

TECHNICAL CODE

PRIVATE AUTOMATIC BRANCH EXCHANGE (PABX) SYSTEM FOR CONNECTION TO PUBLIC SWITCHED TELEPHONE NETWORK (PSTN) AND INTERNET PROTOCOL (IP) NETWORK (SECOND REVISION)

Developed by



Registered by



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A technical code prepared in accordance with section 185 shall not be effective until the Commission pursuant to section 95 of the Act registers it.

For further information on the technical code, please contact:

Malaysian Communications and Multimedia Commission (MCMC)

MCMC Tower 1
Jalan Impact
Cyber 6
63000 Cyberjaya
Selangor Darul Ehsan
MALAYSIA

Tel: +60 3 8688 8000
Fax: +60 3 8688 1000
<http://www.skmm.gov.my>

OR

Malaysian Technical Standards Forum Bhd (MTSFB)

Malaysian Communications & Multimedia Commission (MCMC)
Off Persiaran Multimedia
Jalan Impact
Cyber 6
63000 Cyberjaya
Selangor Darul Ehsan
MALAYSIA

Tel: +60 3 8320 0300
Fax: +60 3 8322 0115
<http://www.mtsfb.org.my>

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Committee representation

This technical code was developed by Fixed and Wireless Terminal Working Group under the Malaysian Technical Standards Forum Bhd (MTSFB) consists of representatives from the following organisations:

Digi Telecommunication Sdn Bhd

NEC Corporation of Malaysia Sdn Bhd

Panasonic Malaysia Sdn Bhd

SIRIM QAS International Sdn Bhd

Telekom Malaysia Berhad

TIME dotCom Berhad

Foreword

This technical code for Private Automatic Branch Exchange (PABX) System for Connection to Public Switched Telephone Network (PSTN) and Internet Protocol (IP) Network ('this Technical Code') pursuant to section 185 of the Act 588.

This Technical Code was developed for the purpose of certifying communications equipment under the Communications and Multimedia (Technical Standards) Regulations 2000.

Major modifications in this revision is inclusion of IP technology requirement for IP PABX.

This Technical Code cancels and replaces SKMM MTSFB TC T003:2013, *Specification for Private Automatic Branch Exchange (PABX) System for Connection to Public Switched Telephone Network (PSTN) (First Revision)*.

This Technical Code shall continue to be valid and effective until reviewed or cancelled.

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PRIVATE AUTOMATIC BRANCH EXCHANGE (PABX) SYSTEM FOR CONNECTION TO PUBLIC SWITCHED TELEPHONE NETWORK (PSTN) AND INTERNET PROTOCOL (IP) NETWORK

1. Scope

This Technical Code specifies the technical requirements for legacy Private Automatic Branch Exchange (PABX) and Internet Protocol (IP) PABX system for connection to Public Switched Telephone Network (PSTN) and IP network respectively.

2. Normative reference

The following normative references are indispensable for the application of this Technical Code. For dated references, only the edition cited applies. For undated references, the latest edition of the normative references (including any amendments) applies.

See Annex A.

3. Abbreviations

For this Technical Code, the following abbreviations and acronyms applies:

AC	Alternating Current
A-CLIP	Analogue Calling Line Identity Presentation
AT	Access and Terminal
ATA	Analogue Telephone Adapter
CAT-5	Category 5
DHCP	Dynamic Host Configuration Protocol
DTMF	Dual Tone Multi-Frequency
ETH	Ethernet
FXO	Foreign Exchange Office
FXS	Foreign Exchange Subscriber
GSM	Global System for Mobile Communication
IDD	International Direct Dial
IPv6	Internet Protocol version 6
LAN	Local Area Network
NU	Number Unobtainable
POS	Point of Sale
PVC	Polyvinyl Chloride
RFC	Request for Comment
SP	Service Provider
SIP	Session Initiation Protocol
SRTP	Secure Real – Time Protocol
TE	Terminal Equipment
TCP	Transmission Control Protocol
TNV	Telecommunication Network Voltage

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UDP	User Datagram Protocol
V_{rms}	Voltage root mean square
VoIP	Voice over Internet Protocol

4. General requirement

4.1 Power supply requirements

Requirements for power supply are as follows:

- a) For Alternating Current (AC) powered Terminal Equipment (TE), the operating voltage shall be rated/marked at 230 V or 240 V in line with the country's nominal voltage and frequency in accordance to MS IEC 60038. If the product is rated with multiple or a range of voltages, voltage range between 230 V (+ 10 %, - 6 %) shall be included. Testing shall be conducted based on 230 V (+ 10 %, - 6 %) or 240 V and other relevant voltages, if the product is marked with multiple or a range of voltages.
- b) Product shall be rated/marked at 50 Hz and testing shall be conducted at 50 Hz. If the product is marked at 50/60 Hz or 50 Hz - 60 Hz then testing shall be conducted either at 50 Hz or 60 Hz, whichever is more unfavourable.
- c) The design of the TE shall be such that all essential items of equipment of the TE shall be powered from batteries on float charge such that the performance of the system shall not deteriorate in any way on failure of the electricity mains supply. Non-essential test equipment and other auxiliary devices may directly work off the electricity mains supply.
- d) The system shall operate on 48 V (nominal) with positive earthing, and shall function satisfactorily within a voltage range of 42 V to 54 V for not less than 80 % of the calls and shall function satisfactorily within a voltage range of 44 V - 52 V for 100 % of the calls.
- e) Where external power supply is used, e.g. AC adaptor or battery, it shall not affect the capability of the TE to meet this specification.
- f) Adaptor shall be pre-approved by the relevant regulatory body before it can be used with the TE.

4.2 Power supply cord and mains plug requirements

TE shall be fitted with a suitable and appropriate approved power supply cord and mains plug. Both are regulated products and shall be pre-approved by the relevant regulatory body before it can be used with the TE.

4.2.1 Power supply cord requirements

The power supply cord shall be certified according to:

- a) MS 2112-5 or BS EN 50525-2-11 or IEC 60227-5 (Polyvinyl Chloride (PVC) insulated - flexible cables/cords); or
- b) MS 140 or MS 2127-4 or IEC 60245-1 & IEC 60245-4 (Rubber insulated flexible cables/cords).

4.2.2 Mains plug requirements

The mains plug shall be certified according to:

- a) MS 589: Part 1 or BS 1363: Part 1 (13 A fused plugs); or
- b) MS 1577 or BS 546 (15 A plugs); or
- c) MS 1578 or BS EN 50075 (2.5 A, 250 V, flat non-rewirable two-pole plugs).

4.3 Polarity

The performance of the TE shall be independent of the PSTN line polarity i.e. the TE shall conform to both polarities of the line feeding (clause A.3 of ETSI ES 203021-1).

4.4 Interoperability and connectivity requirements

TE shall comply with the minimum requirement that is specified by the Service Provider (SP).

4.4.1 Interoperability

TE shall be able to exchange and/or use information between two or more systems or components.

4.4.2 Connectivity

TE shall be able to link with other programs and devices to allow interoperability.

4.5 Marking requirements

Marking requirements are as follows:

- a) TE shall be marked with the following information:
 - i) supplier/manufacturer's name or identification mark;
 - ii) supplier/manufacturer's model or type reference; and
 - iii) other markings as required by the relevant standards.
- b) The markings shall be legible, indelible and readily visible.

4.6 Language

All markings, software and related documents shall be in Bahasa Malaysia or English language.

4.7 Electromagnetic compatibility and electrical safety requirements

Requirements for electromagnetic compatibility and electrical safety are as follows:

- a) TE 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 32.
- b) TE shall comply with the MS IEC 60950-1 safety standard. The requirements in MS IEC 60950-1 that are applicable to the TE e.g. class of equipment, type of Telecommunication Network Voltage (TNV) circuit and types of components shall be identified and complied with.

5. Technical requirements

5.1 Generic network diagram setup for Terminal Equipment (TE)

The generic network diagram of TE is as illustrated in Figure 1.

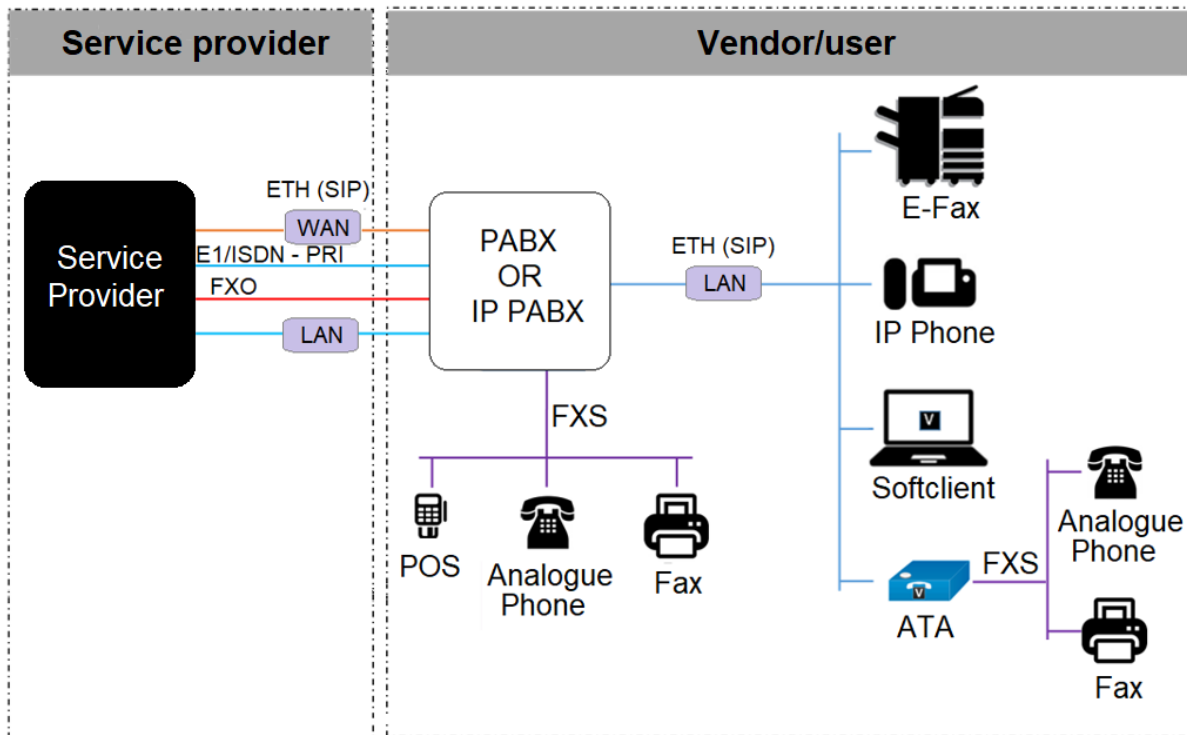


Figure 1. Terminal Equipment (TE) network diagram

5.2 Extension telephones and exchange lines

Requirement for extension telephones and exchange lines are as follows:

- a) The PABX supplied shall be able to accept the use of:
 - i) Dual Tone Multi-Frequency (DTMF) push-button telephones.
 - ii) Rotary dial telephones (decadic pulse).
- b) TE that connected to PSTN shall be designed to meet the following requirements:
 - i) In addition, where PABX system is connected to PSTN, it shall comply with the requirements for connection to PSTN in accordance to SKMM MTSFB TC T001.
 - ii) In addition, where PABX system supported Analogue Calling Line Identity Presentation (A-CLIP), it shall comply with A-CLIP requirement in accordance to SKMM MTSFB TC T002.
- c) TE which the target stations are analogue lines, shall be designed to meet the requirements 5.3 and 5.4 (refer Table 1).
- d) The input/output of IP PABX, shall be complied with Voice over Internet Protocol (VoIP) requirements as follows:

- i) Signalling Protocol: Session Initiation Protocol (SIP) RFC 3261 with an option ITU-T H.323.
- ii) Transport Protocol: User Datagram Protocol (UDP) with an option Transmission Control Protocol (TCP) or Secure Real-Time Protocol (SRTP).
- iii) Codec: ITU-T G.711 (a-law and μ -law) with an option ITU-T G.726 or ITU-T G.729A.
- iv) DTMF: Inband, RFC 2833.
- v) Fax protocol: ITU-T G.711 and/or ITU-T T.38.
- vi) IP assignment: Dynamic Host Configuration Protocol (DHCP) and/or Static IP.
- vii) Addressing: RFC 6157 (applicable for Internet Protocol version 6 (IPv6)).

5.3 Tones and cadences

Requirement for tone and cadences are as follows:

- a) The frequency and cadence for the tones shall comply with the specification in Table 1. The allowable frequency deviation is $\pm 5\%$ of nominal value.
- b) The ring back tone shall be returned to the calling party whenever an extension line in the system is being rung, irrespective of whether the call is internal or external.
- c) TE with capacity above 100 extensions shall be incorporated with Number Unobtainable (NU) tone facilities and shall comply with Table 1.

5.4 Ringing current

Requirement for ringing current are as follows:

- a) Cadence of ringing current shall comply with the specification in Table 1.
- b) Ringing current generator shall have open circuit voltage of not less than $75 V_{rms}$ and not greater than $85 V_{rms}$ and a design nominal frequency within the range of 16 Hz to 25 Hz. The total harmonic distortion shall not exceed 30 %.
- c) Terminal voltage on full load shall be at least $60 V_{rms}$.

Table 1. Ringing signal and service tone

No.	Type of tone	Cadence (second)	Frequency (Hz)	Level (dBm)
1	Ringing current	0.4 ON 0.2 OFF 0.4 ON 2.0 OFF	16-25	$75 V_{rms}$
2	Dial tone	Continuous	425	- 15 to - 9
3	Internal call	1.0 ON 3.0 to 5.0 OFF	425	- 12
	External call	0.4 ON, 0.2 OFF 0.4 ON, 2.0 OFF	425	- 15 to - 9

Table 1. Ringing signal and service tone (continue)

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No.	Type of tone	Cadence (second)	Frequency (Hz)	Level (dBm)	
4	Ring back tone	Internal call	0.4 ON, 0.2 OFF 0.4 ON, 2.0 OFF	425	- 12
		External call	0.4 ON, 0.2 OFF 0.4 ON, 2.0 OFF	425	- 15 to - 9
5	Busy tone (Engage tone)	0.5 ON, 0.5 OFF	425	- 15 to - 9	
6	Congestion tone	Either, i) 0.5 ON, 0.5 OFF or ii) 0.25 ON, 0.25 OFF	425	- 15 to - 9	
7	Intrusion warning tone	0.2 ON, 0.2 OFF 0.2 ON, 5.0 OFF	425	-15 to - 9	
8	NU tone	2.5 ON, 0.5 OFF	425	-15 to - 9	

5.5 Numbering scheme

The generic numbering scheme for TE should be as per Table 2.

Table 2. Numbering scheme and description

Numbering scheme	Description
2xxx 3xxx 4xxx 5xxx 6xxx	Extension numbers
7xxx	Extension number/abbreviated dialling
8x	Tie lines ¹
9	Access to exchange lines
0	PABX operator
1xx	Services

5.5.1 Extension lines and Terminal Equipment (TE) capacity

Extension Line and TE capacity are as follows:

- a) TE with up to 50 extension lines, two digits numbering is acceptable.
- b) TE with more than 50 extension lines and up to 500 extension lines, three digits numbering shall be used.

¹ Tie lines is a leased/dedicated circuit linking two PABXs located in different premises

- c) TE with more than 500 extension lines, four digits and above shall be used, depending on the capacity of the system.

5.5.2 Public exchange lines

Access digit for the public exchange lines shall be '9'.

5.5.3 Operator

Access digit for the operator shall be '0'.

5.5.4 Tie-lines

The first digit of tie-lines access code shall be '8'.

5.5.5 Services

The first digit of services access code shall be '1'.

5.6 Transmission requirements

Requirements for extension line circuit are as follows:

- a) The TE with Foreign Exchange Subscriber (FXS) interface shall function satisfactorily with an extension line loop resistance of up to 1,500 Ω with a leakage resistance of down to 20,000 Ω .
- b) The TE with Local Area Network (LAN) interface shall function satisfactorily with maximum length of 100 m of minimum CAT-5 ethernet cable.

5.7 Route restrictions

Requirement for route restrictions are as follows:

- a) The route restriction equipment shall be of the type that counts the total number of digits dialled as well as analyse the number of pulses of the first two or three digits so as to render the route restriction facility as fool-proof as possible.
- b) Alternatively, the digit analysis in the route restriction equipment shall commence analysis of the first digit dialled only after the route restriction equipment detects the public exchange dial tone.
- c) The route restriction equipment shall reactivate the digit analysis function whenever the public exchange dial tone is detected.
- d) First two digits "00" (International Direct Dial (IDD)) and first three digits "101", "103" and "108" are barred.

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Annex A (Normative)

Normative references

MS 140, *Specification for insulated flexible cords and cables*

MS 589: Part 1, *Specification for 13 A plugs, socket outlets, adaptors and connection units Part 1: Specification for rewirable and non-rewirable 13 A fused plugs*

MS 1577, *Specification for 15A plugs and socket-outlets for domestic and similar purposes*

MS 1578, *Specification for flat non-rewirable two-pole plugs, 2.5 A, 250 V, with cord, for the connection of class II-Equipment for household and similar purposes*

MS IEC 60038, *IEC standard voltages*

MS IEC 60950-1, *Information technology equipment - Safety - Part 1: General requirements*

SKMM MTFSB TC T001, *Specification for terminal equipment connecting to the Public Switched Telephone Network (PSTN)*

SKMM MTFSB TC T002, *Specification for Analogue calling line Identity presentation (A-CLIP) facility for connection to Public Switched Telephone Network (PSTN)*

ITU-T G.711, *Pulse Code Modulation (PCM) of voice frequencies*

ITU-T G.726, *40, 32, 24, 16 kbit/s Adaptive Differential Pulse Code Modulation (ADPCM)*

ITU-T G.729A, *Coding of Speech at 8 kbit/s using Conjugate-Structure Algebraic-Code-Excited Linear Prediction (CS-ACELP)*

ITU-T H.323, *Packet-based multimedia communications systems*

ITU-T T.38, *Procedures for real-time Group 3 facsimile communication over IP networks*

IEC CISPR 32, *Electromagnetic compatibility of multimedia equipment - Emission requirements*

IEC 60227-5, *Polyvinyl chloride insulated cables of rated voltages up to and including 450/750 V - Part 5: Flexible cables (cords)*

IEC 60245-4, *Rubber insulated cables - Rated voltages up to and including 450/750 V - Part 4: Cords and flexible cables*

ETSI ES 203 021, *Access and Terminals (AT); Harmonized basic attachment requirements for Terminals for connection to analogue interfaces of the Telephone Networks; Update of the technical contents of TBR 021, EN 301 437, TBR 015, TBR 017*

BS 1363: Part 1, *13 A plugs, socket-outlets, adaptors and connection units - Part 1: Specification for rewirable and non-rewirable 13 A fused plugs*

BS 546, *Specification for AC power plugs and sockets*

BS EN 50075, *Specification for flat non-wirable two-pole plugs 2.5 A 250 V, with cord, for the connection of class II-equipment for household and similar purposes*

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BS 6500, *Electric cables Flexible cords rated up to 300/500 V, for use with appliances and equipment intended for domestic, office and similar environments*

RFC 2833, *RTP Payload for DTMF Digits, Telephony Tones and Telephony Signals*

RFC 3261, *SIP: Session Initiation Protocol*

RFC 6157, *IPv6 Transition in the Session Initiation Protocol (SIP)*

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Acknowledgements

Members of the Fixed Terminal Sub Working Group

Mr Ahmad Faizan Pardi (Chairman)	SIRIM QAS International Sdn Bhd
Mr Mohd Syaukiazahar Mohd Razali (Vice Chairman)	Telekom Malaysia Berhad
Mr Ahmad Taufik Nik Nor Azlan (Secretariat)	Malaysian Technical Standards Forum Bhd
Mr K.N Hilayarajah	Digi Telecommunications Sdn Bhd
Mr Lee Cheng Yong	NEC Corporation of Malaysia Sdn Bhd
Mr Pang Chieng Yong	Panasonic Malaysia Sdn Bhd
Ms Hafizah Zainal Abiddin	SIRIM QAS International Sdn Bhd
Mr Md Azmi Karnain/	Telekom Malaysia Berhad
Ms Rose Hayati Abdul Halim/	
Mr Arief Khalid Supian/	
Mr Mior Mohd Hadzlan Hamid	
Mr Samsuri Abu Samah/	TIME dotcom Berhad
Mr Md Zakir Bajuri/	
Mr Mohd Jali Senin	