GENERAL DESCRIPTION

ALCATEL 1000 E10

THE CSN SUBSCRIBER ACCESS UNIT

This document is a general description of the CSN, the subscriber access unit of the Alcatel 1000 E10 MM system.

It broadly shows the general features for the subscriber access unit, e.g.: general principles, capacities, supported functions, interfaces, architecture, operation and maintenance, technology and environment.

The CSN is permanently upgraded so as to incorporate the latest improvements of the technology and, therefore, this document cannot be used as a technical specification for a customer contract.

This document provides general information, about the latest generation of the CSN family.
TABLE OF CONTENTS

1. INTRODUCTION .....................................................................................................3
   1.1. NETWORK OPTIMIZATION ...........................................................................3
   1.2. FLEXIBILITY .................................................................................................5
   1.3. SERVICES OFFERED TO THE SUBSCRIBERS ..............................................5
   1.4. INTERFACES ................................................................................................5

2. ARCHITECTURE ......................................................................................................7
   2.1. GENERAL ......................................................................................................7
   2.2. SUBSCRIBER LINE CARDS ...........................................................................8
   2.3. DIGITAL CONCENTRATOR CN ..................................................................10
   2.4. CONTROL UNIT (UCN) .............................................................................11

3. IMPLEMENTATION OF THE DIFFERENT PRODUCTS ............................................12
   3.1. THE CSN PRODUCTS ................................................................................12
   3.2. THE CNE PRODUCTS ................................................................................16
   3.3. THE CNE 64 PRODUCTS ..........................................................................22

4. CAPACITY AND PERFORMANCE ..........................................................................24
   4.1. CAPACITY ....................................................................................................24
   4.2. PERFORMANCES ........................................................................................25
   4.3. COMPATIBILITY ..........................................................................................25

5. OPERATION AND MAINTENANCE ......................................................................26
   5.1. DEFENCE ......................................................................................................26
   5.2. MAINTENANCE .............................................................................................26

6. EQUIPMENT PRACTICE .......................................................................................28
   6.1. SUBRACKS AND BACKPLANES ..................................................................28
   6.2. RACKS .........................................................................................................29

7. CLIMATIC ENVIRONMENTAL CONDITIONS .........................................................30
   7.1. OPERATING CONDITIONS .........................................................................30
   7.2. ELECTROMAGNETIC ENVIRONMENTAL CONDITIONS ............................30

8. GLOSSARY ............................................................................................................31
1. INTRODUCTION

Most operators now have multiple access elements that are specialised by service - telephone subscriber concentrators, leased lines multiplexers, ADSL line terminals, cable or optical fibre lines to users. These various accesses are now generally connected to an SDH loop that centralises and secures the transmission of the access to the telecommunication host center. This situation has created a need to federate all accesses on the same Multiservice Access Node.

The CSN makes all these new features possible. This is “change within continuity” in the best sense of the term.

![Diagram](image)

Figure 1 – The CSN in an NGN network

1.1. NETWORK OPTIMIZATION

The CSN is a modular equipment which can be co-located with the switch or remotely in either buildings or containers. This means substantial savings for operators since they can concentrate the traffic on a small number of PCM lines.
The CSN has a very simple structure: a digital control and connection unit (UCN) and up to 20 concentrators CN, each concentrator fitted with 16 slots.

The CN itself can be either co-located to a CSN or located remotely. A co-located CN is called a CNL and a remote CN is called a CNE.

These 2 levels of remoteness give an extreme versatility to the network operator for managing the subscriber geographic configuration. This allows the location of a subscriber access node in the near vicinity of subscribers.

In urban environments, subscribers are generally close to the exchange and heavy line usage is the norm. CSNs are installed in the parent exchange switchroom, CNEs are distributed in street cabinets and located in telecom or commercial buildings. Interconnection to the host exchange is usually performed via SDH rings.

In suburban areas or medium-sized towns, populations are less dense and the exchange configuration combines both local and remote CSNs. Both local and remote digital concentrators are used.

In outlying areas, subscribers are dispersed in and around villages. A single local or remote CSN serves up to 20 remote digital concentrator (CNE) sites.

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**Figure 2 – Example of network topology**
1.2. FLEXIBILITY

A large range of subscriber line interfaces is one of the keys features of the CSN: Its 16 universal slots per CN accept all types of connection boards for POTS, ISDN BRA and PRA, Leased Lines, V5.1, ADSL, or services boards such tones, voice prompts, line testing equipment or frame concentration. Simple conversion from analogue services to ISDN or ADSL services is therefore possible at marginal cost: ISDN or ADSL lines are connected by replacing or adding subscriber line cards in the CSN.

Cost-effective use of local networks: pair gain systems are not required since both local and remote lines can be connected to CNs in the same way and take advantage of the same facilities: The CSN offers all connected users, whatever their locations, equal access to POTS, ISDN and ADSL services.

The network operator benefits from the same subscriber administration and management for all subscribers, irrespective of where they are located. In addition, the equipment, at CSN level as well as CNE level, can be installed in Telecom buildings, conventional buildings, in containers or in roadside cabinets.

1.3. SERVICES OFFERED TO THE SUBSCRIBERS

- Conventional telephone services (POTS)
- ISDN services, including:
  - bearer services: speech, 3.1 kHz, 7 kHz, 64 Kbit/s unrestricted;
  - teleservices (telephone, fax, teletex, videotex) and remote surveillance;
- Analogue and ISDN subscriber supplementary services;
- Frame service processing for data network access.
- Broadband services including high speed Internet access

1.4. INTERFACES

- Subscriber interfaces
  - analogue (Rotary dial & DTMF / resistive and complex impedance)
  - ISDN Basic Rate Access (2 wires with echo cancellation – 2B1Q encoding)
  - ISDN Primary Rate access (75 and 120 Ohms)
  - 64 Kbit/s codirectional and analogue 2-4 wires leased lines
  - V5.1 interface
  - ADSL (full and lite ADSL)
- Network interfaces
  - 2 Mbit/s (G703 and HDSL for NB services,IMA for BB services)
    - nx2 Mbit/s on optical fiber
• STM 1/4
2. ARCHITECTURE

2.1. GENERAL

The basic characteristics of the CSN are the following:
- A very simple structure, with a digital control unit (UCN) and up to 20 digital concentrators (CN)
- 2 levels of remoting: local/remote CSN, local/remote CN (CNL/CNE)
- Complete plug to plug compatibility between different types of subscriber boards, thanks to the 16 universal slots at CN level
- Software downloading up to subscriber board level
- Hardware structure: 1 to 3 racks, 8 CNL per rack.

![Figure 3 - CSN hardware architecture](image-url)
2.2. SUBSCRIBER LINE CARDS

2.2.1. ANALOGUE SUBSCRIBER LINE CARDS

2.2.1.1. BASIC FEATURE SUBSCRIBER LINE CARD

Each analogue line is connected to a line equipment incorporating a Subscriber line interface circuit (SLIC) and an LSI encoder and filter (COFIDEC) handling analogue/digital conversion in compliance with ITU-T Recommendation G.711, Q.551 and Q.552 (A-law encoding).

In addition, if an individual line equipment fails, the line can be switched to a backup line equipment shared by a number of lines in the CN. This eliminates the need for emergency repair work.

Line density is 16 lines per card.

2.2.1.2. FULL FEATURED SUBSCRIBER LINE CARD

In addition to the basic feature subscriber line card, a full feature subscriber line provides pulse metering and battery reversal capabilities.

Line density is 16 lines per card.

2.2.1.3. DATA LINK LINE CARD

The analogue data link (2 or 4 wires) subscriber line card allows access for four 2/4 wires leased lines.

2.2.2. ISDN SUBSCRIBER LINE CARDS

2.2.2.1. BASIC ACCESS ISDN SUBSCRIBER LINE CARDS

The 2B+D ISDN line card (echo cancellation, 2B1Q encoding) contains up to eight line equipment, controlled by a common logic.

All subscriber line equipment functions comply with international specifications for basic access (Recommendations ITU-T I.412, I.430, I.441, I.451 and ETSI ETR.80).

Optionally, a concentrating function for Internet calls provides for identification, at the card level, and concentration, in the digital concentrator, of the time slots used by Internet calls. It allows either to connect the time slots to an external equipment or to process them in a statistic multiplexing way on specific channels, thus permitting to improve the CSN traffic flow.

An individual line equipment failure can be overcome by switching the line to a backup line equipment shared by a number of line equipment in the digital concentrator. This eliminates the need for emergency maintenance work.
2.2.2.2. **Primary Rate Access ISDN Subscriber Line Cards**

The CSN supports Primary Rate Access ISDN subscriber lines (PRA, 30B+D), used to connect ISDN PABX.


Each card provides a single 30B+D line equipment with full access to PCM links with the parent exchange. A CN digital concentrator can house any number of 30B+D line cards. Capacity is limited only by the amount of traffic offered on access PCM links to the core exchange.

2.2.2.3. **Other Types of Digital Subscriber Line Cards**

In order to meet all operator needs, other types of digital subscriber line cards, are available:

- V5.1 access card: it allows to connect an Access Network with V5.1 interface. Each V5.1 non concentrating interface is made of one 2 Mbit/s PCM. 28 to 30 TS for speech or data are used depending on the number of used signalling TS;
- 64 Kbit/s data link card: this card supports 64 Kbit/s codirectional data links (ITU-T Recommendation G.703). It allows to connect up to 4 leased lines;
- Packet unit card: it offers to ISDN subscribers to use their access D channel for receiving or sending low rate data using a frame structure.

Any type of these cards can be plugged in any line card location in the digital concentrator.

2.2.3. **ADSL Subscriber Line Cards**

<table>
<thead>
<tr>
<th>ATM/AAL block</th>
<th>BB bus</th>
</tr>
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<tbody>
<tr>
<td>ADSL-LT</td>
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<td></td>
<td></td>
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<tr>
<td>POTS-LT</td>
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</table>

**Figure 4 – ADSL line card functional diagram**

The ADSL line card supports 4 lines equipment and a common control logic.

- Each port handles both analogue POTS and broadband data traffic

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**THE CSN Subscriber Access Unit**

Alcatel – Fixed Networks Division - FND

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Depending on the length and the quality of the line, the BB data bit-rate supported are up to 640 Kbit/s from ANT to CSN, and up to 8 Mbit/s from CSN to ANT.

The ADSL line card (TU ADSL) separates voice traffic from broadband data traffic before transmission of each flow on the appropriate bus in the CN back panel.

2.3. DIGITAL CONCENTRATOR CN

2.3.1. NARROW BAND ASPECTS

With its universal card slots, the CN houses 16 Terminal Units. All the different types of boards (POTS, ISDN BA or PRA, ADSL, leased lines or services units) are completely plug-to-plug compatible. It also incorporates positioning and test circuits, the PCM interface and timing signal circuits for Narrow band service.

A local (CNL) or remote (CNE) digital concentrator offers the same functions to all lines connected. In hardware terms, it is only the UCN interface circuits which differ.

The channel signals from the line cards are concentrated on 1 to 4 PCM links connecting the CN to the digital control unit (UCN). All subscriber lines have full access to all PCM time slots. This reduced drastically the consequences of traffic unbalance, and there are no connection constraints and any line equipment on the card can be used to connect any line. Since there are up to 4 PCM links, the blocking probability is negligible.

2.3.2. BROADBAND ASPECTS

For the broadband traffic, the same principle applies: all the ADSL subscribers in the CNL have access to the 155 Mbit/s bus running in the backpanel.

Within the CNL, the BB bus is terminated in an extender board. A 155 Mbit/s "Daisy Chain" (DC) of extender boards between the CNLs enables multiplexing of ADSL lines from various CNLs. In one of the CNLs, a transport interface board terminates the Daisy Chain and accesses the external transport network.

Depending on the BB traffic to be transported, 2 types of transport are used:

- a STM1 optical link (155 Mbit/s)
- 1 to n IMA PCM links (ATM on 2 Mbit/s)

Within the CNE, the BB traffic is also concentrated on the BB bus towards the transport interface board (STM1 or IMA). In case of CNE 512, a Daisy Chain is set up between the 2 CNEs.

These links terminate, in a CNL within the parent CSN, on STM1 or IMA interface boards (4 STM1 or 8 IMA PCM respectively). This allows the BB data flow from various CNE and/or other CSNs to be aggregated to the flow from the CNLs within this parent CSN on the same link towards the ATM backbone.
2.4. CONTROL UNIT (UCN)

The main functions of the CSN’s digital control unit UCN are:
- Call pre-processing for incoming and outgoing calls
- Path connection toward the parent exchange;
- Set up of stand alone local calls
- CSN O peration and M aintenance

The UCN mainly comprises two modules UCX operating in active/standby mode, each UCX comprising:
- A 64 PCM time-division switching matrix (up to 42 links to connect the CNs)
- A control station, with a main processor, main memory, and associated drivers for handling the N°7 signalling, the CN protocol and the switching matrix management.

The UCN also has interface circuits for remote digital concentrators (ICNE) and the parent exchange (IOC), and a set of service units (frequency receivers, tone generators, measuring equipment for both subscriber line and line equipment, alarm handling circuit).
3. IMPLEMENTATION OF THE DIFFERENT PRODUCTS

3.1. THE CSN PRODUCTS

3.1.1. INDOOR INSTALLATION

3.1.1.1. CSNMM : 48V DC POWERED RACK

There are 2 types of subracks:

- the control subrack which houses the UCN and its interfaces.
- the concentrator subrack which receives 2 CNL, i.e. 512 equivalent POTS lines

With these two basic elements, the rack can be equipped from 2 to 8 CNLs.

Depending on the number, the type and the traffic of the subscriber lines to be connected, the CSN comprises one basic rack and 0, 1 or 2 extension racks.

Addition of the UCN and the interfaces boards allows to easily convert an “extension rack” into a “basic rack”. It is also possible to extend a rack already installed by simple add-on of 2xCNLs subrack(s).

3.1.1.2. CSNHD : 48V DC POWERED RACK

The basic equipment of the CSNHD is for 2048 lines.

It includes:

- the control subrack which houses the UCN and its interfaces.
- 4 concentrator subracks which receives 2 CNL, i.e. 512 equivalent POTS lines.

Broadband services are not natively available in a CSNHD; they can be offered by implementing a concentrator subrack CNLMM in the CSNHD rack (--> CSNHM).

3.1.1.3. CSNHD2 : 230V AC POWERED RACK

For a medium to large remote site, a rack with integrated secondary power plant has been designed. In this case, a “power station” subrack replaces a 2xCNL subrack so that the rack comprises an UCN subrack, 3 2xCNL subracks and a power subrack.

The power feeding is based on 230V AC voltage. Operational autonomy is based on external batteries. When necessary, voltage conversion is made by an external transformer. 230V protection and filtering equipment from the mains are included in the basic rack.

2 racks can be powered by the power subrack (2 to 4 230/54V rectifiers). An additional secondary power subrack can also be set in an extension rack.
Broadband services are not natively available in a CSNHD; they can be offered by implementing a concentrator subrack CNLMM in the CSNHD rack (--> CSNHM).

Figure 5 - CSNMM rack (4096 lines, basic rack, 48V DC)

Figure 6 - power station subrack (230V AC installation)
3.1.2. OUTDOOR INSTALLATION

The CSN can also be installed outside. Two arrangements are available, depending on the subscriber capacity required on the remote site.

3.1.2.1. CSN CABINET (MEDIUM CAPACITY)

The cabinet is used for connecting, in a full autonomous way, small to medium subscriber groups and leased lines in a suburban or a rural environment.

The CSN comes in a standalone cabinet which includes the switching, and transmission equipment, the power supply system and the distribution frame.

The previously described subracks, i.e. UCN, 2xCNL and power station, are accommodated in the cabinet. All the features and facilities of the indoor CSN, including the capacity to connect CNEs, are available here.

![CSN outdoor Cabinet](image)

The overall dimensions of this stainless steel cabinet are:

\[ H \times W \times D = 1800 \times 1950 \times 750 \text{ mm} \]

and its weight is approximately 1200 kg, when fully equipped.

It includes a 5 KVA insulation transformer and 4x12 V/105Ah batteries for autonomous operation. If a large autonomy is required (greater than 24 hours for example),

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external batteries are provided. These extra batteries are enclosed in a small outdoor cabinet located under the main CSN cabinet.

The MDF, accessed by a separate lateral door, is equipped with 1200 terminal blocks with lightning arresters and 1024 connectors for subscriber lines, as well as DDF for PCM and alarm connections.

The cabinet can be equipped with various transmission equipment, including ADM STM1/4 systems for NB and BB services.

The air conditioning unit is mounted on the right-hand front door of the cabinet. All the necessary protections and alarms are also provided.

The CSN cabinet is in compliance with the ETSI electromagnetic environment (class B), climatic, corrosion and tightness specifications.

The operating temperature ranges from -33 to +50 °C, and relative humidity is between 5 and 95%. A heating resistor is used in case of very low temperatures (-20°C to -33°C).

3.1.2.2. 20" CSN CONTAINER (LARGE CAPACITY)

When large capacity is required, a 20 feet container is used. As well as the cabinet, this container includes, in a full autonomous way, switching, transmission, DC power plant, air conditioning, MDF and DDF/ODF.

The operating temperature ranges from -33 to +50 °C, and relative humidity is between 5 and 95%. A heating system is used in case of very low temperatures (-10°C to -33°C).

This container can receive up to 3 standard CSN racks.

3.1.2.3. 40" CSN CONTAINER (VERY LARGE CAPACITY)

When larger capacity is required, a 40" ISO container is used. This container includes, in a full autonomous way, switching, transmission, DC power plant, air conditioning, MDF and DDF/ODF.
The operating temperature ranges from -33 to +50°C, and relative humidity is between 5 and 95%. A heating system is used in case of very low temperatures (-10°C to -33°C).

This container can receive up to 9 standard CSN racks.

3.2. **THE CNE PRODUCTS**

3.2.1. **INDOOR INSTALLATION**

3.2.1.1. **CNEMM : 48V DC POWERED RACK**

The CNEMM rack houses 2 subracks, each corresponding to 1 CNE.

According to the requested traffic capacity, 3 configurations are available:

- 1 x 256 equivalent POTS, with 1 to 4 x 2 Mbit/s PCM;
- 1 x 512 equivalent POTS with 2 to 4 x 2 Mbit/s PCM;
- 2 x 256 equivalent POTS with 4 to 8 x 2 Mbit/s PCM.

All the CNE usual functions are supported, including NB as well as BB services.

3.2.1.2. **CNEMM2I : INTEGRATED CNEMM (115/230V AC POWERED RACK)**

This equipment is designed to bring in new services and facilities in buildings without existing Telecom infrastructure (Power DC plant, transmission facilities).

It includes switching functions, power plant (power conversion, batteries,...) and transmission equipments. All these equipments are integrated in the rack itself. In this way there is no need for the operator to provide any external devices.

The product can host up to 256 subscribers lines with 16 POTS card.

The 16 line cards slots give the following access capacity:

- 256 POTS subscribers with TABA16;
- 128 BRI with TABNP;
- 16 PRI with TADP;
- 64 ADSL + POTS with TADSLB.

DC Power plant, from mains 115V or 230V AC

- Filter or Insulating transformer (optional external device)
- Rectifiers (2 x 54V/10A)
- It incorporates 1 or 2 sets of batteries for autonomous operation (~8 hours).
- Converters, inverters, rectifiers are standards CSNMM/CNEMM boards --> same spare parts.
Accommodation for Transmission Equipment:

- 2 Mbit/s G703, HDSL, SHDSL on copper cable (Line Runner - former A1512);
- PDH 8 Mbit/s on optical fiber (ALCATEL 1521);
- SDH 155 Mbits (ALCATEL OPTINEX 1640 FO X).

Rack size: ETSI 19" type, Height: 1700 mm, Width: 600 mm, depth: 600 mm

Figure 10 – CNEMM2I (External view)
Figure 11 – CNEMM2I (230V powered)
3.2.2. **OUTDOOR INSTALLATION**

Like the CSN cabinet, the CNE cabinet is a standalone product which includes the switching and transmission equipment, the power supply system and the distribution frame. As for the switching functions and configuration possibilities, the CNE cabinet operates exactly as the indoor CNE (up to 512 equivalent POTS, NB and BB services).

3.2.2.1. **ACNEMM : CNEMM CABINET (HEAT EXCHANGER VARIANT)**

![ACNEMM outdoor cabinet (Heat exchanger)](image)

The cabinet comprises an aluminium double wall cell. The overall dimensions are \( H \times W \times D = 1700 \times 1400 \times 600 \) mm
and its weight is approximately 600 kg, when fully equipped.
The switching part accommodates 1 or 2 CNE subracks, depending on the number of lines to be connected.
The MDF, accessed by a lateral door, is also modular (300 or 600 pairs). ODF, DDF and alarms connection are also provided.
As for the power supply function, the transformer is optional (115V countries). The secondary power is supplied by 2 or 3 x 54 V/10 A rectifiers. A set of 4 x 12V/105 Ah batteries is provided.

The ACNEMM cabinet is in compliance with the ETSI electromagnetic environment (class B), climatic, corrosion and tightness specifications.

The operating temperature ranges from -33 to +40 °C. When the heating resistor is not equipped, the operating conditions are then -10 to +40°C. Relative humidity is between 5 and 95%.

3.2.2.2. ACNEMM : CNEMM CABINET (AIR CONDITIONING VARIANT)

The cabinet comprises an aluminium cell. The overall dimensions are H x W x D = 1740 x 1700 x 600 mm and its weight is approximately 600 kg, when fully equipped.

The switching part accommodates 1 or 2 CNE subracks, depending on the number of lines to be connected.

The MDF, accessed by a lateral door, is also modular (300 or 600 pairs). ODF, DDF and alarms connection are also provided.
As for the power supply function, the transformer is optional (115V countries). The secondary power is supplied by 2 or 3 x 54 V/10 A rectifiers. A set of 4 x 12V/105 Ah batteries is provided.

The ACNEMM cabinet is in compliance with the ETSI electromagnetic environment (class B), climatic, corrosion and tightness specifications.

The operating temperature ranges from -33 to +55 °C. When the heating resistor is not equipped, the operating conditions are then -10 to +55°C. Relative humidity is between 5 and 95%.
3.3. THE CNE 64 PRODUCTS

The CNE 64 is a remote unit which functionally, as any other CNE, is part of the CSN.

It is dedicated for very small configurations, when the capacity of the site does not exceed 64 equivalent POTS lines. It does not provide BB services.

It comes as a standalone cabinet which includes, depending on the version, the switching and transmission equipment, the power supply system and the distribution frame. Three versions are available for installation in a « telecom » building (48V DC powered), in an industrial building (115/230V AC powered) or outside.

The link to the home UCN is provided by one or two 2-Mbit/s PCMs, according to the load and the traffic. Different transmission systems can be accommodated (2 Mbit/s G703, HDSL, optical fiber, radio links…)

When powered from mains, the CNE64 includes an insulation transformer, a rectifier and a set of four 12 V/40 Ah battery cells that can supply backup power for 8 hours.

DDF and alarms connections are provided in the 3 versions but only the outdoor version includes the MDF for subscriber lines.

The other main characteristics are given in the following table :

<table>
<thead>
<tr>
<th></th>
<th>Indoor Telecom</th>
<th>Indoor industrial</th>
<th>Outdoor</th>
</tr>
</thead>
<tbody>
<tr>
<td>Nb of doors</td>
<td>2</td>
<td>2</td>
<td>1</td>
</tr>
<tr>
<td>HxWxD</td>
<td>1000x600x600</td>
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<td>Weight</td>
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<td></td>
<td>(-5°C to +45°C)</td>
<td>(-5°C to +45°C)</td>
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<tr>
<td>Relative humidity</td>
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<td>5% to 90%</td>
<td>5% to 95%</td>
</tr>
</tbody>
</table>

The CNE 64 cabinet is in compliance with the ETSI electromagnetic environment (class B EMC), climatic, corrosion and tightness specifications.
Figure 14  – CNE 64 indoor (230V powered)
## 4. CAPACITY AND PERFORMANCE

### 4.1. CAPACITY

<table>
<thead>
<tr>
<th>Model</th>
<th>POTS</th>
<th>ISDN-BRA</th>
<th>ADSL</th>
<th>MDF OSP side (outdoor)</th>
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<tbody>
<tr>
<td><strong>CNEHD 64</strong></td>
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<td></td>
<td></td>
</tr>
<tr>
<td>indoor / outdoor</td>
<td>64</td>
<td>32</td>
<td>N/A</td>
<td>100</td>
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<tr>
<td><strong>CNEHD/MM racks</strong></td>
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<td>256</td>
<td>128</td>
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<tr>
<td>indoor 48V or 230V</td>
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<tr>
<td><strong>CNEMM2I/2T racks</strong></td>
<td>256</td>
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<td>64</td>
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<td>Indoor, 48V or 230VAC</td>
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<tr>
<td><strong>CNEMM cabinets</strong></td>
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<td>1 subrack</td>
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<td><strong>CSNHD</strong></td>
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<td>indoor 48V</td>
<td>2 048</td>
<td>1 024</td>
<td>256</td>
<td>256 (2)</td>
</tr>
<tr>
<td>2 096</td>
<td>2 048</td>
<td>512</td>
<td>512</td>
<td>512 (2)</td>
</tr>
<tr>
<td>2 560</td>
<td>1 280</td>
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</tr>
<tr>
<td>3 racks</td>
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<td>4 096</td>
<td>2 048</td>
<td>512</td>
<td>512</td>
<td>512 (2)</td>
</tr>
<tr>
<td>5 120</td>
<td>2 560</td>
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<td><strong>CSNMM racks</strong></td>
<td></td>
<td></td>
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<tr>
<td>1 rack</td>
<td></td>
<td></td>
<td></td>
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<tr>
<td>indoor 48V</td>
<td>2 048</td>
<td>1 024</td>
<td>512</td>
<td></td>
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<tr>
<td>2 096</td>
<td>2 048</td>
<td>1 024</td>
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</tr>
<tr>
<td>3 racks</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>5 120</td>
<td>2 560</td>
<td></td>
<td></td>
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</tr>
<tr>
<td><strong>CSNHD2 racks</strong></td>
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<tr>
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</tr>
<tr>
<td>indoor 230V</td>
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<td>768</td>
<td>128</td>
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<tr>
<td>1 843</td>
<td>8 192</td>
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</tr>
<tr>
<td>3 racks</td>
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<td></td>
<td></td>
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</tr>
<tr>
<td>6 144</td>
<td>3 072</td>
<td></td>
<td></td>
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<tr>
<td>18 432</td>
<td>8 192</td>
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<td><strong>CSNx cabinet</strong></td>
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<td>128</td>
<td>1 200</td>
</tr>
<tr>
<td>6 144</td>
<td>3 072</td>
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<tr>
<td>18 432</td>
<td>8 192</td>
<td></td>
<td></td>
<td>24 000</td>
</tr>
</tbody>
</table>

(1) Switching lines / OSP pairs  (2) CSN HM configuration.
4.2. PERFORMANCES

**Narrowband aspects**
- 2 to 16 x 2 Mbit/s PCM links towards the parent exchange: **460 Erlang**
- Call handling capacity: **100 00 BHCA**

**Broadband aspects**
- 1 to 20 STM1 links (155 Mbit/s) per CSN
- 1 STM1 or 1 to 8 IMA (2 Mbit/s) PCM links per CNE

4.3. COMPATIBILITY

<table>
<thead>
<tr>
<th>CSN rack type (CSN rack or CNE)</th>
<th>CSN Type (Basic rack)</th>
<th>CSN1G [1]</th>
<th>CSNHD</th>
<th>CSNMM [1]</th>
</tr>
</thead>
<tbody>
<tr>
<td>CSN1G Ext rack</td>
<td></td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
</tr>
<tr>
<td>CSNHD Ext rack</td>
<td></td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
</tr>
<tr>
<td>CSNMM Ext rack</td>
<td></td>
<td>Yes</td>
<td>Yes [1]</td>
<td>Yes [1]</td>
</tr>
<tr>
<td>CNE1G</td>
<td></td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
</tr>
<tr>
<td>CNEHD</td>
<td></td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
</tr>
<tr>
<td>CNEHD64</td>
<td></td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
</tr>
<tr>
<td>CNEMM</td>
<td></td>
<td>Yes</td>
<td>Yes [1]</td>
<td>Yes [1]</td>
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<tr>
<td>CNEMM2I, CNEMM2T</td>
<td></td>
<td>No</td>
<td>Yes [1]</td>
<td>Yes [1]</td>
</tr>
</tbody>
</table>

[1] Broadband capability
5. OPERATION AND MAINTENANCE

5.1. DEFENCE

The CSN is supervised from the parent exchange which offers the following features:

- Detecting and analysing faults;
- Identifying and isolating defective elements;
- Initiating reconfiguration and maintenance procedures:

The CSN local defence is based on duplicated software and hardware units (active/standby mode) for control and switching functions. In the event of a switchover from active to standby, calls already set up are unaffected. In the event of an operator initialised switchover, calls already set up and calls being set up are unaffected.

The switching matrix enables all types of connections, and particularly local connections when the CSN is fully isolated. Its right functioning is enforced by dynamic tests performed for the set up of each connection, thus allowing to check the correct execution for control commands.

For analogue and ISDN line units, when the standby line equipment feature is used, a failure in the line equipment will not even affect the concerned subscriber service.

A single failure of one CSN line card cannot affect more the subscribers connected to that card.

Autonomous mode is offered as an option for remote units, in case of disruption of the narrowband links to the core.

5.2. MAINTENANCE

The CSN offers a wide range of tests for both analogue and ISDN -BA subscriber lines.
Tests are initiated by operator commands.

There are two types of test:

- Routine tests activated automatically by the exchange (generally during off-peak periods) on the basis of commands in the calendar file;
- On-demand tests activated by commands which take priority over routine tests.

Alarm messages are generated in the event of a serious component failure. The messages are collected by an alarm processing system which decides on the action required and how the information is to be used (message output, storage, supervision panel display, audio or visual alarm).

Each alarm has a set of characteristics based on:
• Information enclosed in the alarm message or the alarm request;
• Alarm category (urgency degree for requested operation);

The alarm message indicates: the type of alarm: switching, transmission, primary power, break-in, air conditioning, heating plant, fire, etc., the site and the cause of the disturbance.

In addition, alarm signals and indications are integrated into the Alcatel Network Management offer.
6. EQUIPMENT PRACTICE

The CSN has a high degree of adaptability to increasingly stringent environmental standards (climatic, electromagnetic) and it has also a great capability of incorporation for the latest technological developments (memory capacity, new microprocessors, optical fibre links).

It complies with the European standards and carries the EC marking.

6.1. SUBRACKS AND BACKPLANES

Circuit cards are of standard 8U dimensions (233 mm x 350 mm) with a 1.6 mm thickness and have from 2 to 8 layers.

The cards are housed in standard subracks:
- Height 8 U (1U = 30.48 mm);
- Width 154 units (1 unit = 5.08 mm).

Subrack backplanes are multilayer printed circuits with the following characteristics:
- thickness 3.2 mm;
- six layers as standard;
- solderless connectors.

Figure 15 - Rack structure

Shielded cables are used for all inter-subrack and inter-rack links.
6.2. RACKS

- Height 2200 mm;
- Width 900 mm;
- Depth 650 mm.

Each rack holds five subracks separated by baffles which provide thermal protection. Since doors, upper and bottom grilles are punched, racks are cooled by natural convection.

The power distribution is duplicated so that converters are fed by two entirely separate circuits.

![Diagram of Rack Shielding](image)

**Figure 16 - Rack shielding**

The physical characteristics of the CSN allow it to be installed in conventional buildings with no special requirements regarding room height and floor loading.

No special installation precautions are required for remote line units. In most cases, these line units can be installed in a non-air conditioned building.
7. CLIMATIC ENVIRONMENTAL CONDITIONS

7.1. OPERATING CONDITIONS

Appropriate climatic figures are applicable to each of the states described below, for building installation:

- **Normal operating conditions:**
  - Air temperature: from +5°C to +40°C;
  - Relative humidity: from 5% to 85%;

- **Exceptional operating conditions:**
  - Air temperature: from 0°C to +45°C;
  - Relative humidity: from 5% to 90%;

- **Packed equipment transport and storage conditions:**
  - Air temperature: from -35°C to +70°C;
  - Relative humidity: from 5% to 100%;

- **Unpacked equipment transport and storage conditions:**
  - Air temperature: from -5°C to +45°C;
  - Relative humidity: from 5% to 92%.

For outdoor installation, CSN / CNE in containers or cabinets work within the following temperature range: from -33°C to +55°C.

7.2. ELECTROMAGNETIC ENVIRONMENTAL CONDITIONS

Regarding electromagnetic compatibility, equipment are compliant with ETSI recommendations (EMC Class A, for telecommunication equipment centres, and EMC Class B for equipment housed in cabinets).
8. GLOSSARY

<table>
<thead>
<tr>
<th>Abbreviation</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>ADSL</td>
<td>Asymmetric Digital Subscriber Line</td>
</tr>
<tr>
<td>AN</td>
<td>Access Network</td>
</tr>
<tr>
<td>ATM</td>
<td>Asynchronous Transfer Mode</td>
</tr>
<tr>
<td>BRA</td>
<td>Basic Rate Access (for ISDN subscriber)</td>
</tr>
<tr>
<td>BB</td>
<td>Broadband</td>
</tr>
<tr>
<td>CN</td>
<td>Digital Concentrator</td>
</tr>
<tr>
<td>CNE</td>
<td>CSN Remote Concentrator</td>
</tr>
<tr>
<td>CNL</td>
<td>CSN Local Concentrator</td>
</tr>
<tr>
<td>CSN</td>
<td>Access Network</td>
</tr>
<tr>
<td>DC</td>
<td>Daisy Chain</td>
</tr>
<tr>
<td>ETSI</td>
<td>European Telecommunications Standards Institute</td>
</tr>
<tr>
<td>I/C/E</td>
<td>CNE Interface</td>
</tr>
<tr>
<td>I/F</td>
<td>Interface</td>
</tr>
<tr>
<td>IO C</td>
<td>Interface to the parent exchange</td>
</tr>
<tr>
<td>ISDN</td>
<td>Integrated Services Digital Network</td>
</tr>
<tr>
<td>ISO</td>
<td>International Standard Organisation</td>
</tr>
<tr>
<td>ITU-T</td>
<td>ITU Telecommunication standardisation sector, formerly CCITT recommendations</td>
</tr>
<tr>
<td>LEX</td>
<td>Local Exchange</td>
</tr>
<tr>
<td>NB</td>
<td>Narrowband</td>
</tr>
<tr>
<td>PABX</td>
<td>Private Automatic Branch Exchange</td>
</tr>
<tr>
<td>PCM</td>
<td>Pulse Code Modulation</td>
</tr>
<tr>
<td>PDH</td>
<td>Plesiochronous Digital Hierarchy</td>
</tr>
<tr>
<td>POTS</td>
<td>Plain Old Telephone Service</td>
</tr>
<tr>
<td>PRA</td>
<td>Primary Rate Access (for ISDN subscriber)</td>
</tr>
<tr>
<td>PSTN</td>
<td>Public Switched Telephone Network</td>
</tr>
<tr>
<td>SDH</td>
<td>Synchronous Digital Hierarchy</td>
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<td>SS7</td>
<td>ITU-T N°7 Signalling Network</td>
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<td>UCN</td>
<td>Digital Control Unit</td>
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<td>UCX</td>
<td>Control and Connection Unit</td>
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<td>UT</td>
<td>Terminal Unit</td>
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</table>

Alcatel reserves the right to alter these details without notice, as a result of technical improvements or new regulations.