

UNITED REPUBLIC OF TANZANIA
TANZANIA COMMUNICATIONS REGULATORY AUTHORITY
ISO 9001: 2015 CERTIFIED



MINIMUM TECHNICAL SPECIFICATIONS

FOR

PRIVATE AUTOMATIC BRANCH EXCHANGE (PABX)

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PART 1 Introduction

The Tanzania Communications Regulatory Authority (TCRA), established under the Tanzania Communications Regulatory Authority Act No.12 of 2003, is mandated among other duties, to license communications and broadcasting operators and type approve communication equipment for use in the United Republic of Tanzania pursuant to Section 82 of the Electronic and Postal Communications Act, No.3 of 2010 hereby stipulating as follows:

1. The Authority shall be responsible for the establishment and publication of technical standards relating to all regulated services in the United Republic of Tanzania.
2. In establishing such standards, the Authority shall-
 - (a) Where appropriate, seek submissions from other interested parties, in particular, those persons likely to be most affected by the publication of such standards; and
 - (b) Participate in standardization activities and take due account of any relevant standards prescribed by international organizations to which the United Republic belongs, such as the International Telecommunications Union and other sub-regional groupings.

Furthermore, pursuant to Regulation 4(1) of the Electronic and Postal Communications (Electronic Communications Equipment Standards and E-Waste Management) Regulations, 2020 empowers the Authority to determine standards for Electronic Communications Equipment in the country and review them from time to time.

The Authority, therefore, wishes to notify all importers of Private Automatic Branch Exchanges (PABX) about the minimum technical requirements and specifications for PABX. The specifications have been revised on grounds of technology advancement, safety requirements for people using them and the surrounding environment.

PART 2 Scope and Purpose

This specification defines the minimum technical requirements for PABX connected to the Public Switched Telephone Network (PSTN) or IP Core Telecom Networks or any Public Network. The document covers the general requirements of PABX for supporting voice services, data services, video services and multimedia services. The specification document intends to cover the verification of PABX for correct operation

and interworking with exchanges on the Public Switched Telephone Networks or IP Core Telecom Networks or any other Public Network.

PABX can be connected to a Public Network (TDM or IP based) through the following Interfaces, 2W DEL, E1 Interface, ISDN Basic Rate Access, ISDN Primary rate access interface, Ethernet-based Interface and V5 Interface.

PART 3 Definitions and Abbreviations

Definition

PABX stands for Private Automatic Branch Exchange and is the most common telecommunication system in most businesses. PABX allows companies to make and take inbound and outbound calls, set up voice mail, reroute calls between phone units, and many more call management features. It's mostly used to switch calls between a telephone network and an office. PABX can have various types of extensions such as analogue phones, digital phones, IP phones, etc.

Abbreviations

2W	Two wire
AC	Alternating Current
BRI	Basic Rate Interface
CDR	Call Detail Records
CISPR	International Special Committee on Radio Interference
CLI	Calling Line Identification
DC	Direct Current
DEL	Direct Exchange Line
DTMF	Dual tone multi frequency
EMC	Electromagnetic compatibility
FTP	File Transfer Protocol
HTTP	Hypertext Transfer Protocol
IEC	International Electro-technical Commission
IEEE	Institute of Electrical and Electronics Engineers
IETF	Internet Engineering Task Force
IP	Internet Protocol
ITU	International Telecommunication Union
IVR	Interactive Voice Response
ISDN	Integrated Services Digital Network
MGC	Media Gateway Controller
PABX	Private Automatic Branch Exchange
PRI	Primary Rate Interface
PSTN	Public Switched Telephone Network

RFC	Request for Comments
RoHS	Restriction of Hazardous substance
RTCP-XR	Real-time Control Protocol Extended Reports
SIP	Session Initiation Protocol
SRTP	Secure Real-time Transport Protocol
TDM	Time Division Multiplexing
TFTP	Trivial File Transfer Protocol
VoIP	Voice over IP
WLAN	Wireless Local Area Network

PART 4 References

S/N	Reference No.	Title
1.	CISPR 32	Electromagnetic compatibility of multimedia equipment - Emission requirements
2.	EN 61000	Electromagnetic compatibility (EMC)
3.	EN 55022	Information Technology Equipment - Radio disturbance characteristics - Limits and methods of measurement
4.	EN 55024	Information technology equipment - Immunity characteristics - Limits and methods of measurement
5.	EN 55032	Electromagnetic compatibility of multimedia equipment - Emission requirements
6.	ETSI ES 201 168	Speech processing, Transmission and Quality aspects (STQ); Transmission characteristics of digital Private Branch eXchanges (PBXs) for interconnection to private networks, to the public switched network or to IP gateways
7.	ETSI TBR 003	Integrated Services Digital Network (ISDN); Attachment requirements for terminal equipment to connect to an ISDN using ISDN basic access
8.	ETSI TBR 008	Integrated Services Digital Network (ISDN); Telephony 3.1 kHz teleservice; Attachment requirements for handset terminals
9.	IEC/EN 60950-1	Information technology equipment- Safety – Part1: General requirements.
10.	IEC/EN 62368-1	Audio/video, information and communication technology equipment - Part 1: Safety requirements
11.	IETF RFC 791	IPv4
12.	IETF RFC 2460	IPv6
13.	IETF RFC 768	User Datagram Protocol (UDP)
14.	IETF RFC 793	Transmission Control Protocol (TCP)

15.	IETF RFC 3261	Session Initiation Protocol (SIP)
16.	IETF RFC 3550	Real Time Transport Protocol (RTP)
17.	IETF RFC 4733	RTP Payload for DTMF Digits, Telephony Tones, and Telephony Signals
18.	ITU-T Recommendation G.101	The transmission plan
19.	ITU-T Recommendation Q.552	Transmission characteristics at 2-wire analogue interfaces of digital exchange
20.	ITU-T Recommendation G.703	Physical/electrical characteristics of hierarchical digital interfaces, describes data rates and multiplexing schemes for the E Series.
21.	ITU-T Recommendation G.704	Synchronous frame structures used at 1544, 6312, 2048, 8448 and 44 736 kbit/s hierarchical levels
22.	ITU-T Recommendation G.823	The control of jitter and wander within digital networks which are based on the 2048 kbit/s hierarchy
23.	ITU-T Recommendation G.961	Digital transmission system on metallic local lines for ISDN basic rate access
24.	ITU-T Recommendation G.964	V-Interfaces at the digital local exchange (LE) - V5.1 interface (based on 2048 kbit/s) for the support of access network (AN)
25.	ITU-T Recommendation G.965	V-interfaces at the digital local exchange (LE) - V5.2 interface (based on 2048 kbit/s) for the support of access network (AN)
26.	ITU-T Recommendation I.421	Primary rate user-network interface
27.	ITU-T Recommendation I.431	Primary rate user-network interface - Layer 1 specification
28.	ITU-T Recommendation Q.1912.5	Interworking between session initiation protocol (SIP) and bearer independent call control protocol or ISDN user part
29.	ITU-T Recommendation Q.921	ISDN user-network interface - Data link layer specification
30.	ITU-T Recommendation Q.931	ISDN user-network interface layer 3 specification for basic call control

31.	ITU-T Recommendation 1430	Basic user-network interface layer 1 specification
32.	ITU-T Recommendation Q.23	Technical features of push-button telephone sets

PART 5 General Requirements

S/N	Requirement	Details/References
1	Interoperability	The equipment shall provide interoperability with the existing exchanges.
2	Toll-bypass	Toll-bypass shall not be allowed and approval of PABX with reference to this specification document shall not be taken as a grant to go against any prevailing laws/ regulations/ guidelines of the United Republic of Tanzania. PABX shall not be used for termination of fraudulent international voice traffic. The international voice traffic shall be terminated through the licensed international gateways.
3	Interaction with the Public Switched Networks	The equipment shall not necessitate any changes in the existing Public Switched Telecom Network or any other Public Network and shall not impact the interfaces and protocols in these networks
4	Intra PABX calls	The calls within the PABX system shall be switched without using links with Public Switched Telecom Networks. Intra-PABX calls shall not be affected in case of link failure of a Public Switched Telecom Network. When the links between Public Switched Telecom Network and PABX are out of service, PABX shall send a suitable announcement or tone, or message to the calling extension subscriber.
5	Virtual numbers assignment	The assignment of virtual numbers shall be in accordance with the provisions of Electronic and Postal Communications (Electronic Communication Numbering and Addressing) Regulations, 2018.
6	Off-hook dial tone	Whenever any extension goes off-hook, the PABX shall feed dial tone to its extensions.
7	Emergency calls	PABX shall be capable of making calls to Emergency numbers including but not limited to 110, 111,112,113, 114, 115, 116, 117, 118,119, 190 and 199
8	Dual tone multi frequency (DTMF) signaling	PABX shall support transmission of DTMF as per ITU-T Recommendation Q.23 or IEEE Recommendation SIP info or IETF RFC 4733
9	Calling to the PSTN	The PABX shall support calling the PSTN telephones by their E.164 address.
10	Calling Line Identification (CLI)	For all types of calls to the Public network, Calling Line Identification (CLI) shall be forwarded to the main exchange

		and for calls from the public network, CLI received from the main exchange shall be forwarded to called extension number. The PABX shall not modify CLI.
11	Connection with terminal equipment	The PABX shall be capable of connecting to any type approved terminal equipment without affecting the system functioning
12	Alarm or fault diagnosis	The PABX shall be capable of isolating the faults on the PABX side or exchange side for any particular trunk or link and/or all trunks or links.
13	Call Detail Record (CDR)	PABX shall provide Call Detail Record (CDR) for all calls from extensions to Public Networks and from Public Networks to PABX extensions.
14	IP PABX interworking with PSTN	The IP PABX shall support interworking with PSTN Bearer Independent Call Control (BICC) and SIP interworking support in Media Gateway Controller (MGC) shall be based on the ITU-T recommendation Q.1912.5 IP PABX shall connect to the PSTN through SIP based PSTN gateway controller such as MGC that translates SIP messages into PSTN message formats.
15	Addressing	IP PABX shall support both IP Version 4 (IPv4) and IP version 6 (IPv6) PABX shall be capable of interworking with IPv4 and IPv6 networks.
16	Calls to/from Public Networks	PABX shall support calls from Public Networks to any extension and vice versa.
17	Software PABX	The software PABX shall be hosted in a type approved hardware such as server, computer etc.
18	Language	All markings, manuals, software and related documents shall be in English or Swahili language.

PART 6 Technical Requirements

PABX interfaces shall adhere to the following technical requirements

S/N	Interface	Technical Requirements
1	2W DEL (2-wire analog subscriber access interfaces)	PABX shall be capable of connecting with the PSTN Exchange using 2-wire analog subscriber access interfaces for originating as well as terminating calls, The transmission parameters shall be as per ITU-T Recommendation Q.552

		The signaling parameters shall be as per ITU-T Recommendation Q.23
2	E1 Interface	<p>PABX shall be capable of connecting with the public network using the E1 interface (2048 kbit/s interface)</p> <p>The incoming and outgoing calls of the PABX shall be terminated on the interexchange trunk interface of the main exchange.</p> <p>The transmission parameters shall be as per ITU-T Recommendation G.703, G.704 and G823.</p>
3	BRI at S interface	<p>PABX shall be capable of connecting with the PSTN/ ISDN using ISDN Basic Rate Access (2B+D) at S-Interface for originating as well as terminating calls,</p> <p>The transmission, switching and signaling parameters shall be as per ITU-T Recommendation Q.921, Q.931 and 1430.</p>
4	BRI at U-Interface	<p>PABX shall be capable of connecting with the PSTN/ ISDN using ISDN Basic Rate Access (2B+D) at U-Interface for originating as well as terminating calls.</p> <p>The transmission parameters shall be as per ITU-T Recommendation G.961</p>
5	PRI Interface	<p>PABX shall be capable of connecting with the public network using ISDN Primary Rate Access (30B+D) for originating as well as terminating calls.</p> <p>PABX shall be capable of connecting with the PSTN/ ISDN using ISDN Primary Rate Access (30B+D) for originating as well as terminating calls.</p> <p>The transmission, switching and signaling parameters shall be as per ITU-T Recommendation I.421 and I.431.</p>
6	Ethernet-based Interface	<p>PABX shall be capable of connecting with IP networks supporting IPv4 and IPv6 using Ethernet-based Interface for originating as well as terminating calls.</p> <p>PABX shall support both IPv4 as per IETF RFC 791 as and IPv6 as per IETF RFC 2460</p> <p>PABX shall be capable of connecting with the switching node (Media Gateway or Soft Switch)</p> <p>The signaling parameters shall be as per IETF RFC 2460, RFC 3261, RFC 4733, RFC 768/ RFC 793 and RFC 3550</p>

		<p>PABX shall support RTCP-XR protocol for monitoring real time VoIP voice quality.</p> <p>PABX shall support SRTP protocol for the encryption of voice, video and DTMF as per by RFC2833/4733</p>
7	V5 Interface.	<p>PABX shall be capable of connecting with the PSTN/ ISDN using E1 ie. 2048 kbit/s via the access network for originating as well as terminating calls.</p> <p>The transmission parameters shall be as per ITU-T Recommendation G.964 and G.965</p>

6.1 Environment and Safety Requirements

S/N	Requirement	Details
1.	General Safety	PABX shall conform with the safety requirements as specified in IEC/EN 60950-1 or IEC/EN 62368-1
2.	Restriction of Hazardous substance use.	Where applicable, PABX shall be tested and certified for conformity to the standards that govern the restriction for the use of hazardous substances. Under this requirement, the standards IEC 63000 and EN 50581 shall apply.

6.2 Electromagnetic Compatibility

PABX shall conform to electromagnetic emission and immunity limits as per **CISPR 32, EN 55022, EN 55024, EN 55032** and **EN 61000** standards. Test reports shall be provided from internationally accredited test laboratories indicating conformance to the aforementioned standards.

6.3 Power requirements

S/N	Requirement	Details
1	Power supply	<p>PABX may be AC powered or DC powered.</p> <p>For an AC-powered PABX, the AC mains supply voltage shall be 220V ± 10% and frequency 50Hz ± 1%.</p>

		When the external power supply is used (e.g. AC/DC power converter), it shall not affect the capability of the equipment to meet the requirements of this Specification. For the DC-powered PABX, the supply voltage shall be -40 V to -57 V.
2	Plug Type	D and G

6.4 Security requirements

VoIP PABX shall be configured in such a way that it does not support direct, externally initiated, connections via HTTP, Telnet, FTP, or TFTP as means to prevent distributed Denial of Service attack exploitation and it shall be protected against possible Denial of Service attack.

PART 7 Testing and Certification Requirements

PABX shall comply with this minimum technical specification and other national and international standards accepted and adopted in our country.

PART 8 Document Administration

8.1 Amendment

TCRA may from time to time review, update or modify this document to ensure its continued service and to meet the international and/or national performance requirements as necessary.

8.2 Enforcement

This document is enforced by appropriate provisions of the TCRA Act, 2003, the Electronic and Postal Communications Act, 2010 and the Electronic and Postal Communications (Electronic Communications Equipment Standards and E-Waste Management) Regulations, 2020 and effective from the date it has been published.

8.3 Publication

This document shall be published on the TCRA website <https://www.tcra.go.tz> for public information, compliance and reference purposes.