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Telecommunications equipment - Private Branch Exchanges (PBXs) - Signaling requirements in analogue interface for incoming exchange line

Telekommunikationsutrustning – Abonnentväxlar – Signaleringskrav i analogt gränssnitt för ankommande huvudledning

Contents

0 Introduction

This edition results from a general review of Swedish Standards for attachment to a PSTN in order to align their mandatory content with the requirements of the teleterminal directive (91/263/EEC). A number of provisions have been deleted, some provisions have been transferred to informative parts of the standard and some other modifications have been made.

By this edition the Swedish language version of SS 63 63 25 is withdrawn.

1 Scope

This standard covers the requirements for signaling in an analogue interface towards the public switched telephone network for incoming traflic on a one-way or two-way exchange line.

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Prisgrupp L

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2 Normative references

The following standards contain requirements, which through reference, constitute requirements of this standard. All standards are subject to revision, and parties to agreements based on this standard are encouraged to investigate the possibility of applying the most recent editions of the standards listed below.

SS 63 63 24 Telecommunications equipment – Private Branch Exchanges (PBXS) – Signaling requirements in analogue interface for outgoing exchange line

SS 63 63 42 Telecommunications equipment – Subscriber equipment – Attachment requirements for analogue connection to a public switched telephone network

3 Signaling diagram

The signaling diagram will be found in annex A. This signaling diagram provides a description of the performance and characteristics of the public switched telephone network with respect to signaling in the interface for different connection cases and call processes.

The attached signaling diagram covers variations in the performance and characteristics of the public switched telephone network between different types, or variants, of public exchange systems and between different connection forms.

Apart from the variants of public exchange systems represented in this signaling diagram, there is also a limited number of odd exchange systems. Local variations not subject to documentation may also be found in old electromechanical public exchange systems; they are not necessarily covered by this signaling diagram.

The signaling diagram is intended to serve as a piece of information on the performance and characteristics of the telephone network. In this context, the parameter values specified in the signaling diagram with respect to the performance of the PBX are to be regarded as typical values, etc. Thus the parameter values, etc., specified in the signaling diagram do not constitute any mandatory requirements imposed on the PBX in excess of what is explicitly specified as requirements in clause 4 below. The object of those requirements is to secure basic functions of vital importance under normal circumstances and in normal connection cases.

This means that compliance with the requirements set forth in this standard does not provide any guarantee of correct performance of the equipment when connected to the telephone network.

4 Requirements

4.1 General

The line may have a configuration allowing one-way traffic, i.e. only calls from the telephone network to the PBX, or a two-way traffic configuration. In the latter case, the PBX shall, when idle, enter the state defined in this standard. Signaling requirements for outgoing traffic on a two-way line are set forth in standard SS 63 63 24.

4.2 Electrical characteristics

4.2.1 *General*

When the line is connected to current feed, the PBX shall accept that polarities are undefined in relation to the line branches accessible in the physical connection interface.

NOTE 1: The characteristics of the telephone network with respect to current feed of the line vary according to the case of connection; see annex A.

NOTE 2: In certain connection cases, circuit tests are carried out from the public exchange, in the idle state as well in connection with (before) seizure. For the purpose of testing, the line is connected to voltages ranging from 0 to 50 V DC between the branches (a-b) and between earth and each branch (earth-a and earth-b, respectively). There may also be cases of low-frequency alternating voltage of < 50 Hz and < 10 V.

4.2.2 *Resistance in the idle state*

The requirements set forth in standard SS 63 63 42, clause 4.4.1, shall be fulfilled.

4.2.3 *Ringing signal detector*

The impedance of the ringing signal detector (cf. impedance Z specified in annex A) shall amount to ≥ 8 kohms at 25 Hz.

The ringing signal detector shall detect ringing signal voltages ≥ 30 V with a frequency of 25 Hz for pulses with a duration of ≥ 200 ms. Ringing signals with a voltage of < 10 V shall not be detected.

4.2.4 *Low-ohmic loop state*

The DC characteristic in loop state shall fulfil the requirements in SS 63 63 42, 4.7.1. This characteristic is represented by “L” in the signaling diagrams. Under existing current feed conditions, this will normally give a current of at least 10 mA. The PBX shall, at the line current 10 mA, be able to detect a polarity reversal of the current feed from the public network. In addition, the PBX may have the capacity of detecting a break in the current feed from the telephone network. A polarity reversal of or break in the current feed with a duration of < 20 ms shall not be approved.

NOTE: In some cases, the requirement for detection of polarity reversal is not mandatory, see clauses 4.3.7 and 4.3.8.

The contact fictions used for switching a line on which a call is established between different circuits in the PBX shall be designed so that possible breaks, i.e. the time when the requirement for resistance is not fulfilled, shall amount to < 10 ms at switchover.

4.2.5 *High-ohmic loop state*

4.2.5.1 The circuit connecting a high-ohmic loop to the line for disconnection (cf. resistance H according to annex A) shall fulfil the following requirements:

a) The resistance shall be > H ohms, see clauses 4.2.5,2–4.2.5.3.

b) The PBX shall be able to detect a polarity reversal of the current feed from a battery by U volts in series with R ohms (corresponding to minimum feeding voltage, feeding resistance and maximum line length), see clauses 4.2.5.2–4.2.5 .3. In addition, the PBX may have the capacity of detecting a break in the current feed from the telephone network. A polarity reversal of or break in the current feed with a duration of < 20 ms shall not be approved.

NOTE: In some cases, the requirement for detection of polarity reversal is not mandatory, see clauses 4.3,7 and 4.3.8.

4.2.5.2 In the case of connection to a current feed in the public network from a voltage source of 48 V (nominal), the following shall apply: H = 30 kohms, U = 40 V and R = 2800 ohms.

4.2.5.3 In the case of connection to a current feed in the public network from a voltage source of 36 V (nominal) or less, the following shall apply: H = 22 kohms, U = 30 V and R = 2300 ohms.

4.3 Set-up and disconnection of calls

4.3.1 *Call request*

A call request transmitted from the telephone network by means of a ringing signal (cf. annex A) shall be detected and in the PBX result in an alert signal to the operator's console, another telephone set or a telephone answering device.

4.3.2 *Answer*

An answer signal is transmitted by connection of a low-ohmic loop to the line.

4.3.3 *Periodic clearing signal*

When in the conversation state (after receiving an answer) with ringing signals being sent to an extension or with the exchange line put on hold, the PBX shall send periodic clearing signals on the exchange line. When a periodic clearing signal is sent, a high-ohmic loop shall be connected to the line during 1 ± 0,15 s, repeated with an interval (pause) of 8-10 s.

If after reception of an answer, call transfer etc., the switchover to an extension of a call in such a condition occurs at the same time as a periodic clearing signal is sent, this clearing signal must not be interrupted if by that its duration should become < 500 ms.

If the polarity of the current feed of the exchange line is changed during the high-ohmic loop, the waiting A-subscriber has cleared the connection. In this case the exchange line shall be put in idle condition.

Periodic clearing signals shall not be sent if the PBX is unable to detect a polarity reversal at disconnection according to alternative a) in clauses 4.3.7 and 4.3.8. In that case, the PBX shall fulfil at least one of the requirements set forth under a) – c) below, with regard to calls in one of the conditions described above.

a) The call is disconnected within 90 s.

b) A call put on hold is clearly and directly controlled by one of the telephone sets included in the PBX system by:

- the set being called (by ringing or equivalent), after disconnection by the user, for the call put on hold to be established to that set (or in case of no answer, disconnected), or
- the call put on hold being disconnected, after disconnection by the user, unless it is taken over by another set (e.g. by transfer), or
- the presence of a call put on hold being clearly indicated to the user by persistent sound or light signals from the set.

c) A call waiting is clearly and directly controlled by the telephone set having answered or taken over (e.g. by transfer) the call by:

- the call being returned to the controlling telephone set within 90 s, or
- the presence of a call waiting being clearly indicated on the controlling set by persistent sound or light signals.

4.3.4 Register recall

NOTE: Register recall signal in conversation state, if implemented, should consist of a break in the DC-loop. The break should have a duration of 90 ± 40 ms and present a resistance > 100 k Ω. There are, however, no approval requirements for this supplementary service.

4.3.5 *Clear-back signal*

A clear-back signal is transmitted by connection of a high-ohmic loop to the line. At the same time, a ringing signal detector shall be connected to the line.

4.3.6 *Repeated call attempt by operator*

After transmission of a clear-back signal, it shall be possible to detect, provided that disconnection in accordance with clause 4.3.7 has not yet occurred, a repeated call attempt (by an operator in the telephone network) in the form of a ringing signal.

4.3.7 *Disconnection after a clear-back signal*

When the PBX has sent a clear-back signal according to clause 4.3.5 it shall wait for a polarity reversal in the current feed from the public network. When the polarity reversal has been detected the call shall be disconnected and the PBX shall go to idle state. Both-way lines shall then be blocked for outgoing calls > 1 s after the polarity reversal. (If the A-subscriber does not clear the line, the polarity reversal can be delayed up to 3 minutes after the clear-back signal.)

The PBX need not be able to detect polarity reversal in the current feed, provided that seizure of the line for outgoing calls (both-way line)

a) may only be controlled from a telephone set included in the PBX system, and equipped with an indicator showing the state of the exchange line concerned; the indication that the line is no longer engaged shall be delayed by the PBX by 1–2 s after the clear-forward signal has been sent

or

b) is realised by the advance connection (low-ohmic) of a dial tone detector to the line; if, thereafter, an approved dial tone is detected within 5 s, this means that the line is free and through-connection shall be established to the calling extension.

If no approved dial tone is detected within 5 s, the line is not free. The PBX shall then return to idle state towards the line and busy tone should be sent to the extension.

Seizure of a line on which the extension has sent a clear-forward signal shall not occur again until at least 12 s after the instant the clear-forward signal has been forwarded to the public network.

4.3.8 *Forced release in the public network*

When a polarity reversal in the line current feed from the public network has been detected during conversation state, the call shall be disconnected and the PBX shall go to idle state. Both-way lines shall be blocked for outgoing calls > 1 s after the high ohmic loop has been presented to the exchange line.

The PBX need not be able to detect polarity reversal in the current feed, provided that seizure of the line for outgoing calls (both-way line)

a) may only be controlled from a telephone set included in the PBX system, and equipped with an indicator showing the state of the exchange line concerned

or

b) is realised by the advance connection (low-ohmic) of a dial tone detector to the line; if, thereafter, an approved dial tone is detected within 5 s, this means that the line is free and through-connection shall be established to the calling extension.

If no approved dial tone is detected within 5 s, the line is not free. The PBX shall then return to idle state towards the line and busy tone should be sent to the extension.

Seizure of a line on which the extension has sent a clear-forward signal shall not occur again until at least 12 s after the instant the clear-forward signal has been forwarded to the public network.

4.3.9 *Signaling requirements for external call transfer*

External call transfer may be performed in a PBX or in a PBX network if the incoming (analogue or digital) exchange line is connected to a digital public exchange, and if clearing signals from the incoming to the outgoing exchange line, or vice versa, are forwarded within 3 s.

Annex A
(informative)

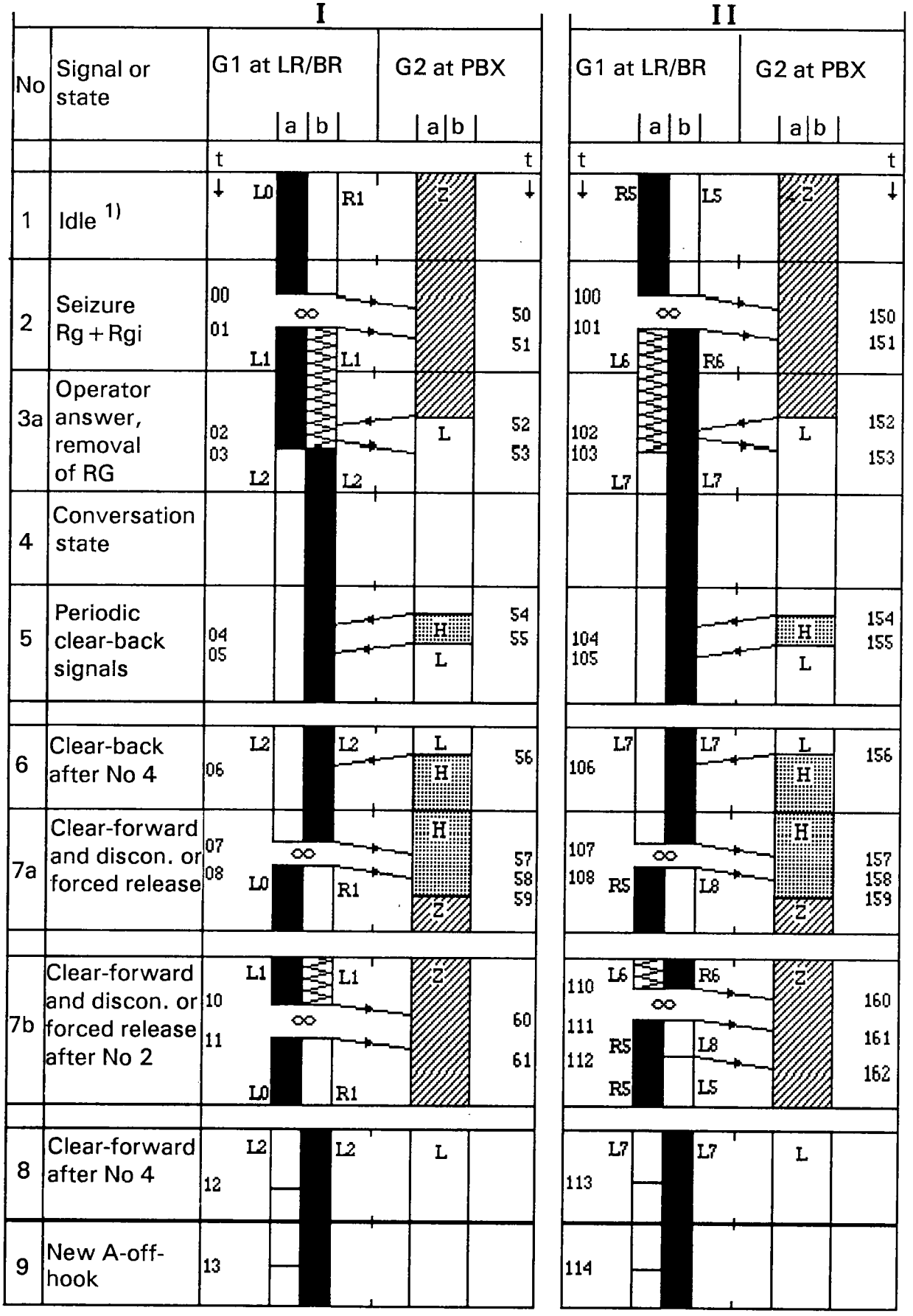
Exchange line DC Signaling, PBX -> Public exchange

This annex is a specification of a national DC signaling system for analogue signaling from a public exchange to a PBX.

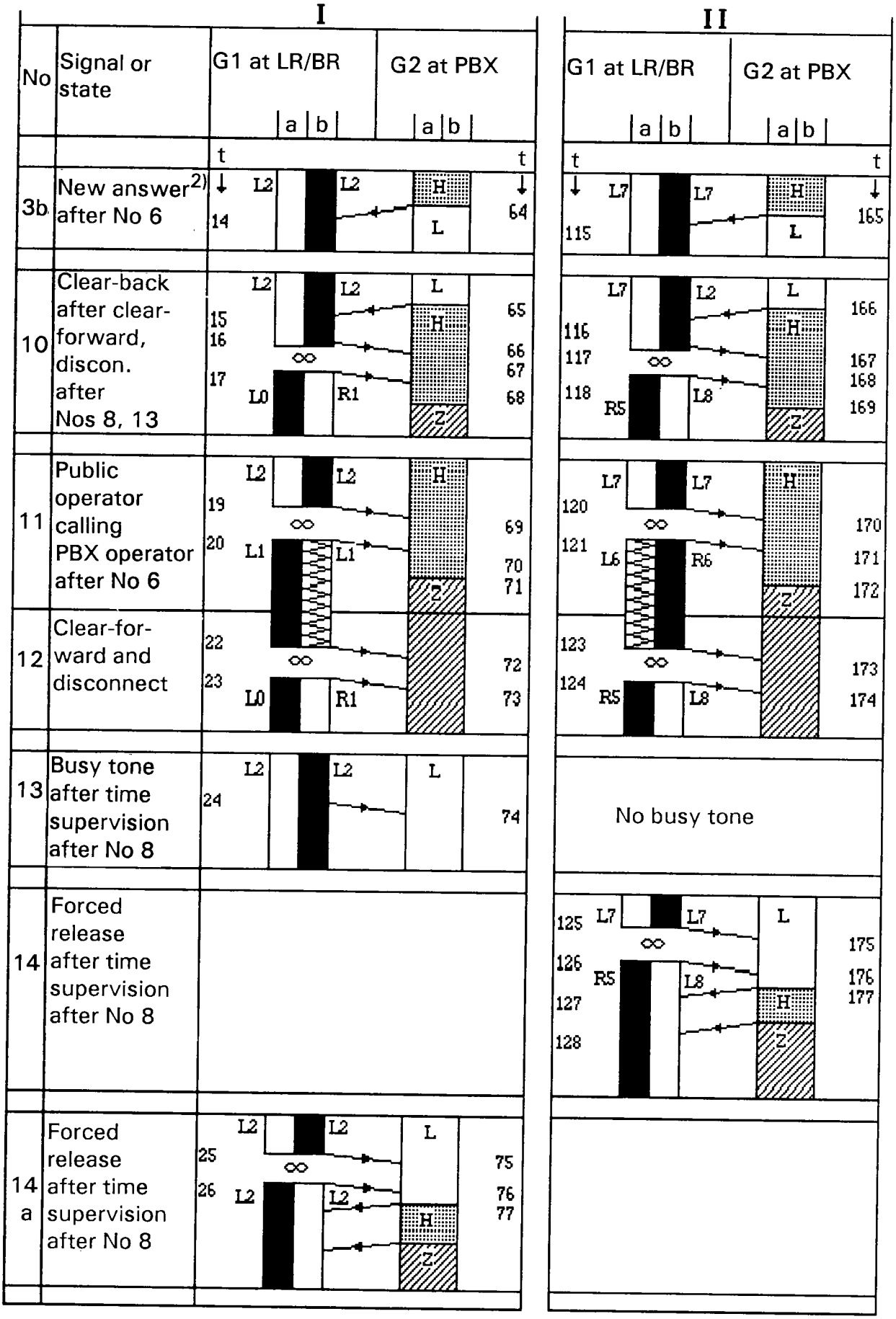
The specification is applicable to connections to a number of different types of exchanges, including those using what is referred to as signaling converters.

This signaling diagram covers certain variations occurring between different types of public exchanges. In the signaling state diagrams these variations are represented by two alternatives (I and II) in two separate columns. In both alternatives, calls are established by means of a ringing signal (RG).

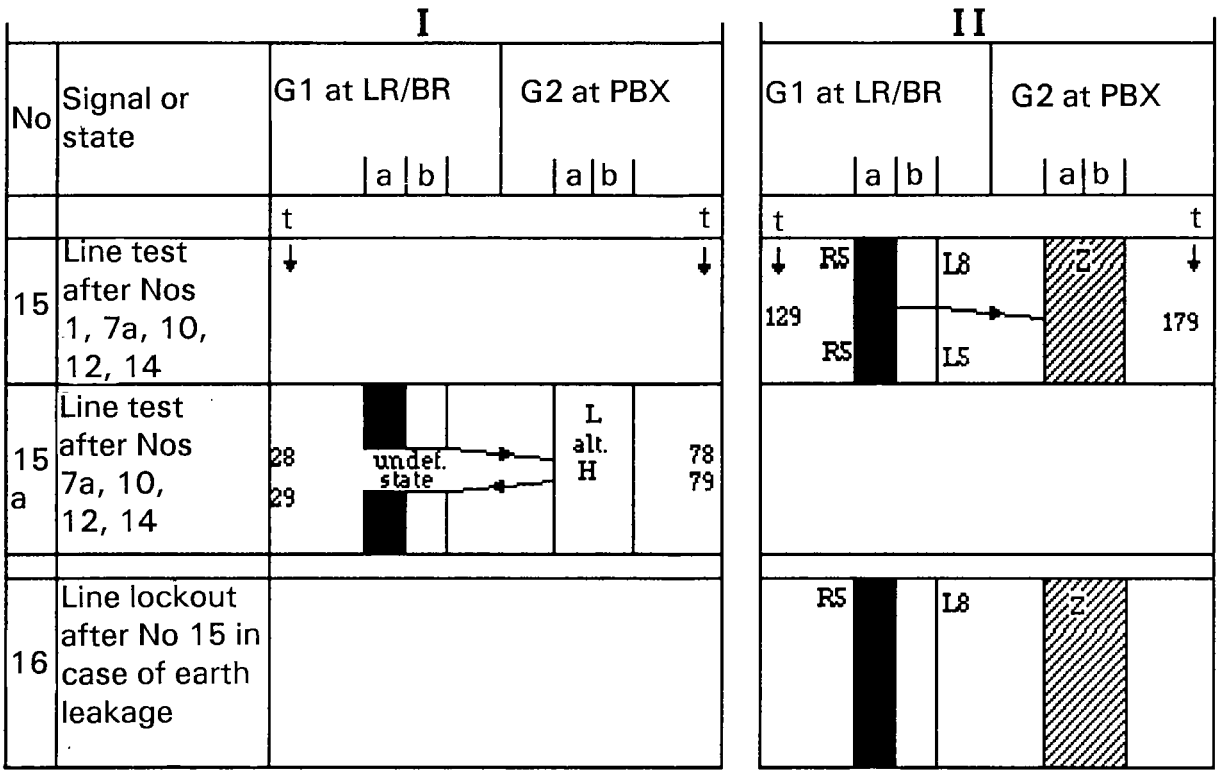
In the Swedish telephone network, there is also a limited number of odd types of public exchanges, with characteristics that may differ from this signaling diagram in various respects.



1) Idle polarity does not exist on one-way lines.



2) Does not apply for extensions.

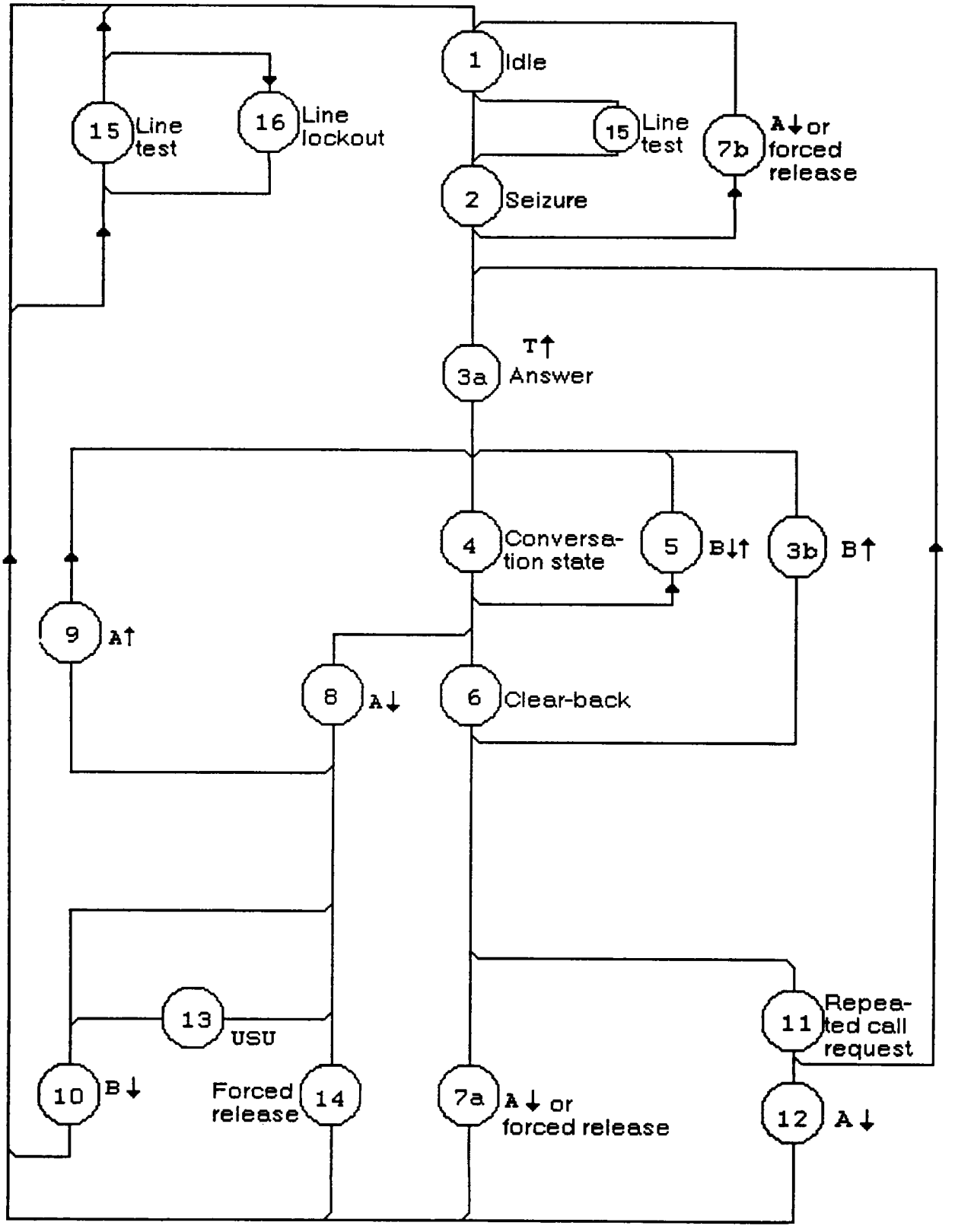


Time limits

t50 t53 t57 t58 t60 t61 → t t66 t67 t70 t72 t73	20—40 ms Recognition time	t150 t153 t157 t158 t160 t161 t162 → t t167 t168 t170 t171 t173 t174 t175 t176 t179	20—40 ms Recognition time
t00 → t01	= 50—900 ms	t100 → t101	= 100—200 ms
t19 → t20	= 0—100 ms	t107 → t108 t110 → t111 t117 → t118 t120 → t121 t125 → t126	= 20—50 ms
t00 → t10	= No time supervision		
t06 → t07	= 90 s or 3 min		
t01 → t03	= min 200 ms	t100 → t110 t106 → t107	= 2—4 min
t02 → t03	= 50—200 ms		
		t101 → t103	= min 200 ms
t07 → t08 t10 → t11 t16 → t17 t22 → t23	= 0—1000 ms	t102 → t103	= 50—200 ms
		t107 → t129	= 400—600 ms
t25 → t26	= 0—50 ms		
t28 → t29	= max 1200 ms		
t12 → t24	= 90—120 s or 12—15 s	t110 → t112 t123 → t124	= 100—300 ms
t15 → t16	= 50—200 ms	t113 → t125	= 2—4 min
t15 → t17	= 150—1200 ms	t116 → t119	= 200—400 ms
t51 → t52 t70 → t72	< 100 ms no det. > 200 ms det. assured	t151 → t152 t170 → t172	< 100 ms no det. > 200 ms det. assured
t54 → t55	= 1,0 ± 0,15 s every 8—10 s	t154 → t155	= 1,0 ± 0,15 s every 8—10 s
t58 → t59 t67 → t68 t70 → t71	= max 100 ms	t158 → t159 t168 → t169 t171 → t172	= max 100 ms
t76 → t77	= max 100 ms	t176 → t177	= max 100 ms

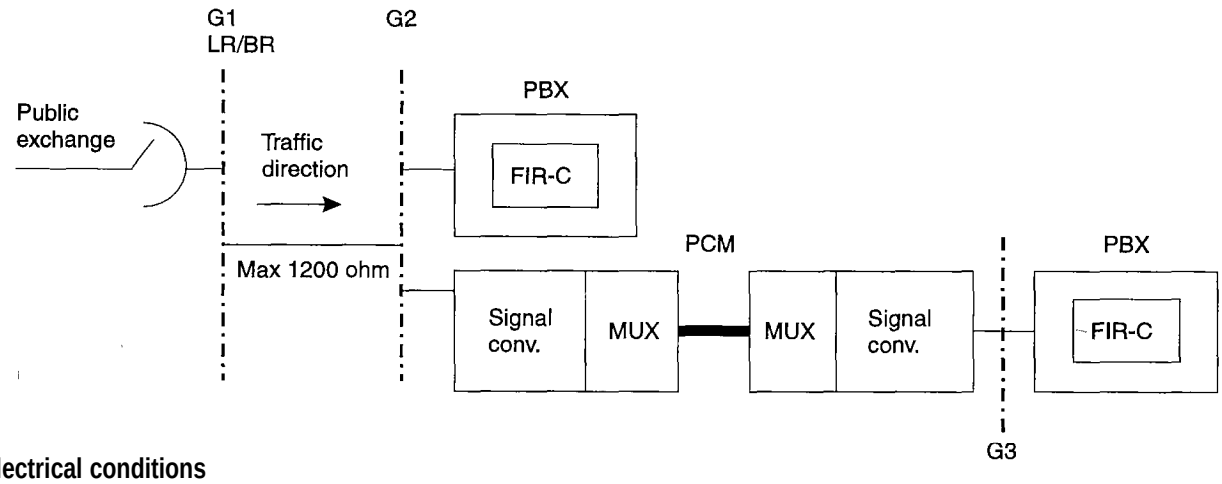
Note: Time limits and parameter values indicated for PBX equipment are typical values,

SEQUENCE CHART



A↓ = Clear-forward
T↑ = Operator answer
B↑ = Answer
USU = Busy tone
B↓↑ = Periodic clearing signal

Interface



Electrical conditions

	36 V	48 V	
R1	200 ohms	300 ohms	800 ohms
L0	1000 ohms	1200 ohms alt.	800 ohms
L1	450 ohms	450 ohms	800 ohms
L2	500 ohms	800 ohms	800 ohms

R5	0 ohms
R6	0 alt. 500 ohms
L5	1000 ohms
L6	1000 alt. 500 ohms
L7	500 ohms
L8	700 ohms

G3 functionally= G2

L < 600 ohm
H > 22 kohms DC resistance at 36 V, > 30 kohms at 48 V.
Z ≥ 8 kohms impedance at 25 Hz, >1 Mohm DC resistance

Legend

Low-ohmic loop

High-ohmic loop with ringing signal detector

High-ohmic impedance for ringing signal

+ on the a-branch and – on the b-branch

- on the a-branch and + on the b-branch

Ringing signal voltage 80 V (nom.), at 25 Hz, superimposed on the exchange voltage. Cadence 1s every 5s.

t — Indicates point of time

∞ — Break

G1, G2, G3 — Interface designation

Transmission of information between the interface

LR/BR — Line relay/cut-off relay
FUR-C — Outgoing exchange line relay set