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CONSTRUCTION, INSTALLATION AND PROTECTION
OF CABLES AND OTHER ELEMENTS OF OUTSIDE
PLANT

**Impact on information and communication
technology equipment architecture of multiple
AC, -48 VDC or up to 400 VDC power inputs**

Recommendation ITU-T L.1206

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OPTICAL FIBRE CABLES

Cable structure and characteristics	L.100–L.124
Cable evaluation	L.125–L.149
Guidance and installation technique	L.150–L.199

OPTICAL INFRASTRUCTURES

Infrastructure including node element (except cables)	L.200–L.249
General aspects and network design	L.250–L.299

MAINTENANCE AND OPERATION

Optical fibre cable maintenance	L.300–L.329
Infrastructure maintenance	L.330–L.349
Operation support and infrastructure management	L.350–L.379
Disaster management	L.380–L.399

PASSIVE OPTICAL DEVICES

L.400–L.429

MARINIZED TERRESTRIAL CABLES

L.430–L.449

For further details, please refer to the list of ITU-T Recommendations.

Recommendation ITU-T L.1206

Impact on information and communication technology equipment architecture of multiple AC, –48 VDC or up to 400 VDC power inputs

Summary

Recommendation ITU-T L.1206 discusses multiple power supply interfaces to information and communication technology (ICT) equipment operated by dual power input feeds with combinations of standardized –48 V direct current (DC) or alternating current (AC) sources, or DC source up to 400 V interfaces. Operational voltage and interface characteristics are detailed in ITU-T Recommendations and European Telecommunications Standards Institute (ETSI) relevant standards. This Recommendation also includes some details on the power architecture within the ICT equipment between the ICT power interface and the ICT end load.

History

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Architecture, ICT, power feed, power input, power interface, up to 400 VDC, –48 VDC.

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Table of Contents

		Page
1	Scope.....	1
2	References.....	1
3	Definitions	1
3.1	Terms defined elsewhere	1
3.2	Terms defined in this Recommendation.....	2
4	Abbreviations and acronyms	2
5	Conventions	3
6	Definition and requirements of multiple power interface configuration at the input of ICT equipment.....	3
6.1	Individual power interface used for multiple power interface configuration.....	3
6.2	Multiple power interface configurations and requirements.....	3
7	Combination dependence of A, A3 and A3ac interfaces for multiple power feeds	7
8	Backfeeding	10
	Appendix I – Power input switch selector installation options.....	12
I.1	External switch selector installation and options for system interface connections	12
I.2	Switch selector installed within converter and interface connections.....	13
	Appendix II – Power input switch selector – General functionality.....	15
II.1	General description of the power input switch selector	15
II.2	Input power monitoring	15
	Appendix III – Backfeeding protection	16
III.1	Example of backfeeding protection.....	16
	Appendix IV – Example of upstream conversion for dual –48 V power feed configuration at input of ICT equipment.....	18
	Bibliography.....	19

Introduction

With the advantage of the emerging up to 400 Volt DC (VDC) power distribution, along with the use of traditional alternating current (AC) and –48 VDC power distribution for networks and information and communication technology (ICT) power feeding, a new multiple power supply interface is defined as being a combination of the standardized AC or direct current (DC) power system interface at the inputs of ICT systems.

This Recommendation provides details showing the ICT equipment front-end power architectures that include an on-board converter and the interconnection options between the converter and the ICT interface. These include switch selection and diode combiner solutions for multiple input feeds.

With an increase in the variation of potential power feeds to ICT equipment especially with the emergence of up to 400 VDC power networks, a clear indication of how a multiple input power feed is to be referenced and how these multiple power feeds can be best managed is crucial in ensuring that common and recognized approaches are adopted in the installation and configuration of future ICT equipment.

Appendix I presents options for the installation of a switch selector within ICT equipment and its operational attributes targeted for its reliable operation.

This Recommendation was developed jointly by the European Telecommunications Standards Institute (ETSI) and ITU-T Study Group 5, and published respectively by ITU and ETSI as Recommendation ITU-T L.1206 and ETSI Standard ETSI TS 103 531, which are technically equivalent.

Recommendation ITU-T L.1206

Impact on information and communication technology equipment architecture of multiple AC, –48 VDC or up to 400 VDC power inputs

1 Scope

This Recommendation is applicable to the case of multiple power feeding configurations at the input of information and communication technology (ICT) equipment in ICT systems. It defines the requirements for the power inputs combination of the three power interfaces: A (–48 V), P or A3 (up to 400 Volt DC (VDC)) and A3ac (AC) that could potentially be used for each input.

This Recommendation also provides details of the power structure within ICT equipment, between ICT equipment interfaces, and ICT equipment system loads that is inclusive of system power converters.

The input power configurations are categorized to allow for a better understanding, identification, impacts, and benefits of adopting each power feeding solution. The consequence on battery test function with the different dual power inputs combinations are indicated.

Requirements are given for avoiding the potential risk of voltage backfeeding from one input to the other and for general isolation requirements.

2 References

The following ITU-T Recommendations and other references contain provisions which, through reference in this text, constitute provisions of this Recommendation. At the time of publication, the editions indicated were valid. All Recommendations and other references are subject to revision; users of this Recommendation are therefore encouraged to investigate the possibility of applying the most recent edition of the Recommendations and other references listed below. A list of the currently valid ITU-T Recommendations is regularly published. The reference to a document within this Recommendation does not give it, as a stand-alone document, the status of a Recommendation.

- [ITU-T L.1200] Recommendation ITU-T L.1200 (2012), *Direct current power feeding interface up to 400 V at the input to telecommunication and ICT equipment*.
- [ETSI EN 300 132-2] ETSI EN 300 132-2 V2.5.1 (2016-10), *Environmental Engineering (EE); Power supply interface at the input to telecommunications and datacom (ICT) equipment; Part 2: Operated by –48 V direct current (dc)*.
- [ETSI EN 300 132-3-1] ETSI EN 300 132-3-1 V2.1.1 (2012-02), *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*.

3 Definitions

3.1 Terms defined elsewhere

This Recommendation uses the following terms defined elsewhere:

3.1.1 interface "P" [ITU-T L.1200]: Interface, physical point, at which power feeding system is connected to operate ICT equipment.

3.1.2 hot standby state of an item [b-ISO/IEC 2382-14]: Standby state providing for immediate operation upon demand.

NOTE 1 – A hot standby state may apply to redundant or stand-alone items.

NOTE 2 – In some applications, an item in a hot standby state is considered to be operating.

3.2 Terms defined in this Recommendation

This Recommendation defines the following terms:

3.2.1 combined power feeding: Function by which two power inputs feeds to information and communication technology (ICT) equipment are managed such that one input is always available to power a single power module within the ICT equipment, e.g., by using the reverse bias characteristic of a two-diode common cathode module or a dual MOSFET.

3.2.2 combiner: A device achieving the combined dependent power feed combination by diode or equivalent static electronic circuitry.

3.2.3 dependent power feed: Power feed associated with a single interface on the information and communication technology (ICT) equipment, but jointly associated to another power feed with a single power module within the ICT equipment via a managed power interface (switched or combined power feed).

3.2.4 independent power feed: Power feed associated with a single interface on the information and communication technology (ICT) equipment and a single power module within the same ICT equipment used in a multiple power feeding interface.

3.2.5 interface "A": Terminals at which the –48 VDC power supply is connected to the ICT equipment system block.

NOTE – This new definition is a “modified version” of the one found in [ETSI EN 300 132-3-1] associated to Figure 1 and Annex A. This power interface is a functional definition and not an exact depiction of the physical location.

3.2.6 interface "A3": Terminals at which the up to 400 VDC power supply is connected to the ICT equipment system block.

NOTE – This new definition is a "modified version" of the one found in [ETSI EN 300 132-3-1] associated to Figure 1 and Annex A. This power interface is a functional definition and not an exact depiction of the physical location.

3.2.7 interface "A3ac": Interface, physical point, at which AC power supply is connected in order to operate the ICT equipment.

NOTE – This new definition is a "modified version" of the one found in [ETSI EN 300 132-3-1] associated to Chapter 4, Figure 1 and Annex B. This power interface is a functional definition and not an exact depiction of the physical location.

3.2.8 switched power feeding: Method by which two power inputs feeds to information and communication technology (ICT) equipment are managed such that one input is always available to power a single power module within the ICT equipment with the use of a switch.

3.2.9 switch selector: A device achieving the switched dependent power feed selection by a power switch.

4 Abbreviations and acronyms

This Recommendation uses the following abbreviations and acronyms:

AC	Alternating Current
A+	Pole plus of input A
A–	Pole minus of input A

B+	Pole plus of input B
B–	Pole minus of input
BCONV	Converter
D	Diode
DC	Direct Current
ICT	Information and Communication Technology
MOSFET	Metal-Oxide-Semiconductor Field-Effect Transistor
SwSelect	Switch Selector
VAC	Volt AC
VDC	Volt DC

5 Conventions

None.

6 Definition and requirements of multiple power interface configuration at the input of ICT equipment

6.1 Individual power interface used for multiple power interface configuration

The power supply interfaces presented in Figures 1 to 6, are the physical inter-connection points to which all the requirements are related. This point is situated between the power supply system(s) and ICT equipment.

Definitions of configurations in which "A", "P(A3)" and "A3ac" interfaces presented as individual interface references are shown in the following documents:

- [b-ETSI EN 300 132-1] Annex C (AC supply) – A3ac interface;
- [ETSI EN 300 132-2] Annex E (–48 VDC supply) – A interface;
- [ITU-T L.1200] – P interface (up to 400 VDC supply) equivalent to [ETSI EN 300 132-3-1] Annex B – A3 interface.

NOTE – Subject to the installation preconditions, this point may be located at any other point between the power supply system and ICT equipment by mutual agreement of the relevant parties.

6.2 Multiple power interface configurations and requirements

For the case of multiple power interface configurations on ICT equipment (e.g., power supply unit with dual feeds), each power interface shall comply with at least one of the applicable standards detailed in clause 6.1.

The multiple power interfaces shall be identified by using each of the individual interface definitions in sequence, for example, an ICT interface comprised of one AC supply (A3ac) and one AC supply (A3ac) shall be named A3ac/A3ac.

In regard to the contents presented within this Recommendation, interface "A3ac/A3ac", "A3ac/A3", "A3/A3", "A3ac/A", "A/A", and "A/A3" are located at the power terminals of the ICT equipment or system as defined by the manufacturer in accordance with [b-IEC 60445].

Table 1 shows all of the interface options for multiple power feeds to ICT equipment. For simplification, the table makes the assumption of a maximum combination of two power feeds. Power interfaces will be configured for any ICT equipment installation and the individual interface shall be in accordance with the input power feed selected.