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Data Sheet
January 2008

LINEAGE POWER

NP1500 Constant Current Front-End Power Supply 85 Vac to 264 Vac Input, 42 Vdc to 58 Vdc Output

RoHS Compliant



Applications

- Optical routing and switching
- Broadband access
- Storage area networks
- Enterprise networks
- Indoor wireless

Description

The NP1500 front-end power supplies are specifically designed to operate as an integral part of a complete distributed power system. A full complement of alarm and shutdown features have been incorporated into the power supply to protect the system in the event of a fault condition. The flexible feature set makes this front-end power supply an excellent choice for applications requiring modular ac-to-dc bulk intermediate voltages, such as distributed power. Features reflect an emphasis on worldwide acceptance of this power system.

* *IEC* is a trademark of International Elektrotechniker Commission.
† *UL* is a registered trademark of Underwriters Laboratories, Inc.
‡ *CSA* is a registered trademark of Canadian Standards Association.
§ *VDE* is a trademark of Verband Deutscher Elektrotechniker e.V.
** This product is intended for integration into end-use equipment. All the required procedures for CE marking of end-use equipment should be followed. (The CE mark is placed on selected products.)

Features

- Universal ac input
- 1500 Watt output from 200-240 Vac
- 1200 Watt output from nominal 100-120 Vac
- Rated for -5 to +55°C operation
- Voltage programming range – 52V default, programmable from 42V to 58V
- Voltage margining with optional Network Protocol Card (NPC) from 42V to 58V
- Redundant parallel operation
- Temperature dependent variable-speed fan
- Hot insertion/removal (hot plug)
- Active load sharing
- Remote sense
- Remote On/Standby
- Over-temperature protection
- Optically isolated alarm signals with a common return
- Front panel LED indicators
- Power factor correction (meets *EN6*1000-3-2)
- CISPR Class B EMI (radiated and conducted)
- *UL*†60950 Recognized, *CSA*‡ C22.2 No. 60950-00 Certified, and *VDE* § (IEC60950) Licensed (*UL* and c-*UL* Listings are provided at the shelf level.)
- CE** marking for low-voltage (73/23/EEC) and EMC (93/68/EEC) directives
- RoHS compliant with lead free exemption

Power Systems

Electrical Specifications

Table 1. Input

Parameter	Min	Typ	Max	Unit	Note
Input Voltage	85 150	120 230	135 264	Vac Vac	Unit will shut down if line voltage drops below either range for more than 100 ms. Unit will start at 5V over minimum value. All output parameters are maintained when operating from line voltages up to 300 Vac.
Input Frequency	47	—	63	Hz	—
Input Current	— — — —	— — — —	15 12 10 8	— — — —	At 100 Vac. At 120 Vac. At 150 Vac. At 208 Vac.
Inrush Current (peak)	—	—	40	A_{peak}	Measured at 25°C for all line conditions. Does not include charging of X-capacitors.
Input Leakage Current	—	—	3.2	mA	255 Vac, 60 Hz.
Power Factor	0.98	0.995	—	—	From 50% to full load @ 120 Vac or 230 Vac.
Efficiency	— —	84 88	— —	% %	At 100 Vac at $V_{OUT} \geq 52V$. At 230 Vac at $V_{OUT} \geq 52V$.
Hold Over Time	—	16	—	ms	Alarm 5 ms prior to shutdown. Output voltage allowed to droop to 45.6V into a constant power load.

Table 2: Output

Parameter	Min	Typ	Max	Unit	Note
V_O Set Point	—	52.0	—	Vdc	Set point tolerance is 1%. Default set point is 52V.
Total Output Power	—	1200 1500	—	W	At 52 Vdc and low line. At 52 Vdc and high line.
Programmable V_O Range	42	—	58	Vdc	Factory programmable in 60 mV increments. Consult factory for details.
Output Margining Range	42	—	58	Vdc	Output voltage may be margined via optional Network Protocol Cards. Consult factory for details.
Regulation	–2	—	2	%	Total regulation line, load, aging, and temperature.
$V_{fullpower}$	—	—	1200/ 1500	W	Full power is 1200W at low line and 1500W at high line. (see Note)
V_{hiccup}	—	4	12	Vdc	Current tail does not start before 12V.
I_{OUT}	—	—	23 29	A	At low line and 52V. At high line and 52V.

Electrical Specifications *(continued)*

Table 2: Output (continued)

Parameter	Min	Typ	Max	Unit	Note
I_{LIM}	—	24 30	—	A	At 1200W, 52V and low line. At 1500W, 52V and high line.
$I_{shortcircuit}$	—	—	200	% of I_{OUT}	—
Ripple and Noise Transmission Noise Psophometric noise	— — —	— — —	250 45 2	mVp-p dBrnC mV	20 MHz bandwidth under any load condition.
Output Rise Time	20	—	100	ms	Measured between the 10% and 90% points of the waveform. At any normal load condition. Voltage slope will always be greater than or equal to zero.
Turn-On Overshoot	—	0	1.5	Vdc	The overshoot is with respect to the initial set point.
High voltage Shutdown	—	55	—	Vdc	At 52 Vdc, maximum delay to shutdown initialization is 64ms.
Backup High Voltage Shutdown	58.4	—	60.2	Vdc	With rectifier output margined to 58V, no step load change will cause high-voltage shutdown. If output voltage is operating within specified range for greater than 50ms, unit will shutdown.
Maximum Voltage During HVSD	—	—	65	Vdc	Duration of overvoltage condition above 60V limited to maximum 100ms.
Transient Response (Voltage Deviation)	—	—	5	%	25% step at 25% to 75% static. 10% step at 0% to 25% static. No HV shutdown for any transient load change. Load transient current delta to be within 250 ± 25 µs. The induced output voltage transient settles to within 1% of the final voltage in less than 10 ms. All data given are for resistive loads.
Capacitive Load	—	500	1700	µF per A	12,500 µF Typ.
Reverse Output Current Protection	—	—	0.5	A	ORing diode.
Turn-on Delay	—	—	3.5	s	Measured from application of valid ac voltage for default unit set point.

Note: Rectifiers may be purchased with the output set to any voltage in the range $42 \le V_O \le 58V$ with the output performance as noted above. Users may also margin the output voltage to any voltage in the range $42 \le V_O \le 58V$ with an optional Network Protocol Card. When the rectifier is programmed to an output voltage within the range of $52V \le Vo \le 58V$, the rectifier output current is adjusted so that a constant power is delivered. However, when the rectifier is programmed to an output voltage within the range of $42V \le Vo < 52$, the output current is maintained at that for 52V, therefore, the rectifier produces less power. For example, if the NP1500 is programmed to 48V, the resultant output power would be 1440W (48V x 30A---30A is the current limit set point for the NP1500). Consult factory for more details.

Electrical Specifications *(continued)*

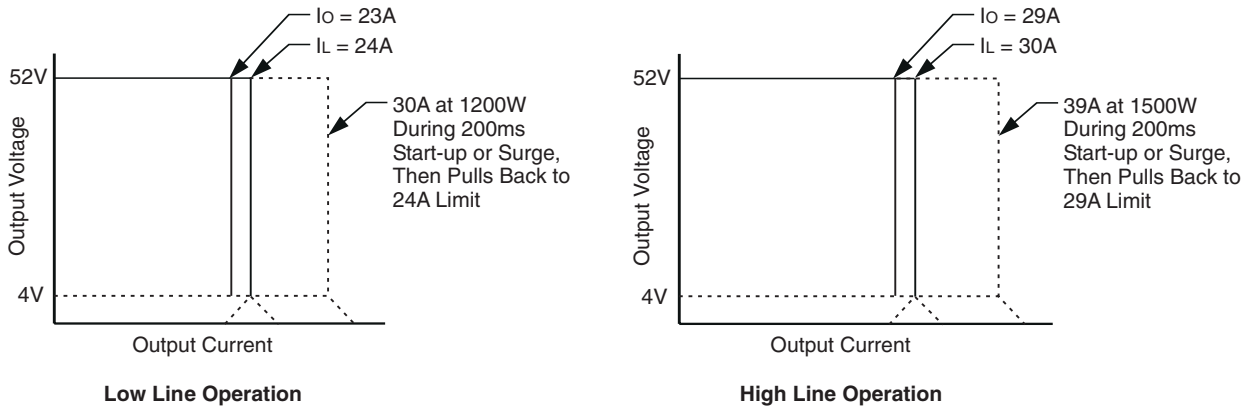


Figure 1. NP1500 Factory-Set Output Voltage and Current

Factory Default Performance at 52V:
If the unit initially powers up at low line (85-135Vac), the unit becomes a 1200W unit. If the line voltage is then increased to high line (150 to 264Vac), it will remain a 1200W unit.

If the unit initially powers up at high line (150-264Vac), the unit becomes a 1500W unit. If the line voltage is then lowered to low line (85-135Vac), the unit shuts off.

The rectifier shuts off in the dead-band zone between 132Vac and 150Vac.

The power unit will operate in the constant voltage mode until the load current exceeds I_L, which is 105% of I_O. The power supply during startup will allow 36A at high line operation, or 30A at low line operation, for 200 ms to start dc/dc converter modules. After the initial startup, the current limit reduces to 30A at high line operation, or 24A at low line operation.

Physical Specifications

Table 3. Physical Specifications

Parameter	Min	Typ	Max	Unit	Notes
Length	—	10.78	—	inches	—
Width	—	5.61	—	inches	Chassis
	—	5.75	—	inches	Face plate
Height	—	3.38	—	inches	Chassis
	—	3.38	—	inches	Faceplate
Weight	—	7	—	lbs.	Without shipping package
Weight	—	8	—	lbs.	With shipping package

Warranty Information

When used within specified operating conditions, Lineage Power will warrant that this product will conform to published specifications and is free of material and workmanship defects for the period of two (2) years from date of manufacture. This warranty applies only to units having the date code of warranty period or less when returned to Lineage Power for repair. Lineage Power's liability will be limited to the repair or replacement, at our option, of the returned unit. Our warranty does not extend to any unit which has been subjected to abuse, misuse, or neglect or to units that have been repaired or altered by anyone other than Lineage Power or an authorized agent. Additional details are provided in contract documents and other full-warranty statements.

Environmental Characteristics

Table 4. Environmental Characteristics

Parameter	Min	Typ	Max	Unit	Note
Storage Temperature	–40	—	85	°C	—
Operating Temperature (air inlet to power unit)	–5	—	55	°C	Airflow front to back with 3 inch clearance for exhaust air in unpressurized enclosure.
Humidity	5	—	95	%	Relative humidity noncondensing.
Altitude	–60 (–200)	—	4000 (13000)	m (ft.)	For operation above 2500m (8000 ft.), maximum operating temperature is derated by 2°C per 305m (1000 ft.).
Shock and Vibration	—	—	—	—	1) Meets Network Equipment Building System (NEBS) GR-63-CORE Level 3. 2) ASTM-D-4728-91 with an 8 hour duration on each axis.
Earthquake Rating	4	—	—	zone	All floors, when installed with corresponding Power System in 19 in. rack.
Harmonic Emissions					Per EN/*IEC*61000-3-2.
Radiated Emissions	—	—	—	—	FCC and CISPR22 (EN55022) Class B, individually and in system with NP Shelf and 3 rectifiers.
Conducted Emissions	—	—	—	—	FCC and CISPR22 (EN55022) Class B
ESD	3	—	—	level	Error free per EN/*IEC*61000-4-2 (6 kV contact discharge, 8 kV air discharge).
Radiated Immunity	3	—	—	level	Error free per EN/*IEC*61000-4-3 (10 V/m).
Electrical Fast Transient Burst	3	—	—	level	Error free per EN/*IEC*61000-4-4 (1 kV on I/O and control ports a 5 kHz repetition rate) for occurrences at 1 minute intervals.
Lightning Surge error-free					Will operate with 320V surge of 2 second duration. EN/IEC61000-4-5 Level 4 (4 kV).
Conducted Immunity	3	—	—	level	Error free per EN/*IEC*61000-4-6 (10 Vrms).
Reliability (calculated)	430,665	—	—	hours	Fully loaded in a 25°C ambient with fan at normal speed. Method I, Case III per Telcordia SR-332, Reliability Prediction for Electronic Equipment.
Service Life	10	—	—	years	25°C ambient, full load excluding fans.

Physical Descriptions

Definition of Terms

Power-Factor Correction
All NP-Series power supplies comply with the specifications set forth in *EN6*1000-3-2.

Input Overcurrent Protection
An internal fuse is provided in each unit for input protection in compliance with safety agency requirements.

Overcurrent Protection
In the event of an overload condition, the power supply limits the output current. See Figure 1 for details.

Overvoltage Protection
The power unit turns itself off before the output voltage reaches a specified threshold.

Overtemperature Protection
In the event of an overtemperature condition, the power unit protects itself by shutting off. Restart can be accomplished with a toggle of remote on/standby.

ORing Diode
A diode at the output of the power unit protects the dc bus in the event of a power supply failure or hot plugging of the power unit.

Remote On/Standby
An opto-isolated input signal. An external 1 mA, 5 V source activates a standby condition in the power module.

Voltage Margining
Output voltage may be adjusted between 42V and 58V. Call factory for details.

Power Fail Warning (PFW)
Communicates incipient loss of output power. Opto-isolated and pulled to ground to activate.

Alarm Return (AR)
Common return for all opto-isolated signals including OTW, remote on/standby, and PFW.

Current Share (I_SHARE)
A single-wire interface between each of the power units forces them to share the load current.

Remote Sense (R_SENSE)
These signals permit the power units to compensate for a voltage drop across the output distribution.

Reset
Toggle the Remote On/Standby to accomplish reset.

Redundant Bias Supply (EX_BIAS_12—15 V)
This protected feed from the internal bias supply may be used to externally power the alarm and control logic.

AC Line Discrimination
The unit senses the input range at power-up and shuts the unit down if the input drops below that line range for a specified period of time.

Variable Speed Fan
Fan spins at lower rpm at room ambients. When ambient temperature exceeds approximately 27°C, the fan speed is linearly increased until approximately 35°C when the fan spins at full speed.

Front Panel LEDs
AC OK (green): The unit has input ac in the correct range.

DC OK (green): The unit is powered up and the output is in regulation.

Fault (red): The unit has detected an internal fault.

Status Signals
The following are the optically isolated open-collector signals (minimum 1 mA sinking capability):

Fault: The unit has detected an internal fault.

Overtemperature Warning (OTW): The unit is overheating; shutdown is imminent (8 second warning).

Power Fail Warning: The output of the power unit will fail in at least 5 ms.

Front-End Power Supply Interfaces

Input Voltages
The product can be used with any standard global line voltage; consult the factory for any particular regional application concerns.

Input Connector
The ac input connection is through an *IEC60320 C-13* connector rated at 10 A/250 Vac in Europe/Asia, and 15 A/120 Vac in North America.

Grounding
Frame ground can be connected so that the output may have either a positive or negative ground.

Connector Information and Signal Definitions

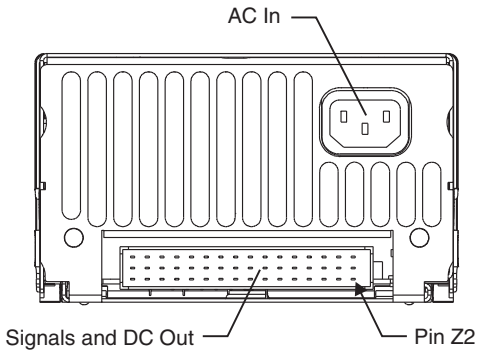


Figure 2. NP1500 Connectors

DC Connector

Each NP1500 rectifier has a DIN 41612 Type F Connector with level 2 gold plating.* Pin-out configuration and function descriptions are as described in Table 5.

Table 5. Rectifier Output Connector Pin Outs

	32	30	28	26	24	22	20	18	16	14	12	10	8	6	4	2
D	Missing Module + (Line)	EX_BIAS_12-15V (Bus)	PFW+ (Line)	OTW + (Bus)	A2 (Bus)	SERIAL INTERRUPT (Bus)	Future Use Bus (Bus)	SHELF PRESENT (Bus)	Vout – (Bus)	Vout – (Bus)	Vout – (Bus)	Vout – (Bus)	Vout + (Bus)	Vout + (Bus)	Vout + (Bus)	Vout + (Bus)
B	Long Pin Vout – (Bus)	A3 (Bus)	ALM_RTN (Bus)	Reserved for mfr's use	A1 (Line)	SERIAL CLOCK (Bus)	RS485- (Bus)	Missing Module - (Line)	Vout – (Bus)	Vout – (Bus)	Vout – (Bus)	Vout – (Bus)	Vout + (Bus)	Vout + (Bus)	Vout + (Bus)	Long Pin Vout + (Bus)
Z	A4 (Bus)	REMOTE_ON/STBY (Line)	I_SHARE (Bus)	FAULT + (Bus)	A0 (Line)	SERIAL DATA (Bus)	RS485+ (Bus)	SERIAL RTN (Bus)	Vout – (Bus)	Vout – (Bus)	Vout – (Bus)	RS- (Bus)	Vout + (Bus)	Vout + (Bus)	Vout + (Bus)	RS+ (Bus)

Note: The (Bus) and (Line) suffixes are indications of how signals are wired on the standard 19 inch shelf.
(Bus) indicates that this signal is routed in parallel to all rectifiers in a specific shelf.
(Line) indicates that each rectifier is individually connected through that pin.

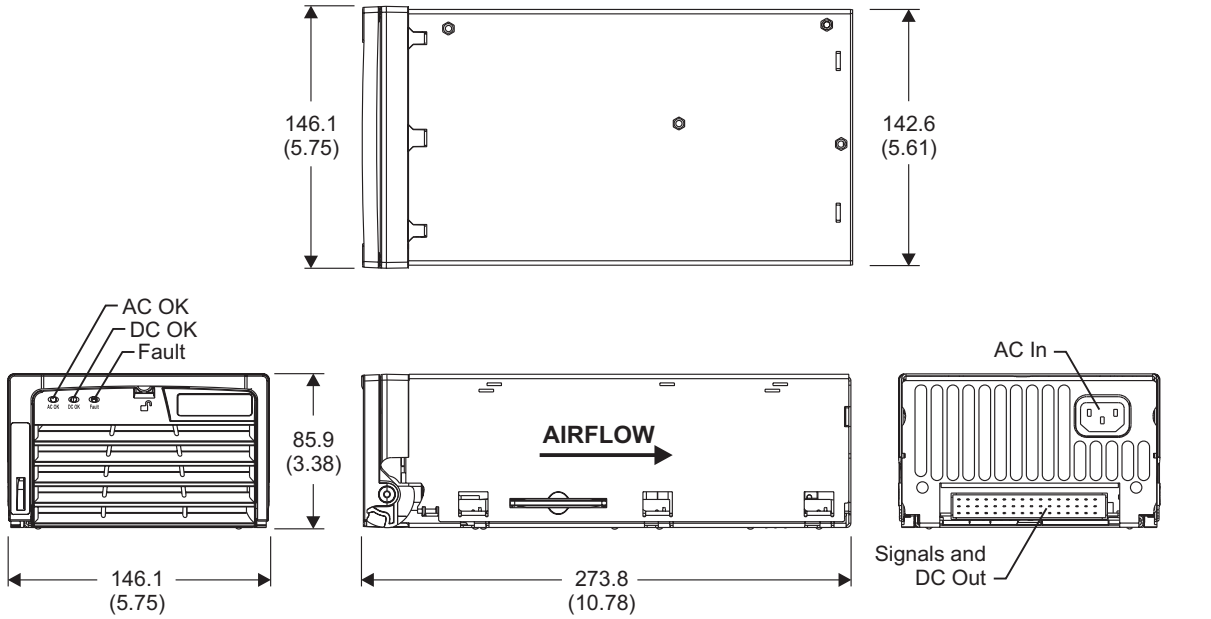
* Please see the *NP Rectifier and NP Shelf* Application Note for more information.

Outline Drawings

NP1500 Rectifier

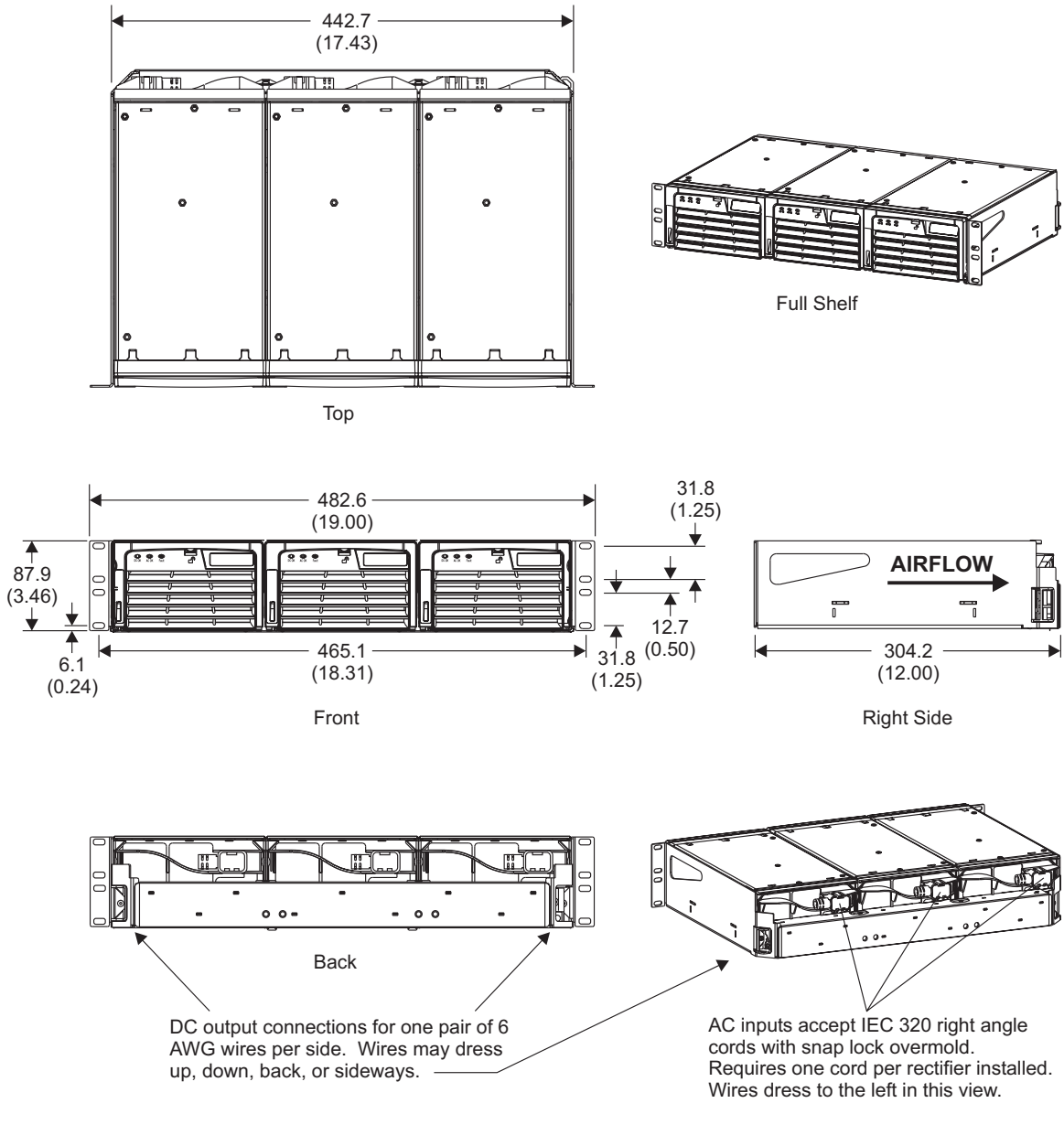
Weight = 7 lbs.

Dimensions are in millimeters and (inches).



Outline Drawings *(continued)*

NP1500 System Dimensions - Three NP1500 Rectifiers in NP Shelf



4-0006

Ordering Information

The NP1500 is intended to be used with the NP Shelf and can be ordered individually or as part of a system.

Table 6. Product Codes

Product	Includes	Comcode	Shipping Weight
NP1500	One (1) NP1500 Rectifier, 52 V	CC109121828	8 lbs.
NP Shelf	One (1) NP Shelf w/dc cables*	CC109121844	9 lbs.
NP Shelf LC	One (1) NP Shelf without dc cables	CC109122537	8 lbs.

* Includes redundant 6 gauge, 3 ft. 10 in. long, dc output cables.

AC Cord Sets

The NP1500 rectifiers integrate the ac cord set into the hot swap architecture. The benefits of this approach are higher quality, higher reliability, and lower cost. To realize this benefit, the cord set must be selected and ordered from the list in Table 7.

Table 7. AC Cord Sets*

Region	AC Cord Set	Appliance Connector	Wall Plug	Comcode
North America	15 A/125 Vac, 10 A/250 Vac†	*IEC60320 C-13* Right Angle	NEMA 5-15P	848545166
Italy	10 A/250 Vac	*IEC60320 C-13* Right Angle	MP231 CEI13-16/VII	848545216
Europe	10 A/250 Vac	*IEC60320 C-13* Right Angle	*IEC* 884/ CEE 7/7 Exception to CEE 7/7: Switzerland SEV 1011	848545208
United Kingdom	13 A/250 Vac	*IEC60320 C-13* Right Angle	BS1363, w/13 A fuse	848545224
Australia	10 A/250 Vac	*IEC60320 C-13* Right Angle	AS3112	CC848788661
Argentina	10 A/250 Vac	*IEC60320 C-13* Right Angle	IRSM 2073:1982	CC848788678
China	10 A/250 Vac	*IEC60320 C-13* Right Angle	GB2099.1-1996	CC848788686
Japan	15 A/125 Vac	*IEC60320 C-13* Right Angle	JIS 8303	848545182

* Contact factory for RoHS status

† For high-line operation, qualified service personnel must replace the wall plug with an appropriate *UL* Listed/CSA plug, as required in compliance with local electrical codes and standards. (*UL* is a registered trademark of Underwriters Laboratories, Inc.)

Table 8. Alarm Cable

Product	Includes	Comcode	Shipping Weight
Analog Alarm Cable	One (1) DB9 Cable Harness	108545257	1 lb.

Notes

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October 2004
DS03-021 Rev 8

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