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**ANALOG SUBSCRIBER LINE SIGNALLING
(BASIC CALL)**

TABLE OF CONTENTS

0.	DOCUMENT HISTORY	1
1.	SCOPE.....	3
2.	REFERENCES.....	4
	2.1. Normative references	4
	2.2. Informative references	4
3.	SYMBOLS, DEFINITIONS AND ABBREVIATIONS.....	5
	3.1. Symbols	5
	3.2. Definitions and abbreviations.....	5
4.	GENERAL.....	6
5.	FEEDING	7
	5.1. Feeding of line in quiescent state	7
	5.1.1. Maximum voltage.....	7
	5.1.2. Minimum voltage.....	7
	5.2. Feeding of a line in "call set up" phase or in "speech" phase.....	7
	5.2.1. Maximum DC loop current	7
	5.2.2. Minimum DC loop current	7
	5.3. Feeding of a line in lock-out state	8
	5.4. Isolation resistance	8
6.	LINE SIGNALLING	9
	6.1. Recognition of lift-up and hang-up actions	9
	6.1.1. Resistance levels	9
	6.1.2. Persistency	9
	6.2. Register recall	9
7.	DIALLING	10
	7.1. Pulse Register Signalling.....	10
	7.1.1. Pulses cadence.....	10
	7.1.2. Ratio between an opening duration and a complete pulse duration	10
	7.1.3. Minimum opening.....	10
	7.1.4. Minimum closure.....	10
	7.1.5. Minimum inter-digit pause time.....	10
	7.2. Dual Tone Multi-Frequency (DTMF) Signalling	10
	7.3. Maximum inter-digit time.....	10
	7.4. Time-out on first digit reception	10
8.	RINGING	11
	8.1. Electrical characteristics of the ringing current	11
	8.1.1. Voltage	11
	8.1.2. Internal resistance of the generator (2Z)	12
	8.1.3. Frequency	12
	8.1.4. Wave form.....	12
	8.1.5. Parasitic signals	12
	8.2. Ringing cadences	13
	8.2.1. Normal cadence.....	13
	8.2.2. First special cadence	13
	8.2.3. Second special cadence.....	14
	8.3. Immediate ringing	15
	8.4. Transition from ringing phase to speech phase - Ring trip	15

- 9. INFORMATION TONES 16
- 10. OPTIONAL FUNCTIONS..... 17
 - 10.1. Charge metering 17
 - 10.2. Analog subscriber signalling for specific supplementary services 17

0. DOCUMENT HISTORY

Every update of this document results in a complete new version with new version number and release date.

Version	Date	Main or important changes since previous version
3.0	05 JUL 2000	...
4.0	26 NOV 2001	<ul style="list-style-type: none"> • § 1. Scope <ul style="list-style-type: none"> • Change applicability of software packages. • Sentence related to older types of exchanges has been removed. • § 2. References <ul style="list-style-type: none"> • Distinguish has been made between normative & informative references • ITU-T recommendation G.100 added as normative reference • Referenced version for EG 201 188 "V1.2.1" in stead of "V1.1.1" • § 3.1. Symbols, definitions and abbreviations - Symbols <ul style="list-style-type: none"> • Modification of definition of dBm and dBmO in accordance with ITU-recommendation G.100 • § 5.1. Feeding - ... of line in quiescent state <ul style="list-style-type: none"> • Equivalent scheme included and conditions for the voltage range added • § 5.1.2. Feeding - ... of line in quiescent state - Minimum voltage <ul style="list-style-type: none"> • Conditions for the minimum voltage added • Value changed from 42 V to 38 V • § 5.2.1. Feeding - ... "speech" phase - Maximum DC loop current <ul style="list-style-type: none"> • Clarification of distinguish between line circuits with or without current limitation <ul style="list-style-type: none"> • In case of current limitation, value changed from 40 to 46 mA • § 5.2.2. Feeding - ... "speech" phase - Minimum DC loop current <ul style="list-style-type: none"> • Condition added for the minimum DC current • § 6.1.2. Line signaling - Recognition of ... - Persistency <ul style="list-style-type: none"> • Distinguish between calling and called removed • Clarification of distinguish between Alcatel- and Siemens- exchanges • § 6.2. Line signaling - Register recall <ul style="list-style-type: none"> • Indication of distinguish between Alcatel and Siemens- exchanges • § 7.1.3. Dialing - Pulse register signaling - Minimum opening <ul style="list-style-type: none"> • Change value from 10 to 8 ms • § 7.1.4. Dialing - Pulse register signaling - Minimum closure <ul style="list-style-type: none"> • Change value from 10 to 8 ms • § 7.1.5. Dialing - Pulse register signaling - Minimum inter-digit pause time <ul style="list-style-type: none"> • Change value of minimum inter-digit pause time form 300 to 400 ms • § 7.2. Dialing - Dual Tone Multi-Frequency (DTMF) Signaling <ul style="list-style-type: none"> • Modification of the note related to the relative input level • § 8.1.1. Ringing - Electrical characteristics ... - Voltage <ul style="list-style-type: none"> • Modification of minimum voltage from 59 Vrms to 38 Vrms • Note added to explain the different types of configurations for Siemens exchanges • § 8.3 Immediate ringing <ul style="list-style-type: none"> • Distinguish between Alcatel and Siemens exchanges added

4.1	24 JAN 2003	<ul style="list-style-type: none">• § 1: system versions adapted• § 3.2: abbreviations added• § 5.1, 5.2: comment related to applicable Vs ranges added• § 6.1.2: recognition of hang-up action and register recall signal adapted• § 8.1.1: minimal value for Vs adapted• § 8.2: text adapted, pictures added• § 8.3: text adapted
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1. SCOPE

This document defines the technical characteristics of an analog line interface of the Public Switched Telephone Network (PSTN), delivered by Proximus.

The specifications are applicable for the following digital exchanges and software packages:

Alcatel/S12 - software package Pack 7 / Pack 8

Siemens/EWSD - software package V14B / V16B

2. REFERENCES

Whenever a date of edition is mentioned, the document with this date should be consulted. If no date is present, the latest version of this document should be consulted.

2.1. Normative references

ETSI-specification "ETR206"	Public Switched Telephone Network (PSTN); Multi-frequency signalling system to be used for push-button telephones [CEPT Recommendation T/CS 46-02 E (1985) or ITU Recommendations Q.23/Q.24]
ITU T-recommendation "G.100"	Transmission systems and media; General characteristics of international telephone connections and international telephone circuits; Definitions used in recommendations on general characteristics of international telephone connections and circuits (1993-03)
Proximus UNI-specification "BGC_D_48_0001_30_01_E"	Completion of Calls to Busy Subscriber (CCBS - Ring Back)
Proximus UNI-specification "BGC_D_48_9811_30_09_E"	PSTN: Subscriber Line Protocol for display (and related) services
Proximus UNI-specification "BGC_D_48_9807_30_04_E"	Information tones
Proximus UNI-specification "BGC_D_48_9811_30_08_E"	16 kHz Charge Event Notification
Proximus UNI-specification "BGC_D_48_9807_20_01_E"	Transmission and interface characteristics of PSTN service

2.2. Informative references

ETSI-specification "EG 201 188 V1.2.1"	Public Switched Network (PSTN); Network Termination Point (NTP) analog interface; Specification of physical and electrical characteristics at a 2-wire analog presented NTP for short to medium length loop applications (2000-01)
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3. SYMBOLS, DEFINITIONS AND ABBREVIATIONS

3.1. Symbols

For the purpose of the present document, the following symbols apply:

dBm	Absolute power level with respect to 1 milli-watt, expressed in decibels; (ref. ITU-T G.100)
dBm0	At the reference frequency (1020 Hz), L dBm0 represents an absolute power level of L dBm measured at the transmission reference point (0 dBr point), and a level of $L + x$ dBm measured at a point having a relative level of x dBr. (ref. ITU-T G.100)
dBr	The relative level of a signal in a transmission path referred to the level at a reference point on the path

3.2. Definitions and abbreviations

For the purpose of the present document, the following symbols apply:

3PTY	Three Party Conference
BCG	Business Communication Group
CCBS	Call Completion to Busy Subscriber
CLIP	Calling Line Identification Presentation
DC	Direct Current
DTMF	Dual Tone Multi-Frequency
EWSD	Digital Public Switch (Siemens)
FSK	Frequency Shift Keying
MD	Main Distribution Frame; Physical point at the boundary of the PSTN (local loop transmission NOT included).
F	Network Termination Point; Physical point at the boundary of the PSTN (local loop transmission included) intended to accept the connection of a TE
NTP	Public Switched Telephone Network
PSTN	Digital Public Switch (Alcatel)
S12	Terminal Equipment
TE	User Network Interface
UNI	

4. GENERAL

The general structure of this document is mainly based on the ETSI-specification "EG 201 188".

All characteristics described in this UNI-specification are applicable at the point of the Main Distribution Frame (MDF). The characteristics at the Network Termination Point (NTP) can be determined by taking into account the transmission characteristics of the local loop (Ref. Proximus UNI-specification "BGC_D_48_9807_20_01_E").

5. FEEDING

5.1. Feeding of line in quiescent state

The exchange delivers a DC-voltage between the A- and B-wires, at an impedance value $2 \cdot R_b$, as indicated in the figure below:

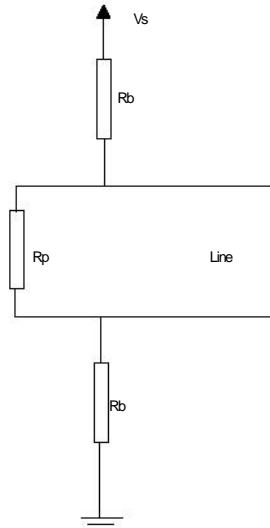


Figure 1

5.1.1. Maximum voltage

The maximum open circuit DC-voltage between the A- and B-wires is 72 V.

5.1.2. Minimum voltage

A minimum DC-voltage between the A- and B-wires of 38 V is guaranteed if at least a resistor of 1 MOhm is connected between the A- and B-wires (V_s is supposed to be minimal -40,5 V).

5.2. Feeding of a line in "call set up" phase or in "speech" phase

5.2.1. Maximum DC loop current

Depending on the type of line card a current limitation applies or not.

Current limitation means that the value of R_b (see figure 1) is modified such that the current value remains constant, independent from the resistance between the A- and B-wire. For the line cards where current limitation is applied, the maximum DC current will be limited to 46 mA.

When current limitation is not applied, the maximum line current is completely determined by the value of R_b (see figure 1) and the loop value. It shall in no circumstances exceed 150 mA when the A- and B- wires are short-circuited, given V_s is maximal -57 V.

5.2.2. Minimum DC loop current

A minimum DC current of 18 mA is guaranteed if the resistance between the A- and B-wire is lower than 1,6 kOhm and V_s is minimal -40,5 V.

5.3. Feeding of a line in lock-out state

A line enters in lock-out state when the subscriber delays to dial, or to hang up after the call (calling or called). When a line goes to lock-out state, the exchange sends on the line the busy tone during a limited duration. After this tone, the feeding current of the line is permanently reduced to a value lower than 13 mA.

5.4. Isolation resistance

The exchange shall properly operate in presence of isolation resistances greater than 75 kOhm between the A- and B- wires and greater than 50 kOhm between ground and the A-/B-wire.

6. LINE SIGNALLING

6.1. Recognition of lift-up and hang-up actions

6.1.1. Resistance levels

The loop-state (open or closed) is determined by the instant state of the loop resistance. The exchange shall detect a closure when the loop resistance becomes lower than 2 kOhm. An opening shall be detected when the loop resistance becomes upper then 15 kOhm.

6.1.2. Persistency

Lift-up action

- shall not be detected if the closure duration is less than 20 ms; - shall be detected if the closure duration is greater than 200 ms.

Hang-up action:

- shall not be detected if the opening duration is less than 250 ms; - shall be detected if the opening duration is greater than 370 ms.

6.2. Register recall

During a call, the subscriber (calling or called) may be able to initiate new calls. Depending on the used telephone set, either the "R" key is pressed or the hook-switch is flashed, which causes a "register recall" signal on the line. The states in the call where register recall may be accepted are determined by the invoked supplementary service, e.g. Call Waiting, 3PTY call, CCBS (ref. Proximus UNI-specification "BGC_D_48_0001_30_01_E").

The exchange shall recognise as "register recall" signal a loop opening with duration between 50 and 250 ms (CEPT nominal value: 90 ms) and occurring during speech phase or ringing phase. The exchange shall in no circumstances recognise an opening lower than 20 ms.

7. DIALLING

7.1. Pulse Register Signalling

7.1.1. Pulses cadence
8 to 12 pulses per second

7.1.2. Ratio between an opening duration and a complete pulse duration
Nominal: 66 %
Tolerance: from 63 to 70 %.

7.1.3. Minimum opening

A loop opening shall in any case be recognised by the exchange when it persists during more than 53 ms. A loop opening shorter than 8 ms shall in no circumstances be recognised.

7.1.4. Minimum closure

A loop closure shall in any case be recognised by the exchange when it persists during more than 25 ms. A loop closure shorter than 8 ms shall in no circumstances be recognised.

7.1.5. Minimum inter-digit pause time

A loop closure greater than 400 ms shall in any case be considered as an interval between 2 consecutive digits.

7.2. Dual Tone Multi-Frequency (DTMF) Signalling

The DTMF receiver in the digital public exchange shall fulfil the CEPT Recommendation T/CS 46-02 (1981, rev. 1985) "Multi-Frequency signalling system to be used for push-button telephones" (Ref. ETSI-specification "ETR 206"):

- Section 1: "Signalling system principles and coding"
- Section 4: "The receiver for digital exchanges".

The sensitivity range for the receiver shall be within the range -4 dBm0 to -28 dBm0 (ref. T/CS 46-02, section 4).

Note: the relative input level on the exchange (MDF point) is 0 dBr ... -3 dBr.

7.3. Maximum inter-digit time

The maximum inter-digit time shall be at least 6 s (digits and other codes). But in most cases the 12 s inter-digit time applies. These values apply to pulse register signalling and DTMF signalling.

7.4. Time-out on first digit reception

From the sending of the dial tone, the user has 30 seconds to send the first digit. This value applies to pulse register signalling and DTMF signalling.

8. RINGING

8.1. Electrical characteristics of the ringing current

8.1.1. Voltage

Voltage: 38 to 90 Vrms superimposed on a DC voltage (at the output of the ringing generator).

Note for the Siemens-switches

For the Siemens-switches two different types of configurations exist to apply the ringing current:

- *Common configuration: in this configuration one or several lines can use a common ringing generator.*
- *Individual configuration: in this configuration a ringing generator is provided per line.*

Common configuration

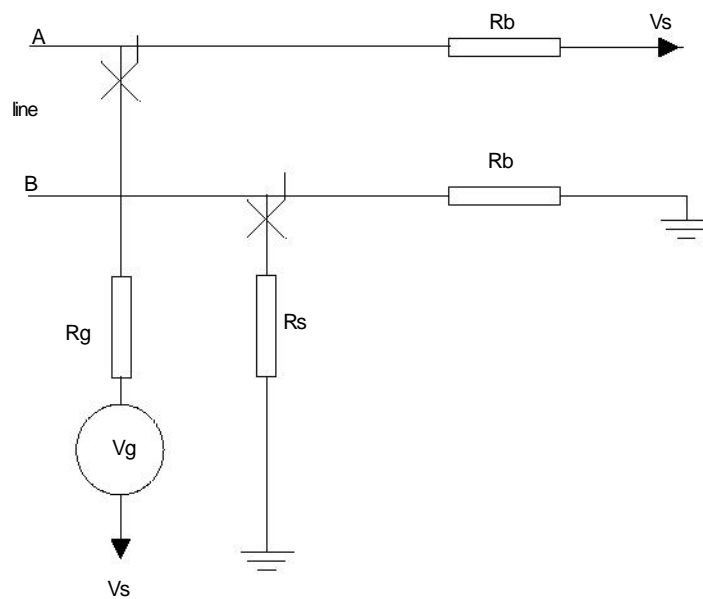


Figure 2

Resistance R_s is located on the line card.

During the OFF-period of the ringing current the line is connected as in speech phase. During the ON-period the line is connected to the ringing generator. The ringing voltage V_G is superimposed on the battery voltage V_s . The relevant values of this configuration are:

R_g	$\leq 1000 \text{ Ohm}$
V	$38 \text{ Vrms} \dots 90 \text{ Vrms}$
G	$350 \pm 10\% \text{ Ohm}$
R_s	$-40,5 \text{ V} \dots -57 \text{ V}$
V_s	$200 \text{ Ohm} \pm 5\%$
R_b	

The min voltage (38 Vrms) of the ringing generator takes already into account that 3 lines, each with 3 TE's in parallel are simultaneously in the ringing phase.

Individual configuration

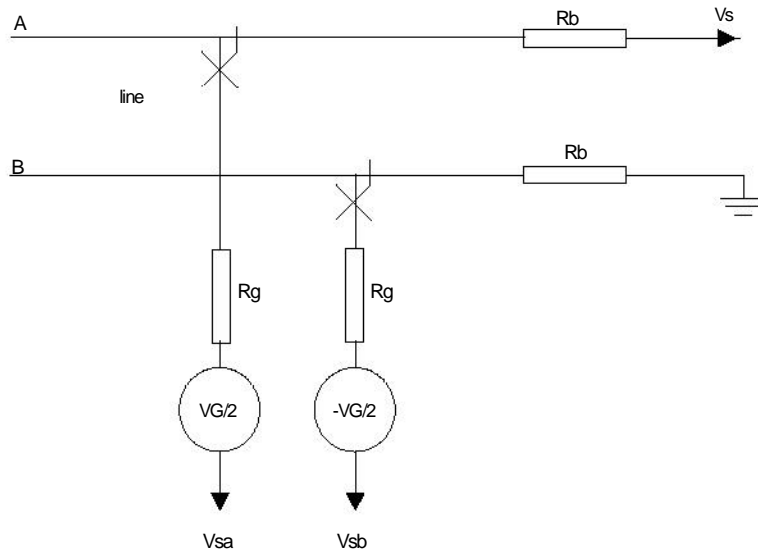


Figure 3

During OFF-period of the ringing current the line is connected as during speech phase. This means that the current limitation can be active. During the ON-period of the ringing current the line is connected to the ringing generator. The ringing generator produces on A- and B-wire a ringing voltage, which are 180° out of phase. Each part of the ringing voltage is superimposed on a DC voltage, respectively V_{sa} and V_{sb} . The relevant values of this configuration are:

R_g	110+/-10% Ohm
$VG/2$	31,5+/-10%Veff
Note: ringing voltage VG between A and B	63+/- 10%Veff
V_{sa} V_{sb}	-19+/-10%V
V_s R_b	+3+/-10%V
	-42,5V....-58V
	135 Ohm....250 Ohm

8.1.2. Internal resistance of the generator (2Z)

Maximum 1 kOhm

8.1.3. Frequency

Nominal: 25 Hz

Tolerance: ± 5%

8.1.4. Wave form

The waveform is a sine.

8.1.5. Parasitic signals

The total power of the parasitic signals (harmonics included) created by the generator shall be 26 dB lower than the power of the 25 Hz wave.

8.2. Ringing cadences

The network may provide different ringing cadences:

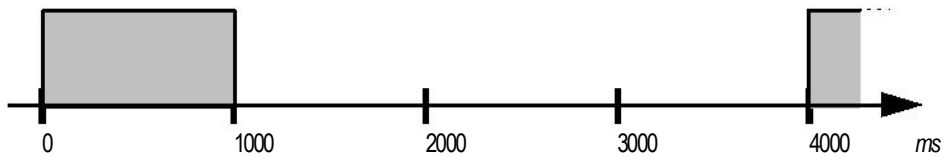
- Normal ringing cadence (system independent): commonly applied for all basic call setups
- Special ringing cadences (system specific): used in some specific situations, such as BCG calls, forwarded calls, CCBS recall, selective ringing.

Refer to next paragraphs for the specific characteristics.

8.2.1. Normal cadence

Sending: 1000 ± 100 ms

Pause: 3000 ± 100 ms

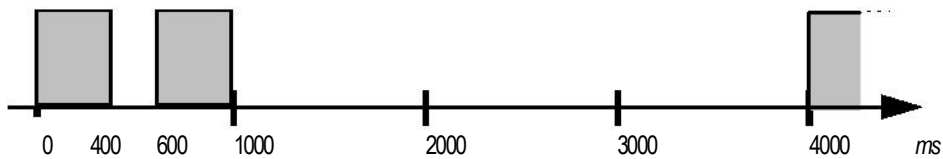


8.2.2. First special cadence

Siemens exchanges:

Sending: 1000 ± 100 ms, i.e. 400 ms signal, 200 ms pause, 400 ms signal

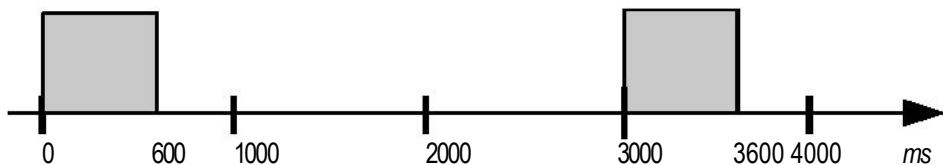
Pause: 3000 ± 100 ms



Alcatel exchanges:

Sending: 600 ± 100 ms

Pause: 2400 ± 100 ms

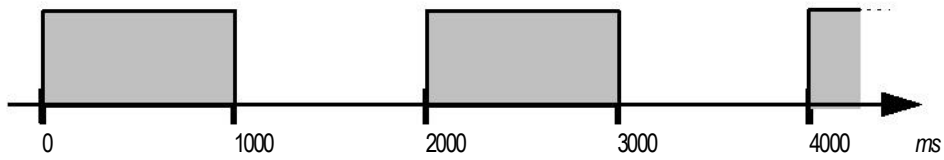


8.2.3. Second special cadence

Siemens exchanges:

Sending: 1000 ± 100 ms

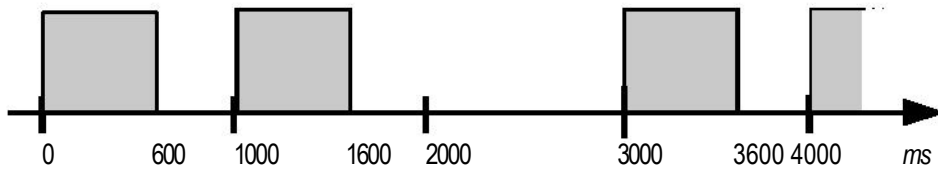
Pause: 1000 ± 100 ms



Alcatel exchanges:

Sending: 600 ± 100 ms

Pause: alternately 400 ± 100 ms, $1400 \text{ ms} \pm 100$ ms



8.3. Immediate ringing

Siemens exchanges

Range: 250 - 600 ms \pm 50 ms

For calls with FSK data transmission, e.g. when Analog CLIP service is active, the application and the timing of immediate ringing can be modified. (Ref. Proximus UNI-specification "BGC_D_48_9811_30_09_E").

Alcatel exchanges

Immediate ringing (350 ms \pm 100 ms) is only used for calls with FSK data transmission, e.g. when Analog CLIP service is active (Ref. Proximus UNI-specification "BGC_D_48_9811_30_09_E").

8.4. Transition from ringing phase to speech phase - Ring trip

When the lift-up action of the called party has been detected as defined in chapter 6.1, the sending of the ringing current shall be stopped within 150 ms. The feeding current shall be applied at the moment the ringing current is removed.

9. INFORMATION TONES

The frequency, cadence and level of the different information tones provided by the Proximus network are described in Proximus UNI-specification "BGC_D_48_9807_30_04_E".

10. OPTIONAL FUNCTIONS

10.1. Charge metering

The exchange shall support metering pulses on analog subscriber lines. Information on this topic can be found in Proximus UNI-specification "BGC_D_48_9811_30_08_E".

10.2. Analog subscriber signalling for specific supplementary services

The transmission of FSK and DTMF signals is required for the application of specific services with on-hook or off-hook data transmission (Analog CLIP, Visual Message Waiting Indication).

The electrical characteristics of these signals are specified in Proximus UNI-specification "BGC_D_48_9811_30_09_E".