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Power Supply 120W AC/DC Input Engineering Specification

Department: Hardware Engineering

Project: Last Mile Core

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REVISION HISTORY

Release / Revision No.	Release / Revision Date	ECN No.	Description
1.0			1 st Draft
1.2	4/14/01		2 nd Draft

1 DOCUMENT OVERVIEW

This document describes the detailed specifications for a wide range, AC/DC input, power supply component element used in the Last Mile Core (LMC) Power Module assembly. This component will provide input to output voltage conversion and regulation for up to 120W of - 48VDC output power with 40 – 100VAC or –70 to 140VDC input. This component works in conjunction with the power control module in the Core Power Module assembly that provides the LMC system power functions such as load sharing, diode oring and fault monitoring.

1.1 Document Objectives

The objectives of this document are to:

1. Provide detailed design specifications for the power supply of the LMC.
2. Provide a purchasing specification for supplier qualification.

1.2 Scope

This document is applicable to all power supplies used in the LMC Power Module assembly.

1.3 Acronyms and Definitions

The following is a list of acronyms used throughout this document. *[List all definitions, acronyms and abbreviations required to interpret the document.]*

Acronym	Definition	Description
LMC	Last Mile Core	
CPM	Core Power Module	

1.4 Document References

The following documents served as references for the material in this functional specification.

Document Number	Document Title	Document Date
UL60950	Safety For Information Technology Equipment	12/01/00
EN60950	Safety For Information Technology Equipment	08/15/00
FCC Part 15	Radio Frequency Devices	
EN55022	Limits and Methods of Measurement of Radio Disturbance Characteristics of Information Technology Equipment.	09/00/00
IEC 61000-3-2	IEC Electromagnetic Compatibility, Limits for harmonic current emissions.	00/00/97
IEC 61000-3-3	IEC Electromagnetic Compatibility, Limits of voltage fluctuations and flicker.	00/00/87
IEC 61000-4	IEC Electromagnetic Compatibility, Immunity Standards	
EN50081	Electromagnetic Compatibility-Generic Emission Standard Part: Residential, Commercial and Light Industry.	00/0092

2 OPERATING SPECIFICATIONS

All specifications below apply for worse case combination of input conditions and output load over operating environment as defined in section 3.

2.1 Input Specifications

The input specifications of the power supply are listed in table 1 below.

Requirement	Conditions	Min	Typ	Max	Units
input voltage	See Detail A	40		100	VAC
input frequency		48		62	Hz
efficiency	maximum load, nominal line	65	72		%
efficiency	minimum load	60			%
efficiency	maximum load, low line	62			%
hold-up time (-48VDC output)	from loss of AC or DC input at full load, at 40VAC or 70DVC input voltage	20			Ms
input current	RMS, Full load			5	A _{rms}

Table 1. Input Specifications

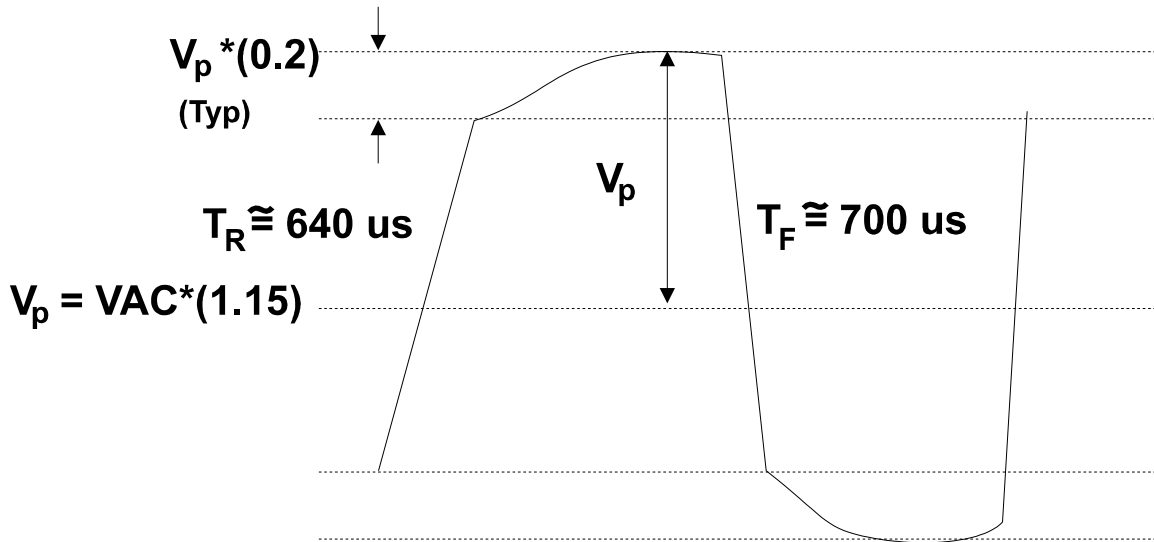
- 2.1.1 The AC input is provided from a ferro-resonant source with a waveform as represented by Figure 1 below. The source voltage is single phase (Hot) with an earth ground referenced (Neutral) return. A separate earth ground is also provided.

The DC input is sourced from a –130 VDC input with the hot lead being – polarity and the neutral lead being + polarity. A separate earth ground is also provided.

- 2.1.2 Input connections to the power supply are made via a terminal block or quick disconnect connector. Three inputs are provided:

AC In Hot	-DC In Hot
AC In Neutral	+DC In Neutral
Earth Ground	Earth Ground

2.1.3 The unit shall not be damaged, nor generate output transients in excess of 10% over nominal, by input surges per ANSI/IEEE C62.41 - 1991 Category B2.



DETAIL A

Figure 1

2.1.4 The unit shall be guaranteed to start-up under no-load conditions with +/- 5% load regulation.

2.1.5 The unit shall not be damaged by continuous application of any input voltage below the specified operating limit.

2.1.6 The AC/DC input shall have an EMI filter.

- 2.1.7 The -48V shall current limit at 2.6A and shall foldback without damage, under short circuit and/or overload conditions.
- 2.1.8 The unit shall not draw significant current below a specified input voltage, referred to as the Low Voltage Cutoff, or “LVC”. The LVC at full load will be 33VAC +/- 3VAC or -67VDC +/- 3VDC.
- 2.1.9 The power supply shall meet the following EMI requirements:
 - FCC Part 15 Class B
 - EN 55022 Class B
 - EN 50082 Immunity
- 2.1.10 The unit shall start up at full load under all temperature conditions at an input voltage lower than 40VAC or -75VDC. The unit shall not start up at the LVC point (see 4.1.7) or at any input voltage lower than this point.

2.2 Output Specifications

The following describes the output specifications for the power supply.

Table 2. Output Specifications

Requirement	Conditions	Min	Typ	Max	Units
Output Voltage	full line & load range	-40	-48	-56	VDC
Output Current	full line & load range	0.5		3	A
Output Power	full line & load range			120	W
Ripple & Noise	20 MHz bandwidth			500	mV _{p-p}
Transient Response	<10% duty cycle			500	mV _{p-p}
overvoltage limit				65	VDC
temperature coefficient				0.03	%/°C

- 2.2.1 Initial output voltage setting shall be -48VDC +/- 2% measured at the output connector with 60% load, 65VAC input, 25° C.
- 2.2.2 Output to be classified as SELV in accordance with UL 60950/EN 60950, with no direct connection to earth.
- 2.2.3 Input to output isolation shall be not less than 4242VDC.
- 2.2.4 The unit shall operate without damage with a short circuit on either output (0 - 2 ohms) of indefinite duration.
- 2.2.5 The power supply shall be capable of providing the necessary output signals to feed an external monitoring board to enable 60/40 load sharing between the supplies.

3 ENVIRONMENTAL SPECIFICATIONS

Table 3 defines the operating environment for the power supply component.

Table 3. Environmental Requirements

Requirement	Conditions	Min	Typ	Max	Units
Component Ambient Temperature	Operating	-35		+70	°C
	Start-up	-40		+65	
Case Temperature	Mftr specified area			TBD	°C
humidity	non-condensing	5		95	% RH

All electrolytic capacitors shall be rated for a temperature of 105 degrees C.

4 MECHANICAL SPECIFICATIONS

4.1 Overall Dimensions

Power supply unit to be less than an envelope described by the following dimensions:
4.00"W x 6.00"L x 2.00"H.

4.2 Electrical Connections

Input and output connectors to be on opposite sides of long dimension.
Connector style TBD.

5 COMPLIANCE SPECIFICATIONS

5.1 Product Safety

The Power supply component specified for use in the LMC shall be a recognized component, listed with an NRTL, which complies with UL1950 or UL60950, third edition. The power supply shall also be approved and listed in accordance with CSA 22.2 No. 950 and EN 60950.

The Conditions of Acceptability for recognized/listed approval shall be consistent with end use application in the LMC.

5.2 Radiated and Conducted Emissions

The Power supply should have documentation records to prove compliance with CFR47, FCC Part 15, and EN55022/CISPR 22, for radiated and conducted emissions under Class B limits.

5.2.1 Power Factor Correction

The supplier shall provide a statement of conformity to the following requirements:

IEC/EN 61000-3-2 Harmonic

IEC/EN 61000-3-3 Flicker

5.3 Immunity

The power supply should have sufficient onboard EMI filtering to provide compliance to the Low Voltage Directive, in accordance with the Generic IEC Immunity standards:

IEC 61000-4-2 ESD	Level 3
IEC 61000-4-3 Radiated Immunity	Level 2
IEC 61000-4-4 EFT/Burst	Level 3
IEC 61000-4-5 Electrical Surge	Level 3

6 MARKING AND LABELING

6.1 Regulatory Labels

The power supply component specified for use in the LMC, will be labeled with an appropriate NRTL recognized component marking, to include a control number or identification reference to support manufacturer identification. The power supply shall be listed in the respective directory to comply with UL1950 or UL60950, CSA 22.2 No. 950 and EN 60950.

The power supply shall have a CE Mark in accordance with the European’s Low Voltage Directive. A statement will appear on the product label or within the user manual to declare that the device complies with Part 15 of the FCC Rules.

The power supply shall have the appropriate markings to represent proper input and output voltage and current ratings, potential voltage hazard symbols and to identify proper grounding in accordance with the approved safety standards.

6.2 Commercial Labels

The power supply shall be labeled with the manufacturer’s part number, assembly revision and serial number and/or date of manufacturer.

7 QUALITY

The manufacturing processes, test and inspection procedures, and quality program used by the supplier/manufacturer shall be adequate to meet the technical requirements of the standards referenced in this document. Quality Assurance criteria, in this area, shall cover the ability of the factory testing program to provide product operability and functionality.

The supplier shall, upon request, make available to Wave 7 Optics all documentation and information that describes controls, procedures, and standards used for the following: manufacturing, in-process testing, final product inspection and testing, calibration and maintenance of tools and test sets, control of non-conforming materials/product, periodic product qualification testing, and all other aspects of the quality program.