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*Belgacom / BELCOMLAB
Rue Carlistraat 2
B-1140 Evere
Belgium*

tel: +32 2 244.58.88

fax: +32 2 244.59.99

E-mail: belcomlab@belgacom.be

Structured 2048 kbit/s digital leased lines

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1. Introduction

This document contains the technical specifications for the BELGACOM structured 2 Mbit/s leased lines service. These leased line specifications are based on a generic model as shown in annex 1. The central part of the model is the "connection". A connection includes a series of transmission channels or telecommunication circuits. It's set up to provide for the point-to-point transfer of signals between the terminal equipments of the customer.

The connection is presented to the user via an "interface presentation" at the Network Termination Point (NTP). The NTP comprises all physical connections and their technical access specifications that form part of the BELGACOM transmission network. In some cases the NTP is presented by means of an electrical equipment referred to as the Network Termination Unit (NTU). For the description of the structured 2 Mbit/s leased line service, the NTU is considered as being contained within the connection.

The structured 2 Mbit/s leased line provides a bi-directional point-to-point digital circuit for which no structuring of the data is provided by the BELGACOM network. However, the customer has to structure his 2048 kbit/s data signal in accordance with ITU-T Recommendation G.704. By doing so, Belgacom is able to offer a better service to her customers.

The network interface presentation offered to a structured 2 Mbit/s leased line customer is based on the G703-interface; 120 Ohms is the standard version, but as an option the 75 Ohms-version can still be obtained.

2. Connection characteristics

2.1. Transfer rate

2.1.1. Leased line timing

By default, the structured 2 Mbit/s digital leased line carries the timing of the customer's terminal within the range 2048 kbit/s \pm 50 ppm.

As an option, the structured 2 Mbit/s digital leased line can also be designed in such a way that it provides timing that is synchronous to the network timing.

2.1.2. Information transfer rate

The structured 2 Mbit/s digital leased line connection is capable of transferring an information rate of 2048 kbit/s \pm 50 ppm. However, this information rate of 2048 kbit/s has to be structured by the user in accordance with ITU-T Recommendation G.704.

2.2. Structure

The connection shall not be structured by BELGACOM; the full bit rate of 2048 kbit/s shall be available to the user. However, this information rate of 2048 kbit/s has to be structured by the user in accordance with ITU-T Recommendation G.704.

Note: if the customer's terminal has been approved to the specifications mentioned in paragraph 4, the structuring of the user's 2048 kbit/s data signal will automatically be executed as required.

2.3. Establishment of communication

Establishment or release of the connection shall not require any protocol exchange or other intervention at the NTP by the customer.

2.4. Symmetry

The connection shall be symmetrical, i.e. each direction of transmission shall have the same nominal characteristics, although the actual values shall be independent.

2.5. Connection configuration

The connection configuration is point-to-point.

2.6. Network performance

2.6.1. Transmission delay

The one way end-to-end delay shall be less than $(10 + 0.01G)$ ms, where G is the geographical distance in kilometers. *(In the exceptional case that a satellite transmission has to be involved for the realization of the leased line, the one way end-to-end delay shall be less than 350 ms).*

2.6.2. Jitter

2.6.2.1. Jitter tolerance at the network input port

The structured 2 Mbit/s leased line shall function as specified with input jitter being the sum of two band limited components as defined in table 2.7.2.1-1. This requirement is taken from ETS 300 247.

filters for generation of jitter spectrum (first order)		bandpass filter for measurement of input jitter	input jitter measured by bandpass filter
lower cut-off (high pass)	upper cut-off (low pass)	lower cut-off first order	UI peak-to-peak (maximum)
only low pass	4 Hz	4 Hz to 100 kHz	1,1 UI
40 Hz	100 kHz	40 Hz to 100 kHz	0,11 UI

Table 2.7.2.1-1

2.6.2.2. Maximum jitter at the network output port

The maximum jitter at the output port from the network (i.e. at the NTP towards the customer's terminal equipment) shall not exceed the network limits for the maximum output jitter as specified in table 2.7.2.2-1, when measured with first order linear filters with the defined cut-off frequencies. This requirement is taken from ITU-T Recommendation G.823.

measurement filter bandwidth		output jitter
lower cut-off (high pass)	upper cut-off (low pass)	UI peak-to-peak (maximum)
20 Hz	100 kHz	1,5 UI
18 kHz	100 kHz	0,2 UI

Table 2.7.2.2-1

2.6.3. Slip

Slip occurs at a point between two parts of a communication link that are operating at similar but not identical bit rates (plesiochronously). The structured 2 Mbit/s digital leased lines, offered by BELGACOM, comply with ITU-T Recommendation G.822.

2.6.4. Error parameters

2.6.4.1. Performance level

The error performance level for the structured 2 Mbit/s leased lines are at least conform to ITU-T Recommendation G.826.

3. Network interface presentation

3.1. Physical characteristics

The physical connection arrangements for the *standard* NTP of a structured 2 Mbit/s digital leased line (120 Ohms version of the G.703-interface) is provided by means of a RJ45 socket and with contact assignments as specified in table 3.1-1.

contact	network interface
1 & 2	transmit pair
3	shield reference point
4 & 5	receive pair
6	shield reference point
7	unused
8	unused

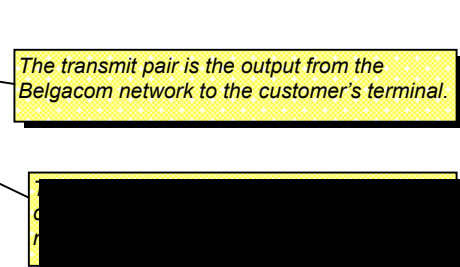


table 3.1-1

However, with the agreement of the customer, an alternative means of connection may be provided as an *option*:

- by means of a hardwired connection (120 Ohms version of the G.703-interface), by using insulation displacement connectors;
- by means of two 1,6/5,6 coax-connectors (75 Ohms-version of the G.703-interface), by using one coaxial pair in each transmission direction.

3.2. Electrical characteristics

The electrical characteristics of the *standard* NTP of a structured 2 Mbit/s digital leased line are in accordance with ITU-T Recommendation G.703 (120 Ohms).

As an *option*, the 75 Ohms-version of the G.703-interface can still be offered (as specified in ITU-T Recommendation G.703).

3.3. Safety

Regarding the safety, the NTP complies with EN 60950 (IEC 950).

3.4. ElectroMagnetic Compatibility (EMC)

The network interface presentation fulfils to the EMC requirements which are imposed under the EMC Directive 89/336/EEC.

4. Terminal equipment

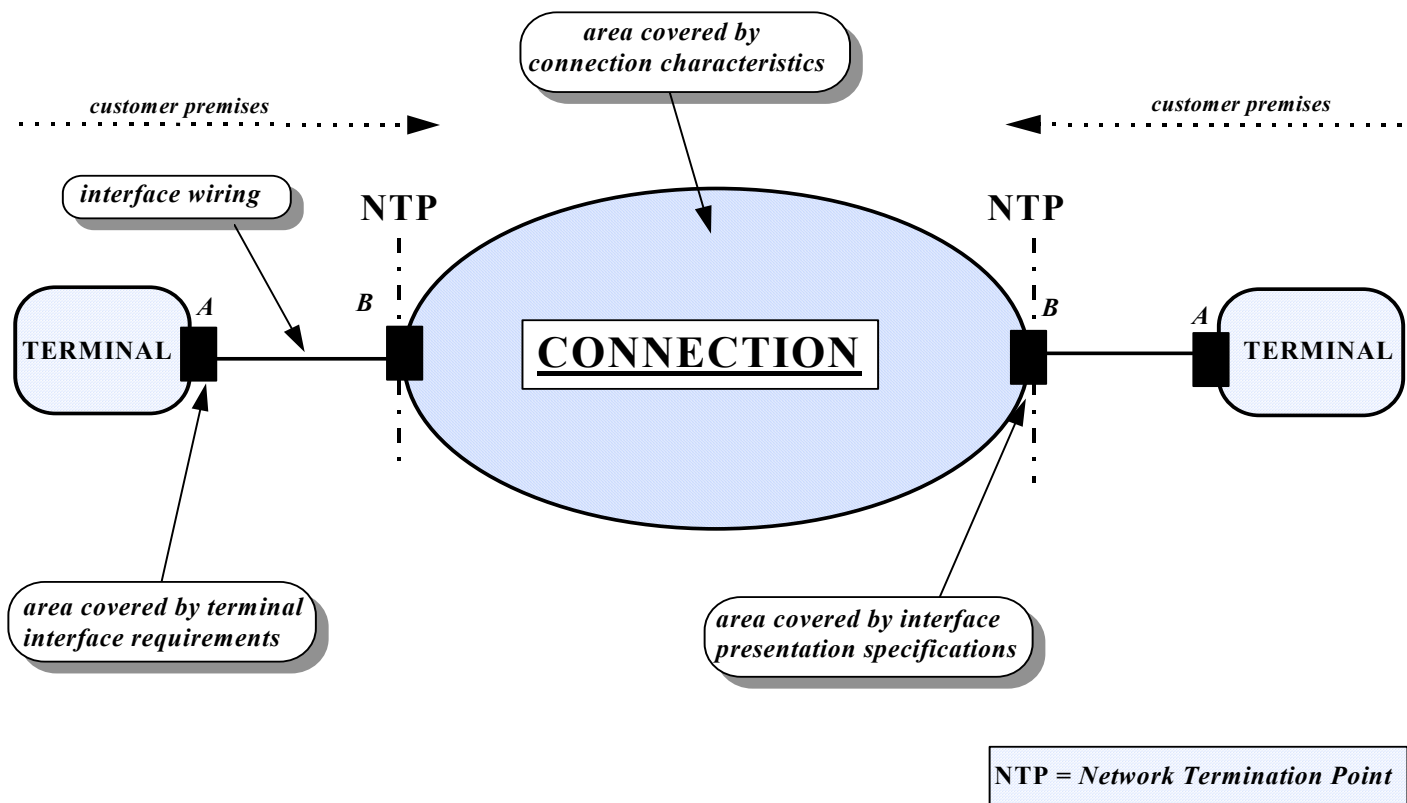
For connection to the NTP of a structured 2 Mbit/s digital leased line, the terminal of the customer has to be approved to BE/SP-103 or CTR13.

Please note that it is very helpful for Belgacom if the CRC-4 procedure, which is mentioned as an option in the BE/SP-103, has been implemented correctly in the customer's terminal. By doing so, Belgacom is able to offer a better service to her customer.

At the NTP the customer shall provide Belgacom with a grounding connection point. This grounding connection point should be easily accessible, located near the NTP, and shall enable Belgacom to attach a 4 mm² (minimum section) ground cable with lug, bolt and washer. The characteristics of the grounding connection point provided by the customer must be conform to article 69 of the actual RGIE¹; this grounding point shall have a resistance value not exceeding 30 Ohms.

¹ RGIE: Règlement Général des Installations Electriques

Generic model for leased lines specifications



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ANNEX 2

Definitions, symbols and abbreviations.

A) Definitions

For the purpose of these technical specifications, the following definitions apply:

Background block error ratio

The ratio of errored blocks over all blocks within a specified measuring period, where neither are counted during unavailability periods nor during severely errored seconds.

Errored block

A block with one or more bit errors.

Errored second

A second in available time with one or more bit errors.

Leased lines

The telecommunications facilities provided by the BELGACOM public telecommunications network that provide defined transmission characteristics between network termination points (NTP) and that do not include switching functions that the user can control.

Network Termination Point (NTP)

All physical connections which form part of the BELGACOM telecommunications network and which are necessary for access to and efficient communication through the BELGACOM network.

Open Network Provision (ONP)

Open Network Provision (ONP) is a regulatory concept introduced by the Commission of the European Communities. It is intended to ensure "harmonized conditions for open and efficient access to and use of public telecommunications networks and, where applicable, public telecommunications services." In particular, ONP specifies a set of harmonized conditions which govern the technical interfaces (including the definitions of network termination points), conditions of use, and tariff principles of the network or service to which they are applied. The general principles of ONP are contained in the Council Directive 90/387/EEC, the "ONP Framework Directive". These principles are applied to a number of areas of telecommunications, including leased lines. In addition, the leased lines are specifically covered by the Directive 92/44/EEC, the "ONP leased line Directive".

Severely errored second

A second in available time where at least 0,1% of the bits are errored.

Slip

One or more extra or missing consecutive unit intervals in the bit stream. Slip occurs at a point between two pieces of the communication link that are operating at similar but not identical bit rates (plesiochronously). If a piece of equipment is transmitting data at a rate X towards another piece of equipment which is operating at a rate Y, then depending on whether X is greater or less than Y, there will be either a loss of, or a gain of data at the received piece of equipment. The addition or loss of bits in a bit stream is referred to as slip.

B) Symbols and abbreviations

For the purpose of these technical specifications, the following abbreviations apply:

<u>CRC-4:</u>	<i>Cyclic Redundancy Check-4 bit.</i>
<u>CTR:</u>	<i>Common Technical Regulations.</i>
<u>DCE:</u>	<i>Data Circuit-terminating Equipment.</i>
<u>DTE:</u>	<i>Data Terminal Equipment.</i>
<u>ES:</u>	<i>Errored Seconds.</i>
<u>ITU:</u>	<i>International Telecommunication Union.</i>
<u>NTP:</u>	<i>Network Termination Point.</i>
<u>ONP:</u>	<i>Open Network Provision.</i>
<u>ppm:</u>	<i>Parts per million.</i>
<u>RGIE:</u>	<i>Règlement Général des Installations Electriques.</i>
<u>SES:</u>	<i>Severely Errored Seconds.</i>
<u>UI:</u>	<i>Unit Interval.</i>