Final draft ETSI EN 302 099 V2.1.0 (2014-06)

Environmental Engineering (EE);
Powering of equipment in access network

Reference

REN/EE-02043

Keywords

access, network, power supply, remote

ETSI

650 Route des Lucioles
F-06921 Sophia Antipolis Cedex - FRANCE

Tel.: +33 4 92 94 42 00 Fax: +33 4 93 65 47 16

Siret N° 348 623 562 00017 - NAF 742 C
Association à but non lucratif enregistrée à la
Sous-Préfecture de Grasse (06) N° 7803/88

Important notice

The present document can be downloaded from:
http://www.etsi.org

The present document may be made available in electronic versions and/or in print. The content of any electronic and/or print versions of the present document shall not be modified without the prior written authorization of ETSI. In case of any existing or perceived difference in contents between such versions and/or in print, the only prevailing document is the print of the Portable Document Format (PDF) version kept on a specific network drive within ETSI Secretariat.

Users of the present document should be aware that the document may be subject to revision or change of status. Information on the current status of this and other ETSI documents is available at
http://portal.etsi.org/tb/status/status.asp

If you find errors in the present document, please send your comment to one of the following services:
http://portal.etsi.org/chaircor/ETSI_support.asp

Copyright Notification

Contents

Intellectual Property Rights

IPRs essential or potentially essential to the present document may have been declared to ETSI. The information pertaining to these essential IPRs, if any, is publicly available for **ETSI members and non-members**, and can be found in ETSI SR 000 314: *"Intellectual Property Rights (IPRs); Essential, or potentially Essential, IPRs notified to ETSI in respect of ETSI standards"*, which is available from the ETSI Secretariat. Latest updates are available on the ETSI Web server (http://ipr.etsi.org).

Pursuant to the ETSI IPR Policy, no investigation, including IPR searches, has been carried out by ETSI. No guarantee can be given as to the existence of other IPRs not referenced in ETSI SR 000 314 (or the updates on the ETSI Web server) which are, or may be, or may become, essential to the present document.

Foreword

This final draft European Standard (EN) has been produced by ETSI Technical Committee Environmental Engineering (EE), and is now submitted for the Vote phase of the ETSI standards EN Approval Procedure.

Proposed national transposition dates	
Date of latest announcement of this EN (doa):	3 months after ETSI publication
Date of latest publication of new National Standard or endorsement of this EN (dop/e):	6 months after doa
Date of withdrawal of any conflicting National Standard (dow):	6 months after doa

Modal verbs terminology

In the present document "**shall**", "**shall not**", "**should**", "**should not**", "**may**", "**may not**", "**need**", "**need not**", "**will**", "**will not**", "**can**" and "**cannot**" are to be interpreted as described in clause 3.2 of the ETSI Drafting Rules (Verbal forms for the expression of provisions).

"**must**" and "**must not**" are **NOT** allowed in ETSI deliverables except when used in direct citation.

1 Scope

The present document describes the principles for powering of Telecommunications Equipment (TE) in access networks and contains requirements for the powering systems, laying down:

- the characteristics of the input and output interfaces of the power units;
- the power back-up conditions for TE including a power unit;
- the management data, necessary to guarantee the availability of the service and to ensure the maintenance of the power units.

The present document takes into account the characteristics of access network equipment for which the limits of responsibility in the installation or design of the power plants are very different than for equipment of telecom centre: it goes from "complete integration of the power plant in the TE" to "remote power feeding from a distant power plant".

The present document applies to the powering of all equipment of the access network (copper, fibre or radio networks) located outside telecommunications centres. The access network is defined as the part of the telecommunications network, which comprises the customer terminal installation and the first exchange (switching unit). The customer terminal and the switching unit are excluded from the application field of the present document.

The present document describes different configurations of powering the TE:

- Local power supply for TE
- Remote Feeding to TE from centre through copper access pair
- Cluster Power supply feeding power for a cluster of TE
- Back feeding or Reverse Powering architecture that can supply power to Access Network Units such as ONU or ONT or remote DSL unit from the customer premises through its final distribution access copper pair

2 References

References are either specific (identified by date of publication and/or edition number or version number) or non-specific. For specific references, only the cited version applies. For non-specific references, the latest version of the reference document (including any amendments) applies.

Referenced documents which are not found to be publicly available in the expected location might be found at http://docbox.etsi.org/Reference.

NOTE: While any hyperlinks included in this clause were valid at the time of publication ETSI cannot guarantee their long term validity.

2.1 Normative references

The following referenced documents are necessary for the application of the present document.

[1] ETSI ETS 300 132-1: "Equipment Engineering (EE); Power supply interface at the input to telecommunications equipment; Part 1: Operated by alternating current (ac) derived from direct current (dc) sources".

[2] ETSI EN 300 132-2: "Environmental Engineering (EE); Power supply interface at the input to telecommunications and datacom (ICT) equipment; Part 2: Operated by -48 V direct current (dc)".

[3] CENELEC EN 60950-1: "Information technology equipment - Safety - Part 1: General requirements".

[4] IEC 60950-21: "Safety of information technology equipment - Part 21: Remote power feeding".

[5] CENELEC/IEC EN 60038: "CENELEC/IEC standard voltages".

[6] CENELEC EN 60664-1: "Insulation coordination for equipment within low-voltage systems - Part 1: Principles, requirements and tests".

[7] CENELEC EN 50310: "Application of equipotential bonding and earthing in buildings with information technology equipment".

[8] CENELEC EN 60896-2: "Stationary lead-acid batteries - General requirements and methods of test - Part 2: Valve regulated types".

[9] ETSI EN 300 253: "Environmental Engineering (EE); Earthing and bonding of telecommunication equipment in telecommunication centres".

[10] Recommendation ITU-T K.35: "Bonding configurations and earthing at remote electronic sites".

[11] CENELEC TR 62102: "Electrical safety - Classification of interfaces for equipment to be connected to information and communications technology networks".

[12] Recommendation ITU-T K.45: "Resistibility of telecommunication equipment installed in the access and trunk networks to overvoltages and overcurrents".

[13] ETSI ES 203 215: "Environmental Engineering (EE); Measurement Methods and Limits for Power Consumption in Broadband Telecommunication Networks Equipment".

[14] ETSI EN 300 132-3-1: "Environmental Engineering (EE); Power supply interface at the input to telecommunications and datacom (ICT) equipment; Part 3: Operated by rectified current source, alternating current source or direct current source up to 400 V; Sub-part 1: Direct current source up to 400 V".

[15] ETSI ES 202 336-1: "Environmental Engineering (EE); Monitoring and Control Interface for Infrastructure Equipment (Power, Cooling and Building Environment Systems used in Telecommunication Networks); Part 1: Generic Interface".

2.2 Informative references

The following referenced documents are not necessary for the application of the present document but they assist the user with regard to a particular subject area.

[i.1] ETSI EN 300 019-1-1: "Environmental Engineering (EE); Environmental conditions and environmental tests for telecommunications equipment; Part 1-1: Classification of environmental conditions; Storage".

[i.2] ETSI EN 300 019-1-3: "Environmental Engineering (EE); Environmental conditions and environmental tests for telecommunications equipment; Part 1-3: Classification of environmental conditions; Stationary use at weatherprotected locations".

[i.3] ETSI EN 300 019-1-4: "Environmental Engineering (EE); Environmental conditions and environmental tests for telecommunications equipment; Part 1-4: Classification of environmental conditions; Stationary use at non-weatherprotected locations".

[i.4] ETSI EN 300 019-1-8: "Environmental Engineering (EE); Environmental conditions and environmental tests for telecommunications equipment; Part 1-8: Classification of environmental conditions; Stationary use at underground locations".

[i.5] ETSI TR 102 629: "Access, Terminals, Transmission and Multiplexing (ATTM); Reverse Power Feed for Remote Nodes".

[i.6] ETSI EN 301 605: "Environmental Engineering (EE); Earthing and bonding of 400 VDC data and telecom (ICT) equipment".

[i.7] ETSI TR 102 614: "Environmental Engineering (EE); Reverse powering of access network unit by end-user equipment: A4 interface".

[i.8] CENELEC HD 60364-1: "Low-voltage electrical installations - Part 1: Fundamental principles, assessment of general characteristics, definitions".

[i.9] ETSI EN 302 999: "Safety; Remote Power Feeding Installations; Safety requirements for the erection and operation of information technology installations with remote power feeding".

3 Definitions and abbreviations

3.1 Definitions

For the purposes of the present document the following terms and definitions apply:

access network: part of a telecommunications network between the customer terminal installation and the first switching unit

backfeeding or reverse powering: powering architecture that can supply power to access network units from the customer through its final distribution access copper pair

NOTE: Access network units may be ONU, ONT or remote DSL units.

centralized powering: remote powering in which the remote feeding source is located in a telecommunications centre

cluster powering: remote powering of a cluster of equipment (1 to n items of equipment), in which the remote feeding source is located outside a telecommunications centre

distant power receiver: power equipment electrically connected to a Remote Power Unit

NOTE: Its function is to supply telecommunications equipment situated at the same location. It may be combined with the item of telecommunications equipment itself.

hazardous voltage: See EN 60950-1 [3].

Local Power Unit (LPU): power supply equipment whose function is to supply a telecommunication equipment situated at the same location

NOTE: It is generally locally connected to the mains and provides dc or ac voltage output to feed telecommunication equipment.

local powering: powering principle of a telecommunications equipment by a (dedicated) power unit implemented in the same location

primary circuit: See EN 60950-1 [3].

Remote Feeding Telecommunication (RFT) circuit: secondary circuit within the equipment, intended to supply or receive dc power via a telecommunication network at voltages equal to or exceeding the limits for TNV circuits, and on which overvoltages from telecommunication networks are possible

Remote Power Unit (RPU): power unit, connected to the mains or from a centralized power plant, which supplies distant telecommunications equipment

remote powering: power feeding of a telecommunications equipment by a remote power circuit

NOTE: Such a circuit consists of a remote power unit, distribution wiring, and fed receivers.

RFT-C circuit: RFT circuit which is so designed and protected that under normal operating conditions and single fault conditions the currents in the circuit do not exceed defined values

RFT-V circuit: RFT circuit which is so designed and protected that under normal operating conditions and single fault conditions the voltages are limited and the accessible area of contact is limited

secondary circuit: See EN 60950-1 [3].

SELV circuit: See EN 60950-1 [3].

TN-C: See CENELEC HD 60364-1 [i.8].

TN-S: See CENELEC HD 60364-1 [i.8].

TNV circuit: See EN 60950-1 [3].

TT: See CENELEC HD 60364-1 [i.8].

3.2 Abbreviations

For the purposes of the present document, the following abbreviations apply:

ac	alternating current
AN	Access Node
ANU	Access Network Unit
CH	Customer's Home
CPE	Customer's Premises Equipment
dc	direct current
DC/DC	Direct Current/Direct Current
DSL	Digital Subscriber Line
EMC	ElectroMagnetic Compatibility
FTTB	Fibre To The Building
FTTC	Fibre To The Curb
FTTCab	Fibre To The Cabinet
FTTDp	Fibre To The Distribution point
FTTH	Fibre To The Home
HD	Harmonization Document
ICT	Information & Communication Technology
IEC	International Electrical Committee
ISDN	Integrated Services Digital Network
IT	Information Technology
ITU-T	International Telecommunication Union - Sector Telecommunication (T)
LED	Light Emitting Diode
LPU	Local Power Unit
ONT	Optical Network Termination
ONU	Optical Network Unit
P	Power
PG	Power Gathering
PW	Power Way
RFT	Remote Feeding Telecommunication
RFT-C	Remote Feeding Telecommunication-Current
RFT-V	Remote Feeding Telecommunication-Voltage
RPU	Remote Power Unit
S	Signal
S/P_{filter}	filter separating signal S and power P
SELV	Safety Extra Low Voltage
TC	Telecommunication's Centre
TE	Telecom Equipment
TNV	Telecommunication Network Voltage
UPS	Uninterruptible Power Supply

4 Powering configurations

The main characteristic feature of the different powering architectures of access network equipment is the location of the following two functions:

- the point of connection to the mains; and
- the place of power back-up.

The total network can be divided in three main parts:

1) the Telecommunication Centre (TC);

2) the field (the undefined area between the Telecom Centre and the Customer's Home);

3) the Customer's Home (CH).

Powering architectures

Equipment of access networks can be powered remotely from a telecommunications centre (centralized powering) or from a power supply node (cluster powering), or locally from the mains (local powering). Inside these three main powering architectures, several configurations of powering are used. They are summarized in the clauses 4.1 to 4.2 and in the figures 1, 2 and 3 by the acronyms PW1 to PW 10 (for powering).

Power back-up

For the telephone service, which needs to provide an available service even in the case of a mains outage, a power back-up unit is located either in the remote power source or in the equipment powered. The clauses 4.1 to 4.2 detail the different installation configurations.

Location of the Telecom Equipment (TE)

On the figures 1, 2 and 3 of the following clauses, the TE in access network is schematically represented in the field. These figures mean that the TE can be implemented in different types of locations:

- in a customer's office;
- in a building, public or private;
- in an indoor cabinet;
- in a street cabinet;
- on a pole cabinet;
- in a telecommunications manhole, etc.

The TE provides services for several customers or for one professional customer.

On figure 3, the TE can be located at customer's home and provides services for only one private customer.

Power interfaces

Six power-feeding interfaces are mentioned in the following clauses: They are as follows:

I_0 = Power interface between a -48 V/-60 V power plant and the fed equipment in a telecom centre. It fits with the interface "A" according to EN 300 132-2 [2].

I_1 = Power interface between the public mains (commercial ac) and the fed equipment. It shall comply with the voltage defined in EN 60038 [5].

I_2 = Power interface at the output of a remote power source.

I_3 = Power interface at the input of a distant power receiver interface, in remote powering.

I_4 = Power interface between a local power unit and the fed equipment, in local powering. It fits with the interface "A" according to EN 300 132-2 [2] or with the interface defined in clauses 6.2 to 6.4.

I_5 = Power interface between the equipment in a telecom centre and one of the following:

i) the public mains (commercial ac); or

ii) emergency power (UPS, diesel generator); or

iii) interface "A" that shall comply with ETS 300 132-1 [1]; or

iv) interface "A3" that shall comply with EN 300 132-3-1 [14]. Nominal AC voltage shall comply with the voltage defined in EN 60038 [5].

I_6 = Power Interface from the customer. When using the telecom pair to transmit power, the voltage is 60 V DC maximum and peaks are limited according to TR 102 614 [i.7] and EN 60950-1 [3]. Under specific conditions ensuring proper operation, safety and reliability for POTS or DSL lines, a maximum of 120 V DC voltage option is possible from point of connexion outside of the customer premises (same limits as for ISDN voltage).

4.1 Remote powering

4.1.1 Centralized powering

The different power supply configurations are detailed in figure 1. The output of the power source is defined at interface I_2. It comes from a TE (PW1a) or from a specific remote power unit (RPU in PW1b). Interface I_0 corresponds to the input of the RPU. The remote power unit consists of protection and distribution devices and, possibly, power conversion equipment. Interface I_5 corresponds to Interface I_1 and is located in the telecommunication centre.

In some cases, the TE of the access network may be equipped with a battery providing additional power in periods of heavy traffic (PW3). This battery is recharged by the remote power supply during periods of light traffic.

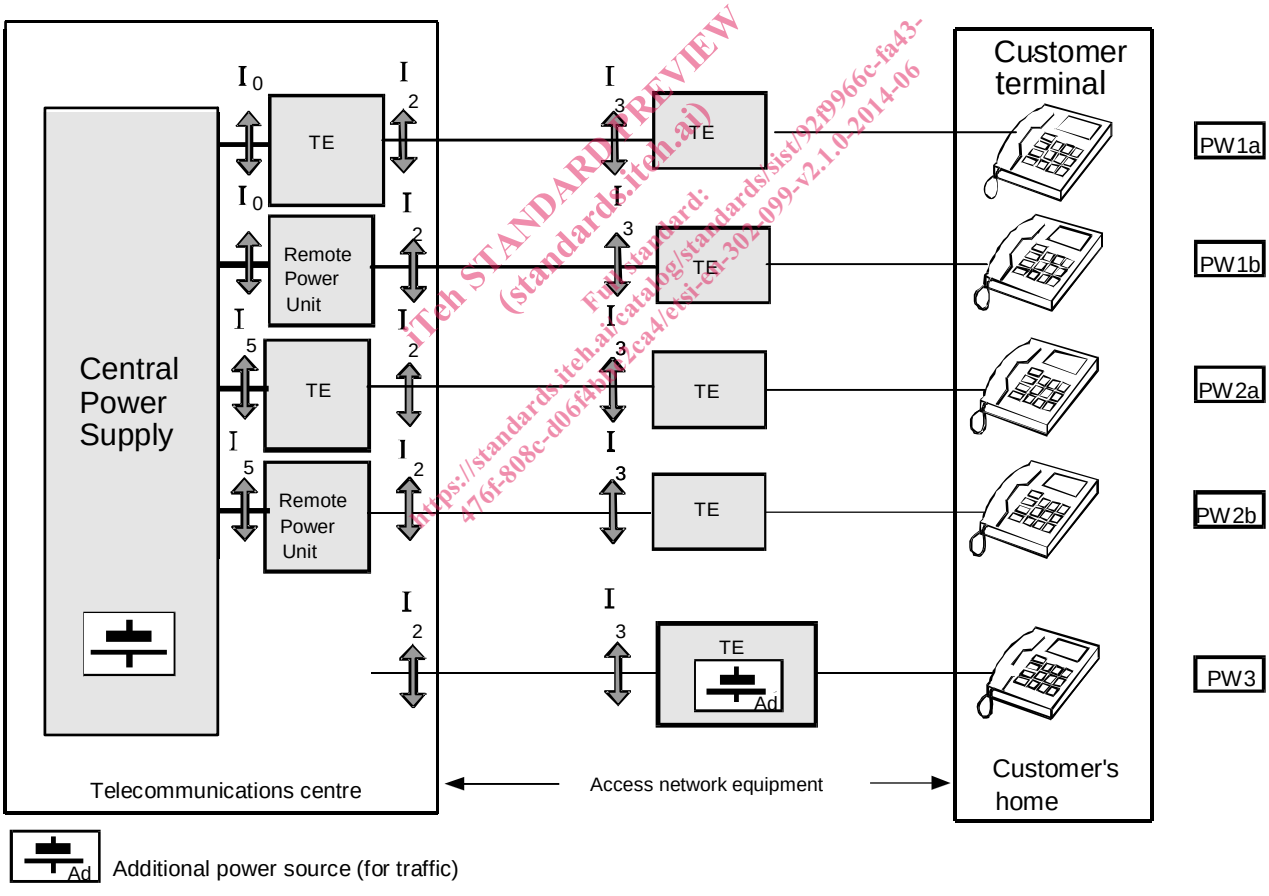

Figure 1: Centralized powering

4.1.2 Cluster powering

The different possible power supply configurations are detailed in figure 2. The remote power source, called Remote Power Unit (RPU), serves a group of distant telecommunications equipment, from 1 to n. The RPU is installed in a location (building, outdoor cabinet, manhole, etc.) which is distinct from the TE's building, cabinet or manhole. The telephone service is backed up by batteries located either at the remote power unit (remote powering with back-up at source, PW4) or in the telecommunications equipment (remote powering with local back-up, PW5).