



Telecommunications equipment – Private Branch Exchanges (PBXs) – Attachment requirements, signaling characteristics for analogue connection to a public switched telephone network (PSTN)

Telekommunikationsutrustning – Abonnentväxlar – Signalerings tekniska krav för analog anslutning till ett allmänt tillgängligt telenät.

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Introduction

In this edition of the standard, the attachment requirements for analogue connected PBXs have been significantly reduced. This edition only contains requirements, mainly from the Swedish Standards SS 63 63 24 and SS 63 63 25, that are not covered by TBR 21 and are essential for an accurate interworking between PBX and PSTN.

1 Scope

This standard is applicable for PBXs intended for connection to an analogue PSTN interface in Sweden and are additional to the requirements set forth in TBR 21. The document is applicable for PBXs intended to use incoming, outgoing or two-way traffic exchange lines. It is not applicable for direct dial-in exchange lines.

This document gives no detailed information about the sequence and time limits of the signalling. For a more complete description, see Swedish Standards SS 63 63 24 and SS 63 63 25.

The call release procedure used in the Telia PSTN imposes a few requirements additional to TBR 21 to prevent the users from unintentional connection of calling and called parties and unintentional "lock situations". These requirements (see clause 4) have been deemed essential from the interworking point of view. They are preceded by an information about the call handling in the Telia PSTN (see clause 3).

Clause 5 lists those requirements in TBR 21 that are not fully applicable and finally clause 6 gives some recommendations for information.

2 Normative references

The following standards contains requirements, which through reference, constitute requirements of this standard.

- TBR 15 Business TeleCommunications (BTC) – Ordinary and Special quality voice bandwidth 2-wire analogue leased lines (A2O and A2S) – Attachment requirements for terminal equipment interface
- TBR 21 Terminal Equipment (TE); Attachment requirements for pan-European approval for connection to the analogue Public Switched Telephone Networks (PSTNs) of TE (excluding TE supporting the voice telephony service) in which network addressing, if provided, is by means of Dual Tone Multi Frequency (DTMF) signalling.

3 Call handling procedures in Telia PSTN (informative)

The PSTN applies to the exchange line either **idle state polarity** (+ on a-branch and – on b-branch) or **conversation state polarity** (- on a and + on b).

The PSTN indicates **call answer** by reversing the polarity at both the calling and the called party exchange line (from idle to conversation state polarity).

Disconnection of calls:

- 1) When in conversation state the PSTN has detected a high-ohmic loop (TE on-hook) at the calling party, the PSTN will disconnect the call and send a polarity reversal (release signal) to both the calling and the called party within 3s.
- 2) When in conversation state the PSTN has detected a high-ohmic loop (TE on-hook) at the called party, the PSTN will disconnect the call and send a polarity reversal (release signal) to both the calling and the called party after 90s.

During the supervision time (the 90s), the called party may return to conversation state by connecting a low-ohmic loop (TE off-hook) to the line. In case of a subsequent high-ohmic loop the 90s timer will restart. If, during the supervision time the PSTN detects a high-ohmic loop (TE on-hook) at the calling party, the PSTN will disconnect the call and send a polarity reversal (release signal) to both the calling and the called party within 3s.

NOTE: The supervision time 90s will be reduced to 45s in the future.

4 Requirements in addition to TBR 21

4.1 Seizing the line for an outgoing call

The PBX shall not seize an exchange line for making an outgoing call, unless the line is free, i.e. the PSTN shall have cleared the line after the previous call. There are four different approved methods for a PBX to decide if the line is free :

- 1) **Usage of a polarity detector or a polarity reversal detector** that is able to determine if the exchange line has idle polarity.
- 2) **Usage of a dial tone detector** that is able to determine if a valid dial tone is received from the network within 1s after the PBX exchange line interface has applied a low-ohmic loop to the line.
- 3) **Usage of a timer** that is able to determine if at least 4s have elapsed since the PBX exchange line interface applied a high-ohmic loop to the line. This alternative is not applicable for both-way exchange lines.
- 4) **Usage of a state indicator** showing the state of the exchange line concerned and included in the proprietary telephone set controlling the seizing of the line. The transmission path within the PBX, from the calling extension to the exchange line, shall not be through-connected until the seizure has been approved.

4.2 External call transfer

External call transfer, i.e. a connection within the PBX of an incoming exchange line to an outgoing exchange line, may be performed if the following requirement is met by the PBX: A detected polarity reversal (release signal) on the incoming exchange line shall be forwarded within 3s to the outgoing exchange line as a high-ohmic loop.

5 Requirements in TBR 21 that are not fully applicable

5.1 Connection methods

The PBX shall provide one or more of the following connection methods

- a) an RJ 11/12 connector as described in TBR 21, subclause 4.2
- b) an ISO 8877 connector as described in TBR 15, subclause 4.1
- c) a set of connection contacts (e.g. an isolation displacement connector or a screw terminal block) to which solid wire conductors with diameters in the range 0,4 mm to 0,6 mm can be connected.
- d) a wiring arrangement connected by any means to the PBX, with unterminated solid wire conductors with diameters in the range 0,4 mm to 0,6 mm at the distant end from the PBX.

5.2 Acceptance of breaks in the loop in a call attempt

TBR 21, subclause 4.6 is not applicable for Swedish approval of PBXs.

5.3 DC feeding

The loop state requirements in TBR 21 apply for line feeding currents which can be obtained when the terminal equipment is connected to 50 VDC in series with 3200 ohms to 230 ohms (see TBR 21, subclause 4.7). For Swedish approval of PBXs this range is changed from 3200 ohms to 850 ohms. The replacement of 3200 ohms by 850 ohms is applicable to all clauses of TBR 21.

5.4 DC characteristics

In TBR 21, subclause 4.7.1, the points E and F in table 5 and the limit E-F in figure 5 are not applicable for Swedish approval of PBXs.

6 Recommendations (informative)

6.1 Breaks in the loop

To preclude that the PSTN unintentionally detects a high-ohmic loop, the contact functions used for switching a connected line between different circuits in the PBX should be designed so that breaks are shorter than 10 ms at switchover.

6.2 Acceptance of breaks in the DC-feed

The PBX should accept that PSTN executes a line test before dial tone sending when loop state has been established for the purpose of making a call. During this line test the feeding voltage may be interrupted for a period of up to 0,85s.

6.3 Immunity against low-frequency AC

Pulses shorter than 200 ms or lower than 10V should not be approved as valid ringing signal by the PBX .

6.4 Register recall

A register recall signal in conversation state, if implemented, should be produced by the PBX as a high-ohmic loop with a resistance >100 kohm and a duration of $90 \text{ ms} \pm 40 \text{ ms}$. The requirement is not mandatory but shall be fulfilled if the PBX is intended to use the PSTN supplementary services that make use of register recall.

6.5 Crosstalk

The crosstalk attenuation between two PBX exchange line interfaces in loop state, each terminated with the reference impedance Z_r , should be at least 73 dB when measured with a sinewave signal at 1020 Hz applied to one of the interfaces at a level of 0 dBm. The recommendation does not apply when the interfaces are used for external call transfer. The reference impedance Z_r consists of 270 ohms in series with a parallel combination of 750 ohms and 150 nF.

6.6 Gain limitations

The gain in each transmission direction should not, at any frequency within 300-4300 Hz, exceed 1 dB between an exchange line interface and any other electrical 2-wire interface of the PBX and not exceed 10 dB between an exchange line interface and any other electrical 4-wire interface of the PBX. Furthermore the gain in each transmission direction between two exchange line interfaces, when used for external call transfer, should not exceed 1 dB. This applies when the exchange line interface is terminated with the reference impedance Z_r .

Annex
(informative)

Bibliography

- SS 63 63 24 Telecommunications equipment – Private Branch Exchanges (PBXs) – Signalling requirements in analogue interface for outgoing exchange line
- SS 63 63 25 Telecommunications equipment – Private Branch Exchanges (PBXs) – Signalling requirements in analogue interface for incoming exchange line