

Handläggande organ/Standardizing body

Fastställt/Approved

Utgåva/Edition

Sida/Page

ITS Information Technology Standardization

1996-05-10

3

1 (15)

SIS FASTSTÄLLER OCH UTGER SVENSK STANDARD SAMT SÄLJER NATIONELLA, EUROPEISKA OCH INTERNATIONELLA STANDARDPUBLIKATIONER ©

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

Telekommunikationsutrustning – Abonentväxlar – Signaleringskrav i analogt gränssnitt för avgående huvudledning

Contents

	Page
0 Introduction	1
1 Scope	1
2 Normative references	2
3 Signaling diagram	2
4 Requirements	2
4.1 General	2
4.2 Electrical characteristics	2
4.3 Set-up and disconnection of calls	3
Annex A Signaling diagram (informative)	6

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By this edition the Swedish language version of SS 63 63 24 is withdrawn.

1 Scope

This standard covers the requirements for signaling in analogue interfaces towards the public switched telephone network for outgoing traffic on one-way or two-way exchange lines.

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 25 Telecommunications equipment – Private Branch Exchanges (PBXs) – Signaling requirements in analogue interface for incoming exchange line
- SS 63 63 42 Telecommunications equipment – Subscriber equipment – Attachment requirements for analogue connection to a public switched telephone network
- ETS 300 001 Attachments to Public Switched Telephone Network (PSTN); General technical requirements for equipment connected to an analogue subscriber interface in the PSTN

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 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 PBX over the telephone network, or a two-way traffic configuration. In the latter case, the PBX shall, when idle, enter the state defined in standard SS 63 63 25 for incoming traffic.

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 as after a call attempt from the PBX (before the dial tone is sent). 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 SS 63 63 42, clause 4.4.1, shall be fulfilled.

4.2.3 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 clause 5.3.10.4.

The contact functions used for switching a connected line 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.

4.2.4 High-ohmic loop state

4.2.4.1 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 5.2.4.2–5.2.4.3.
- 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 5.2.4.2–5.2.4.3. 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 requirements for detection of polarity reversal is not mandatory, see clause 5.3.10.4.

4.2.4.2 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.

4.2.4.3 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 seizing signal is transmitted to the telephone network by the connection of a low-ohmic loop to the line. If the line has a two-way traffic configuration, the circuit receiving the ringing signal shall be disconnected at the same time (cf. SS 63 63 25).

4.3.2 *Dial tone*

A dial tone is sent from the public exchange to indicate readiness to receive address information.

When sending address signals in an automatic mode the PBX shall be equipped with a dial tone detector or a timer for waiting before start of sending address signals. The requirements set forth in SS 63 63 42 section 4.8.1 shall be fulfilled.

4.3.3 *Address signaling*

For the purpose of address signaling, decadic pulsing (loop-disconnect signaling) or multifrequency tone signaling shall be used in accordance with clauses 4.3.4 and 4.3.5, respectively.

4.3.4 *Decadic pulsing (Loop-disconnect signaling)*

For decadic pulsing, if provided, the requirements set forth in ETS 300 001, clause 5.3, shall apply.

4.3.5 *Multi-frequency tone sending*

Tone code senders (DTMF-senders) shall fulfil the requirements set forth in SS 63 63 42, clause 4.8.2. An exception is made for the transmission levels which shall not be as stated in SS 63 63 42, clause 4.8.2.2. The following levels shall be used:

- high frequency group: -9 dBm +4/-6 dB
- low frequency group: -11 dBm +4/-6 dB

However, the level of the higher frequency component in the compound signal shall be 1 dB to 4 dB higher than the level of the lower frequency component.

Compliance with the requirements shall be verified in the exchange line interface. The measurements shall be conducted under normal operating conditions of the PBX. The termination during the test shall be nominal impedance as specified in SS 63 63 42.

4.3.6 *Answer*

When the called party answers, an answering signal is transmitted from the telephone network as a polarity reversal in the current feed.

4.3.7 *Call metering signals*

NOTE: Reception of 12 kHz call meter pulses, if implemented, should be performed in accordance with ETS 300 001, 9.2.1. There are, however, no approval requirements for this supplementary service.

4.3.8 *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.

4.3.9 *Clear-forward signal*

The clear-forward signal is transmitted by connection of a high-ohmic loop to the line.

4.3.10 *Disconnection*

4.3.10.1 *Disconnection before reception of an answering signal.*

When a call from the PBX is disconnected before reception of an answering signal (a polarity reversal), the line shall not be seized for a new outgoing call over the telephone network within at least 1 s after the clear-forward signal (high-ohmic loop) has been sent to the network.

4.3.10.2 *Disconnection after answer but before clear-back.*

When a call from the PBX is disconnected after reception of an answer signal, but before a clear-back signal (a polarity reversal) has been received, the line shall not be seized for a new outgoing call over the telephone network within at least 1 s after the clear-forward signal (high-ohmic loop) has been sent and the clear-back signal has been received. If the B-subscriber does not clear the line the clear-back signal can be delayed up to 3 minutes after sending of the clear-forward signal.

4.3.10.3 *Disconnection after clear-back.*

When a call from the PBX is disconnected after the reception of a clear-back signal (the B-subscriber has cleared the call and the time supervision of 90-180 s has expired causing the sending of a clear-back signal (polarity reversal) to the PBX) the line shall not be seized for a new outgoing call over the telephone network within at least 1 s after the clear-forward signal (high-ohmic loop) has been sent.

4.3.10.4 *Idle polarity detection*

The PBX need not be able to detect idle polarity provided that control of line seizure (for a new call)

a) is possible only from a set included in the PBX system and equipped with an indicator showing the current state of the exchange line; the indication of the line being free shall be delayed by the PBX for 1–2 s after transmission of the clear-forward signal;

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.

4.3.10.5 *Deviations from requirements*

The requirements set forth in clauses 5.3.10.1–5.3.10.3 represent the minimum functionality and time limits that may be applied on a general basis to different types of public exchanges in accordance with the attached signaling diagram. In addition, a PBX may incorporate logical functions and supplementary time limits for the initiation and supervision of the disconnection process which are adjusted to different versions of the signaling diagram, depending on the type of public exchange to which the PBX is connected.

Therefore, deviations from the requirements set forth in clauses 5.3.10.1–5.3.10.3, due to the PBX operating on the basis of differentiated criteria adapted to the public exchange concerned, will be accepted if the supplier is able to demonstrate that correct performance will be achieved in relevant connection cases.

4.3.11 *Automatic repeat call attempts*

For automatic repeat call attempts in the event of an unsuccessful calling operation, the requirements set forth in ETS 300 001, clause 5.6.7, shall be fulfilled.

4.3.12 *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 PBX to a public exchange.

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.

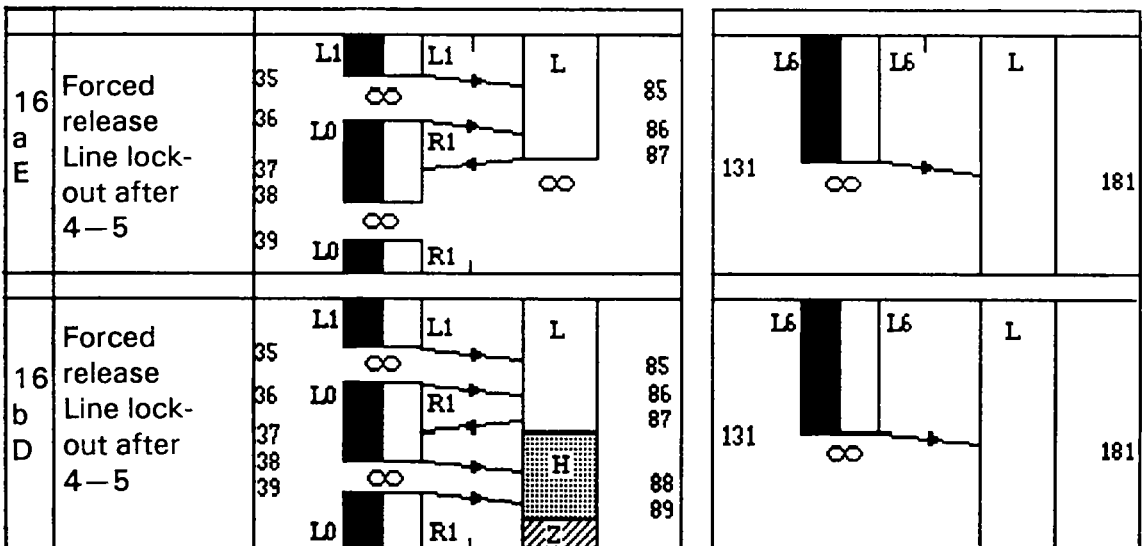
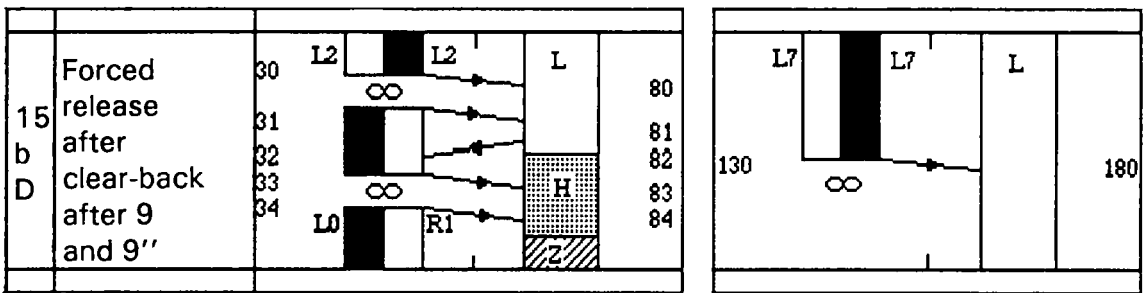
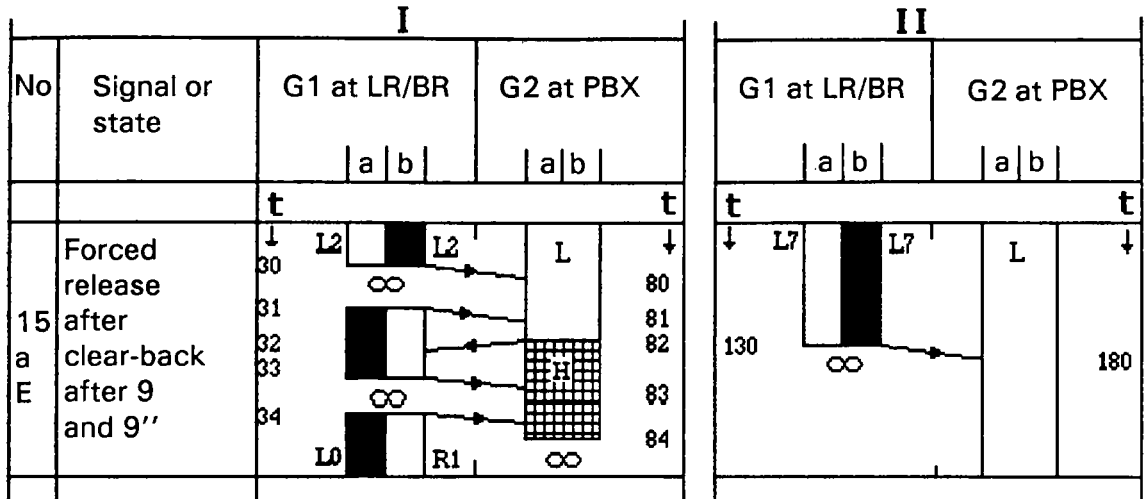
In the Swedish telephone network, there is also a limited number of odd types of public exchanges, with characteristics that may differ from this signaling diagram in various respects.

		I				II				
No	Signal or state	G1 at LR/BR		G2 at PBX		G1 at LR/BR		G2 at PBX		
		a	b	a	b	a	b	a	b	
		t		t		t		t		
1a	Idle	L0	R1	∞		R5	L5	∞		
2a	Seizure	L0	R1	L	50	R5	L5	L	150	
1b	Idle	L0	R1	Z		R5	L5	Z		
2b	Seizure	L0	R1	L	51	R5	L5	L	151	
3	Dial tone after 2	L1	L1	L	52	L6	L6	L	152	
4	Decadic pulsing "1"	03		∞	53			∞	153	
		04		R	54			R	154	
		05			∞	55			∞	155
		06		R	L	56 57			R L	156 157
5	Decadic pulsing "0"	08		∞	58			∞	158	
		09		R	59 60			R L	159 160	
6	Disconnect of reg.	11	∞		61		∞		161	
		12	L2	L2	62	L7	L7		162	
6a	Disconnect of reg.					L6	L6	L	163	
							∞			
						R7	R6		164	
						L7	L7		165	
7	Answer after no 6	L2	L2		63	L7	L7		166	
8	Conversation state after Nos 7a, 7a', 7a''									

		I				II			
No	Signal or state	G1 at LR/BR		G2 at PBX		G1 at LR/BR		G2 at PBX	
		a	b	a	b	a	b	a	b
		t		t		t		t	
9	Clear-back local call	↓ 14	L2	L2	L	↓			↓
7a	New B off-hook	15							
9'	Clear-back local call after 8	16	L2	L2	L	66	L7	L7	L
7a'	New B off-hook	17				67			
9''	Clear-back local call after 8	18	L2	L2	L		L7	L7	L
7a''	New B off-hook	19							
10aE	Clear-forward after clear-back disconnect after 9, 9''	20 21 22	L2	L2	L	70 71 72	L7	L7	L
			L0	R1	∞		∞	∞	∞
10a'E	Clear-forward after clear-back disconnect after 9'	20 21 22	L2	L2	L	70 71 72	L7	L7	L
			L0	R1	∞		∞	∞	∞
10bD	Clear-forward after clear-back disconnect after 9, 9''	20 21 22	L2	L2	L	70 71 72	L7	L7	L
			L0	R1	∞		∞	∞	∞
10b'D	Clear-forward after clear-back disconnect after 9'	20 21 22	L2	L2	L	70 71 72	L7	L7	L
			L0	R1	∞		∞	∞	∞

		I				II			
No	Signal or state	G1 at LR/BR		G2 at PBX		G1 at LR/BR		G2 at PBX	
		a	b	a	b	a	b	a	b
		t		t		t		t	
11 a E	Clear-forward bef. answer, disconnect after 3-6	↓ L2 23 L0	L2 24 R1	L 73 H 74 ∞	↓ L6 124 ∞	L6 125	L 174 H 175	↓	↓
11 b D	Clear-forward bef. answer, disconnect after 3-6	↓ L2 23 L0	L2 24 R1	L 73 H 74 Z	↓ L6 124 ∞	L6 125	L 174 H 175	↓	↓
12 a E	Clear-forward bef. clear-back after 8	L2 26	L2	L 76 H	L7 126	L7	L 176 H		
12 b E	New A 1) off-hook	L2 27	L2	L 77	L7 127	L7	L 177		
13 a D	Clear-forward bef. clear-back after 8	L2 26	L2	L 76 H	L7 126	L7	L 176 H		
13 b D	New A 1) off-hook	L2 27	L2	L 77	L7 127	L7	L 177		
14 a E	Clear-back after clear-forward and discon. or forced release after 12a	L2 28 L0	L2 ∞ R1	L 78 H 79 ∞	L7 128 ∞	L7 129	L 178 H 179		
14 b D	Clear-back after clear-forward and discon. or forced release after 13a	L2 28 L0	L2 ∞ R1	L 78 H 79 Z	L7 128 ∞	L7 129	L 178 H 179		

1) Does not apply to extensions



		I				II				
No	Signal or state	G1 at LR/BR		G2 at PBX		G1 at LR/BR		G2 at PBX		
		a	b	a	b	a	b	a	b	
		t		t		t		t		
16 a' E	Forced release Line lock-out after 6	↓		↓		↓	L7	L7	L	↓
		See 16 a E				132	∞			182
16 b' D	Forced release Line lock-out after 6					L7	L7	L		182
		See 16 b D				132	∞			182
17 a E	Removal of dial tone Line lock-out after 3	40	L2	L2	L	90				91
		41	L0	R1			∞			
17 b D	Removal of dial tone Line lock-out after 3	40	L2	L2	L	90				91
		41	L0	R1			∞			
18 a E	Reg. ²⁾ recall signal after 8	42	L2	L2	L	92		H		93
		43			L					
18 b D	Reg. ²⁾ recall signal after 8	42	L2	L2	L	92		H		93
		43			L					
19	Line test after 10, 11, 14-17									
		136	RS	L8	L alt H	186				187
		137	RS	L5	H					188
		138			alt ∞					

2) Function not existing in certain systems
 When valid, the call is put on hold in the public exchange and the line is transferred to state 2 in the diagram.

I					
No	Signal or state	G1 at LR/BR		G2 at PBX	
		a	b	a	b
		t		t	
19 a	Line test after 2a, 2b, 10, 11, 14–17	44		L alt. H	94 95
20	Line lockout after 19 in case of no return to idle state				

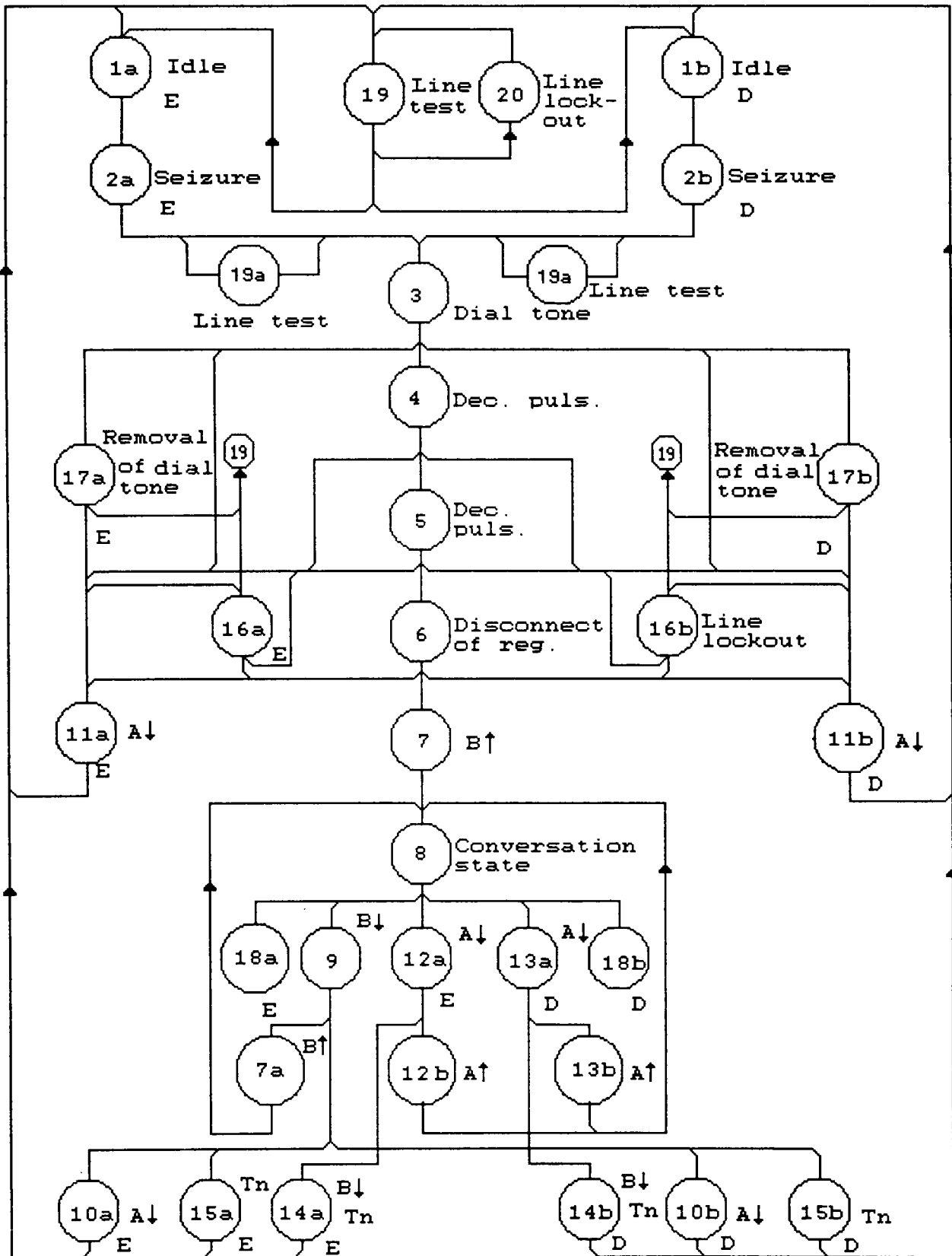
II			
G1 at LR/BR		G2 at PBX	
a	b	a	b
t		t	
RS		L8	
		L	

Time limits

t61		t161			
t62		t162			
t63		t163			
t66		t164			
t67		t165			
t71		t166			
t74	20–40 ms	t167			
t78 → t80	Recognition time	t168	20–40 ms		
t81		t172 → t175	Recognition time		
t83		t178			
t85		t179			
t86		t180			
t89		t181			
t90		t182			
t91		t183			
		t186			
t11 → t12	= 0–300 ms	t111 → t112	} = 15–100 ms		
t14 → t30	} = 90 s	t113 → t114			
t16 → t30			t113 → t115	} = 100–400 ms	
		t119 → t120			
		t128 → t129			
		t112 → t132	} = 2–4 min		
		t114 → t132			
t16 → t17	< 1,5 s for periodic clearing signals from B-party PBX, otherwise subscribercontrolled	t115 → t130	= 2–4 min		
		t117 → t118	< 1,5 s for periodic clearing signals from B-party PBX, otherwise subscribercontrolled		
t18 → t30	= 90 s alt. 3–6 min	t119 → t130	= 3–6 min		
t20 → t21	} = 30–100 ms	t122 → t136	} = 30–150 ms		
t23 → t24				t125 → t136	
t32 → t33				t127 → t136	
t37 → t38				t130 → t136	
		t129 → t136			
t21 → t22	} = 0–1000 ms	t124 → t125	= 150–300 ms		
t24 → t25			t126 → t128	= 2–4 min	
t28 → t29			t128 → t129	= 250–300 ms	
t33 → t34			t131 → t136	} = 200–350 ms	
t38 → t39		t132 → t136			
t30 → t31	} = 0–400 ms	t133 → t136			
t35 → t36			t136 → t137	= 200–300 ms	
t40 → t41			t152 → t153	> 800–1000 ms	
t44 → t45	= max 1100 ms	t153 → t154	} = 60 ± 5 ms		
t52 → t53	= 800–1000 ms	t155 → t156			
		t158 → t159			
t53 → t54	} = 60 ± 5 ms	t154 → t155	= 40 ± 5 ms		
t55 → t56			t156 → t157	} = 25–100 ms	
t58 → t59			t159 → t160		
t54 → t55	= 40 ± 5 ms	t156 → t158	= 500–700 ms		
t56 → t57	} = 25–100 ms	t184 → t185	= 90 ± 40 ms		
t59 → t60					
t56 → t58	= 500–700 ms				
t92 → t93	= 90 ± 40 ms				

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

Sequence chart

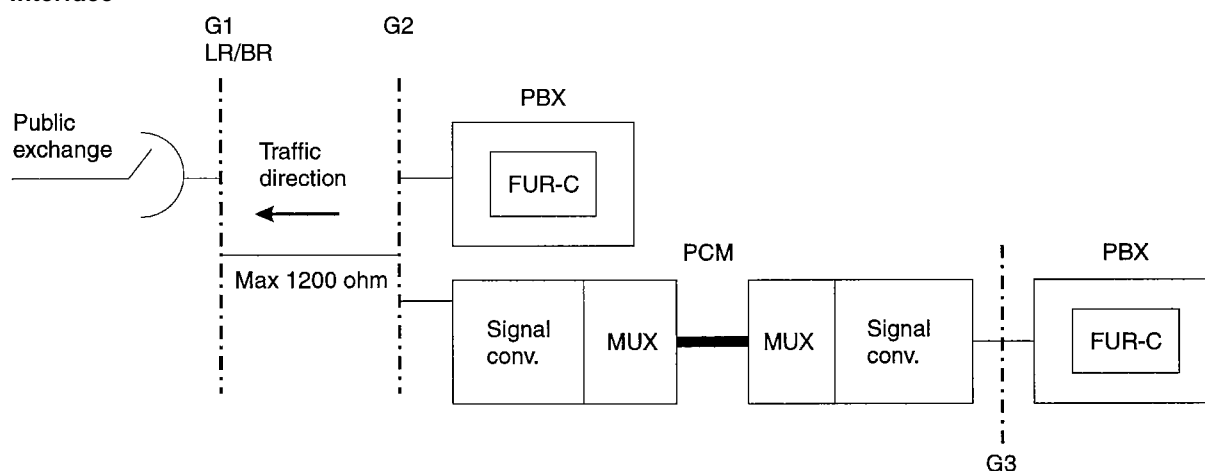


A↓ = Clear-forward
 B↑ = Answer

E = One-way
 D = Both-way

Tn = Forced release
 Ink = Line lockout

Interface



Electrical conditions

	36 V	48 V	
R1	200 ohms	300 ohms	800 ohms
L0	1000 ohms	1200 ohms alt.	800 ohms
L1	500-625 ohms	600-800 ohms	800 ohms
L2	500-600 ohms	800 ohms	800 ohms
R5	0 ohms		
R6	200 ohms		
R7	50 ohms		
L5	1000 ohms		
L6	600 ohms		
L7	600 ohms		
L8	700 ohms		

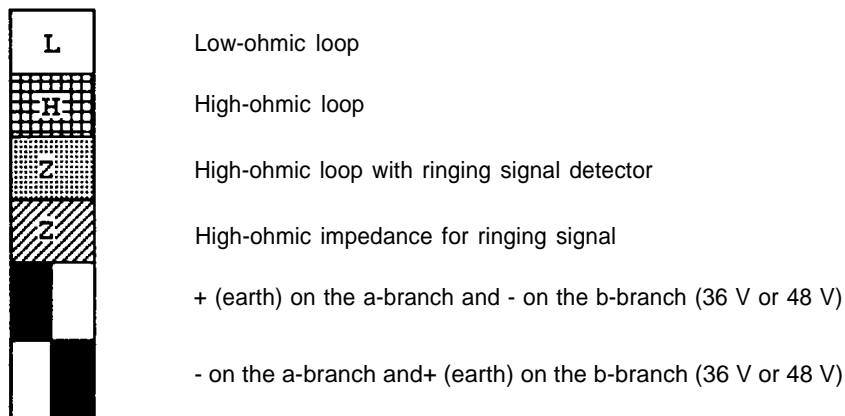
R = 0-50 ohms

L < 600 ohm

H > 22 kohms DC resistance at 36 V, > 30 kohms at 48 V.

Z > 4 kohms impedance at 25 Hz, > 1 Mohms DC resistance

Legend



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