly connected to a telecommunication network shall comply with the requirements for an SELV ⁴ circuit or a TNV-1 circuit (refer to 6.3.1 of IEC 60950).	M
3.3.2	Where protection of telecommunication network relies on the protective earthing of the equipment, the equipment installations instructions and other relevant literature shall state that integrity of protective earthing must be ensured (refer to 6.3.2 of IEC 60950).	Note 2
3.3.3	There shall be insulation between circuitry intended to be connected to a telecommunication network and any parts or circuitry that will be earthed (refer to 6.3.3 of IEC 60950).	M
3.3.4	The leakage current to a telecommunication network originating from a mains powered equipment shall not exceed 0.25 mA r.m.s. (refer to 6.3.4.1 of IEC 60950). This requirement does not apply to equipment where the circuit to be connected to a telecommunication network is connected to an earthing terminal in the equipment.	Note 2
3.4	Protection of equipment users from over voltages on telecommunication networks	–
3.4.1	Equipment shall provide adequate electrical separation between TNV-1 circuit and certain parts of the equipment (refer to 6.4.1 of IEC 60950).	M
3.4.2	Compliance with 3.4.1 is checked by the electric strength test procedure of 6.4.2 of IEC 60950.	M
3.5	Protection of the telecommunication wiring system from overheating	–
3.5.1	Equipment intended to provide power over the telecommunication wiring system to remote equipment shall limit the output current to a value that does not cause damage to the telecommunication wiring system (refer to 6.5 of IEC 60950).	Note 2
Note 1	Requirements are mandatory if TNV circuits are connected to other circuits.	
Note 2	Requirements are mandatory if clause is applicable.	

NOTE

- Functions that are not applicable will be shown by the addition of texts (in italic) or the deletion of texts (through strikeouts).
- The following notations are used in the Specification:
 - CR Conformance requirement defines features and functions which must be supported at minimum.
 - M Mandatory requirements
 - O Optional requirements
 - NA Not Applicable
 - GID General Information and Definitions

⁴ Safety Extra Low Voltage (SELV) circuit is so designed and protected that under normal and single fault conditions, its voltages do not exceed a safe value of 42.4 V peak or 60 Vd.c. under normal operating conditions.

PART B V-INTERFACES AT THE DIGITAL LOCAL EXCHANGE (LE) – V5.2 INTERFACE (BASED ON 2048 kbit/s) FOR THE SUPPORT OF ACCESS NETWORK (AN)
(ITU-T Recommendation G.965, March 1995)

TABLE 1: INTERFACE REQUIREMENTS			
TITLE	ITU-T REC G.965	COMMENTS	CR
Scope	1		GID
Normative References	2		GID
Definitions, Symbols and Abbreviations	3		GID
Electrical and Physical Interface Requirements	4	The V5.2-interface may have one to sixteen 2048 kbit/s links (Figure 1/G.965). Each 2048 kbit/s interface shall conform with ITU-T Rec. G.703, G.704 and G.706.	M
		- Each interface is of the balance interface pair type.	O
		- Each interface is of the coaxial type.	O
Procedural Interface Requirements	5	The functional and procedural requirements of each of the 2048 kbit/s links shall be as defined in IDA RS PSTN 5, Table 1, clause 5.	M
Link Control Requirements and Procedures	5.1		M
Link-ID verification	5.1.1		M
Link blocking	5.1.2		M

TABLE 2: SERVICES AND ARCHITECTURE ASPECTS AND REQUIREMENTS			
TITLE	ITU-T REC G.965	COMMENTS	CR
On-Demand Services	6.1	Heading	–
PSTN	6.1.1	PSTN Access (refer to IDA RS PSTN 5, Table 2, clause 6.1.1) – with DTMF or line state signalling – with or without supplementary services – PABXs with or without DDI	O
ISDN Basic Access (ISDN-BA)	6.1.2	ISDN-BA user port (refer to IDA RS PSTN 5, Table 2, clause 6.1.2) – with NT1 as integral part of the AN – with NT1 as a separate equipment	O
ISDN Primary Rate Access (ISDN-PRA)	6.1.3	ISDN-PRA user port – with NT1 as integral part of the AN – with NT1 as a separate equipment (conforming to ITU-T Rec. G.962 for the support of NT2 e.g. ISDN PBX, connected at the T reference point) Note 1	O
Permanent Line (PL) Capability	6.2		O
Semi-Permanent Leased Line	6.3		O
Permanent Leased Line Services	6.4		O
<u>Note 1</u> Multi-rate bearer services, which may use H0, H12 or other multi-slot channels between user port and LE are also supported by any V5.2 interface which supports ISDN-PRA using the appropriate ISDN signalling systems.			

TABLE 3: CONTROL AND PROVISIONING			
TITLE	ITU-T REC G.965	COMMENTS	CR
Control Principles	7.1	Heading	–
General requirements and assumptions	7.1.1		GID
Control of ISDN-BA user port for the PL capability	7.1.2	Refer to IDA RS PSTN 5, clause 7.1	O
Control of ISDN-PRA user port when the PL capability is provided	7.1.3		O
Statements and assumptions	7.1.3.1		O
ISDN and PL capability	7.1.3.2		O

TABLE 3: CONTROL AND PROVISIONING (CONTINUED)			
TITLE	ITU-T REC G.965	COMMENTS	CR
Provisioning strategy and requirements	7.2	Heading	–
General	7.2.1	Provisioning shall be performed through the Q-interfaces of the AN and the LE.	GID
Provisioning requirements	7.2.2	The association of bearer channels is under the control of the BCC protocol and not statically associated through provisioning.	M
Bearer Channel Connection (BCC)	7.3	The BCC protocol is used to allocate bearer channels on a specific 2048 kbit/s link to user ports, generally on a call by call basis.	GID
Protection	7.4	The protection protocol is used in the case of interfaces with more than one 2048 kbit/s link. It is required that the link control, the control, and the BCC protocols have a communication path over the V5.2 interface, even in the event of one 2048 kbit/s link failure (i.e. primary or secondary link).	GID

TABLE 4: PROTOCOL ARCHITECTURE AND STRUCTURE			
TITLE	ITU-T REC G.965	COMMENTS	CR
Functional Description	8.1	Figure 5/G.965	GID
Protocol Requirements for PSTN and ISDN	8.2		GID
Time Slots	8.3	Time slots 16, 15 and 31 of each 2048 kbit/s link may be used as physical communication channels and shall be allocated as required by provisioning. Time slots not provisioned as physical communications channels are available to be used as bearer channels under the control of the BCC protocol.	M
Time Slot Allocation for Physical Communication Channels	8.4	– In the case of only one 2048 kbit/s link, the time slot allocation for the physical C-channels shall be the same as that for the physical C-channels in IDA RS PSTN 5, Table 4, clause 8.4. This is to ensure full compatibility with V5.1.	M
		– In the case of more than one 2048 kbit/s links forming a V5.2 interface, then the protection protocol shall be used.	M
Data types for V5.2 C-paths	8.4.1		O
Communication paths when PSTN is provided on a V5.2 interface	8.4.2		M
Communication paths when ISDN is provided on a V5.2 interface	8.4.3	Data types from ISDN user ports may be placed in one or more logical C-channels. Data from any single user port shall not be split into different logical C-channels. The f-type data may not be supported.	M
Layer 2 Sublayering and Multiplexing on Communication Channels	8.5	Refer to IDA RS PSTN 5, Table 4, clause 8.5.	GID
Layer 3 Multiplexing	8.6	In general, layer 3 multiplexing is the same as for IDA RS PSTN 5, Table 4, clause 8.6, but with the V5.2-relevant additions.	GID
Congestion Control	8.7	Refer to IDA RS PSTN 5, Table 4, clause 8.7.	GID

TITLE	ITU-T REC G.965	COMMENTS	CR
Envelope Function Sublayer of LAPV5 (LAPV5-EF)	9	The contents of this clause are identical to those of IDA RS PSTN 5, Table 5.	M

TITLE	ITU-T REC G.965	COMMENTS	CR
Frame Structure for Peer-to-Peer Communication	10.1	Refer to IDA RS PSTN 5, Table 6, clause 10.1.	M
Invalid Frames	10.2		M
Elements of Procedures and Formats of Fields for Data Link Sublayer Peer-to-Peer Communication	10.3	Heading	–
Link Address field format	10.3.1	Refer to IDA RS PSTN 5, Table 6, clause 10.3.1.	M
Link address field variables	10.3.2	Heading	–
Address field extension bit (EA)	10.3.2.1	Refer to IDA RS PSTN 5, Table 6, clause 10.3.2.1.	M
Command/response field bit	10.3.2.2	Refer to IDA RS PSTN 5, Table 6, clause 10.3.2.2.	M
V5DLaddr	10.3.2.3	The V5DLaddr shall be a 13-bit number. Defined values of the V5DLaddr are given in Table 1/G.965.	M
Definition of the Peer-to-Peer Procedures of the Data Link Sublayer	10.4	Refer to IDA RS PSTN 5, Table 6, clause 10.4.	M

TITLE	ITU-T REC G.965	COMMENTS	CR
AN Frame Relay Sublayer	11	The contents of this clause are identical to those of IDA RS PSTN 5, Table 7.	Note 1
<u>Note 1</u> “M” if Table 2, clause 6.1.2 and/or clause 6.1.3 are/is supported.			

TITLE	ITU-T REC G.965	COMMENTS	CR
Sublayer-to-Sublayer Communication and Mapping Function	12	The contents of this clause are identical to those of IDA RS PSTN 5, Table 8.	M

TABLE 9: GENERAL LAYER 3 PROTOCOL STRUCTURES			
TITLE	ITU-T REC G.965	COMMENTS	CR
General	13.1		M
Information elements that appear in every message (header)	13.2		M
Protocol Discriminator information element	13.2.1		M
Layer 3 Address information element	13.2.2		M
Message Type information element	13.2.3		M
Other information element	13.3	See Annex E/G.965 for a complete list of V5.2 information elements	M
Protocol message functional definition and information content	13.4		GID
Codesets	13.5	There shall be only one codeset.	M

TABLE 10: PSTN SIGNALLING PROTOCOL SPECIFICATION AND LAYER 3 MULTIPLEXING			
TITLE	ITU-T REC G.965	COMMENTS	CR
PSTN Signalling Protocol Specification and Layer 3 Multiplexing	14	The contents of this clause are identical to those of IDA RS PSTN 5, Table 9.	O

TABLE 11: CONTROL REQUIREMENTS AND PROTOCOL			
TITLE	ITU-T REC G.965	COMMENTS	CR
ISDN-BA user port status indication and control	15.1	The contents of this clause are identical to those of IDA RS PSTN 5, Table 10, clause 14.1.	Note 1*
PSTN user port status indication and control	15.2	The contents of this clause are identical to those of IDA RS PSTN 5, Table 10, clause 14.2.	Note 2
ISDN primary rate user port status indication and control	15.3		Note 3
Control Protocol	15.4	The contents of this clause are identical to those of IDA RS PSTN 5, Table 10, clause 14.4 with the exception of Table 56/G.965 which is modified due to two additional Control function elements required for ISDN primary rate port.	M Note 4
V5.2-re-provisioning procedures	15.5	The contents of this clause are identical to those of IDA RS PSTN 5, Table 10, clause 14.5.	O
<p><u>Note 1</u> "M" if 6.1.2 is supported. * It is optional if grading information is sent from the AN-Management.</p> <p><u>Note 2</u> "M" if 6.1.1 is supported.</p> <p><u>Note 3</u> "M" if 6.1.3 is supported.</p> <p><u>Note 4</u> The contents of the control-function-element and ID information elements are implementation dependent.</p>			

TABLE 12: LINK CONTROL REQUIREMENTS PROTOCOL			
TITLE	ITU-T REC G.965	COMMENTS	CR
Link Control Requirements Protocol	16		M
2048 kbit/s layer 1 link maintenance requirements	16.1		M
Events and failure reports	16.1.1		M
Detection algorithm for events and signals	16.1.2	The equipment shall implement one or both of the alternatives for detecting "loss of signal".	M
V5.2-interface layer 1 link FSM	16.1.3		M
Requirements and procedures for the additional functions	16.1.4		M
Link control requirements and procedures	16.2	Heading	-
The link blocking and unblocking	16.2.1		M
The link identification	16.2.2		M

TABLE 12: LINK CONTROL REQUIREMENTS PROTOCOL (CONTINUED)			
TITLE	ITU-T REC G.965	COMMENTS	CR
Events and function elements relevant for the control of the link state machines	16.2.3		M
Link control FSM, AN (link) and LE (link)	16.2.4		M
Link control protocol	16.3	Heading	–
Link control protocol message definition and content	16.3.1		M
LINK CONTROL message	16.3.1.1		M
LINK CONTROL ACK message	16.3.1.2		M
Link control protocol information element definition, structure and coding	16.3.2		M
Layer 3 address information element	16.3.2.1		M
Link control function information element	16.3.2.2		M
Definitions of the link control protocol states: OUT OF SERVICE IN SERVICE AWAIT LINK CONTROL ACK	16.3.3		M
Link control protocol procedure	16.3.4	Heading	–
General	16.3.4.1		M
Start traffic indication	16.3.4.2		M
Stop traffic indication	16.3.4.3		M
Link control layer 3 protocol entity procedure	16.3.4.4		M
Handling of error conditions	16.3.5		M
Timers for the link control protocol	16.3.6	Timer tolerance shall be $\pm 10\%$	M
AN and LE side layer 3 protocol entity state tables	16.3.7	Table 24/G.965	M

TABLE 13: BCC PROTOCOL ELEMENTS AND PROCEDURES			
TITLE	ITU-T REC G.965	COMMENTS	CR
General	17.1		GID
BCC protocol entity definition	17.2	Heading	-
Definition of BCC protocol states	17.2.1	Heading	-
BCC states in the AN: BCC OPERATIONAL state (ANBcc0) BCC AN FAULT REPORT state (ANBcc1)	17.2.1.1		M
BCC states in the LE	17.2.1.2		NA
Definition of BCC protocol primitives, messages and timers	17.2.2	Table 26/G.965	M
BCC protocol message definition and content	17.3		M
ALLOCATION message	17.3.1		M
ALLOCATION COMPLETE message	17.3.2		M
ALLOCATION REJECT message	17.3.3		M
DE-ALLOCATION message	17.3.4		M
DE-ALLOCATION COMPLETE message	17.3.5		M
DE-ALLOCATION REJECT message	17.3.6		M
AUDIT message	17.3.7		M
AUDIT COMPLETE message	17.3.8		M
AN FAULT message	17.3.9		M
AN FAULT ACKNOWLEDGE message	17.3.10		M
PROTOCOL ERROR message	17.3.11		M
BCC information element definition, structure and coding	17.4		GID
BCC Reference Number information element	17.4.1		M
Other information elements	17.4.2		GID
User Port Identification information element	17.4.2.1		M
ISDN Port Time Slot Identification information element	17.4.2.2		M

TABLE 13: BCC PROTOCOL ELEMENTS AND PROCEDURES (CONTINUED)			
TITLE	ITU-T REC G.965	COMMENTS	CR
V5-Time Slot Identification information element	17.4.2.3		M
Multi-Slot Map information element	17.4.2.4		O
Reject Cause information element	17.4.2.5		M
Protocol Error Cause information element	17.4.2.6		M
Connection Incomplete information element	17.4.2.7		M
Description of the BCC protocol and the BCC procedures	17.5	Annex K	O
General	17.5.1		M
Bearer channel allocation – Normal procedure	17.5.2		M
Bearer channel allocation – Exceptional procedures	17.5.3		M
Bearer channel de-allocation – Normal procedure	17.5.4		M
Bearer channel de-allocation – Exceptional procedures	17.5.5		M
Audit procedure	17.5.6		M
AN internal failure notification procedure	17.5.7		M
Handling of error conditions	17.5.8		M
List of system parameters (timers)	17.6	Timer tolerances shall be $\pm 10\%$	M

TABLE 14: PROTECTION PROTOCOL SPECIFICATION			
TITLE	ITU-T REC G.965	COMMENTS	CR
General	18.1	Heading	–
Introduction	18.1.1		M
Provisioning of physical and logical C-channels	18.1.2		M
Separation of responsibilities	18.1.3		M
Management of C-channel resources after failure	18.1.4		M
Monitoring functions and detection of failures	18.1.5		M
Functional model for the protection protocol	18.1.6		M
Other principles	18.2		M
Protection protocol entity definition	18.3	Heading	–
Definition of protection protocol states	18.3.1	Heading	–
States in the AN: NULL state (SOAN0) SWITCH-OVER REQUESTED BY AN state (SOAN1) SWITCH-OVER INITIATED BY LE state (SOAN2)	18.3.1.1		M
States in the LE	18.3.1.2		NA
Definition of protection protocol events	18.3.2	Table 49/G.965	M
Protection protocol message definition and content	18.4		M
SWITCH-OVER REQ message	18.4.1		M
SWITCH-OVER COM message	18.4.2		M
OS-SWITCH-OVER COM message	18.4.3		M
SWITCH-OVER ACK message	18.4.4		M
SWITCH-OVER REJECT message	18.4.5		M
PROTOCOL ERROR message	18.4.6		M
RESET SN COM message	18.4.7		M
RESET SN ACK message	18.4.8		M
Protection protocol information element definition, structure and coding	18.5		M
Logical C-channel identification information element	18.5.1		M
Sequence-number information element	18.5.2		M
Physical C-channel identification information element	18.5.3		M

TABLE 14: PROTECTION PROTOCOL SPECIFICATION (CONTINUED)			
TITLE	ITU-T REC G.965	COMMENTS	CR
Rejection Cause information element	18.5.4		M
Protocol Error Cause information element	18.5.5		M
Protection protocol procedures	18.6	Heading	–
General	18.6.1		M
Broadcast of protection protocol messages on the two data links of the primary and secondary link	18.6.2		M
Standard protection switch-over procedure initiated by LE-side	18.6.3		M
Dedicated protection switch-over procedure initiated by OS LE	18.6.4		M
Protection switch-over procedure requested by AN-side	18.6.5		M
Handling of error conditions	18.6.6		M
List of system parameters	18.7	Timer tolerances shall be $\pm 10\%$.	M
AN and LE side state tables	18.8	Heading	–
Protection protocol FSM in the AN	18.8.1		M
Protection protocol FSM in the LE	18.8.2		NA

TITLE	ITU-T REC G.964	COMMENTS	CR
Service scenarios, architecture and functional definition of access arrangements with an AN at the LE	Annex A		GID
Use of the protocol information elements for national PSTN protocols	Annex B		GID
Basic requirements of the system management functions in the AN and the LE	Annex C		GID
Protocol architecture for PSTN and ISDN (BA and PRA) user port control	Annex D		GID
Frame structures, message codepoints and addressing scheme for V5.2-interface	Annex E		M
The concept and requirements for the upgrade of an interface V5.1 into an interface V5.2	Annex F		GID
AN requirement for pulse dialing	Annex G	The contents of this annex are identical to those of Annex H/G.964.	GID
Layer 3 error detection procedure	Annex H	The contents of this annex are identical to those of Annex I/G.964.	GID
Protection protocol - Explanatory notes and information flow	Annex J		GID
BCC protocol application principles	Annex K		O
Bibliography	Appendix I		GID

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- [3] ITU-T Recommendation I.430 Basic user-network interface; layer 1 specification and test principles.
- [4] ITU-T Recommendation G.960 Digital section for ISDN basic rate access.
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