



Modular Power System Components PS3000-Series Power Shelves



The PS3000 Series Power Shelves are designed to operate with RM-Series rectifiers* in distributed power systems.

Introduction

The PS3000-Series Power Shelves are designed to operate as a key element in a complete distributed power system. They are 5.25 in. (3U) high subrack assemblies that mount into a 19 in. rack. The power shelf mates to a commercial power grid and when assembled with rectifiers generates a precisely regulated dc bus voltage. These power shelves house RM-Series rectifiers* and provide for input filtering, protection, and a number of alarm and control features. These products are intended for integration into end-use equipment. The PS3000-Series Power Shelves are safety certified by *UL*[†], *CSA*[‡], and VDE. All the required procedures for CE marking of end-use equipment should be followed. The power shelf can supply up to 2.25 kW of redundant power or 4 kW of available power depending on configuration of rectifiers.

Principal elements of the power shelf are:

- Rack mount sheet metal chassis (3U height, 19 in. rack)
- ac input module with line filtering, circuit breaker, and ac present LED
- Rectifiers (up to four 750 W, three 1 kW, two 1.5 kW or 2.0 kW units per shelf)
- Power system controller slot with standard passive alarm aggregation card
- Optional controller to control multiple shelves and battery backups

General

The PS series power shelves can be used with any standard global line voltages in the range of 100 Vac to 250 Vac. The power shelf may be configured with three types of inputs—single feed, dual feed, and direct connect. Refer to ac input module (ACIM) section for details. The standard ac input connection to the shelf is through an IEC320 type connector system rated at 16 A/250 Vac in Europe/Asia and 20 A/120 Vac in North America.

The PS3000 power shelf can hold up to four 750 W, three 1000 W, or two 1500 W/2000 W RM series rectifiers. The outputs of these rectifiers are routed to two studs on the backplane. The alarm and status signals from the rectifiers are routed to an alarm aggregation card in the controller slot where they are consolidated and brought out to a 25-pin host interface connector on the backplane. Jumpers provided on the backplane enable the power shelf to be configured for local or remote sense of output bus voltage.

* Also known as front-end power supply unit.

† *UL* is a registered trademark of Underwriters Laboratories, Inc.

‡ *CSA* is a registered trademark of Canadian Standards Association.

ac Input Connections

ac input power is connected to the shelf on the left rear of the chassis assembly. Either a terminal strip with screw terminals or a standard IEC connector is provided to connect a customer-supplied line cord. The N+1 redundant configuration may be equipped with a dual ac input module that provides redundant ac input.

These systems are designed to be compatible with worldwide power sources. They are intended for operation from a variety of ac voltages and line cord ratings.

Table 1 summarizes the ac voltages and line cord ratings, by geographical region, that may be used to power these systems.

Table 1. Regional Specification

Nominal Mains Voltage	Line Cord Rating	Region Served
120 Vac	20 A	North America
200 Vac	20 A	Japan
208 Vac	20 A	North America
220 Vac	16 A	Europe
240 Vac	13 A	United Kingdom
240 Vac	20 A	Australia, North America

ac Input Module (ACIM)

The ac input module is located on the left side of the power shelf (as viewed from the front). Following are the different options available:

- Single ac input through an IEC-320 connector with a single ac filter, ac-on indicator, surge suppression and circuit breaker.
- Dual ac input through two IEC-320 connectors with dual ac filters, ac-on indicators, surge suppression, and circuit breakers.

Table 3. Basic Front-End Power Supply Configurations

The RM-Series Front-End Power Supply can be configured in the PS3000 according to the following table:

Version	Front-End Power Supply Model Number	Maximum Number of Rectifiers	Maximum Output Power With N+1 Redundancy	Maximum Output Power Without Redundancy
PS3000A4	RM0750	4	2250	3000
PS3000A3	RM1000	3	2000	3000
PS3000A2	RM1500	2	1500	3000
PS3000A2	RM2000	2	2000	4000

- Single ac input connected through a terminal strip with a single ac filter, ac-on indicator, surge suppression, and circuit breaker.
- Single ac input with a terminal strip direct connected to the source (no ac filter, ac-on indicator, surge suppression or circuit breaker.)

Note: The ac line filter is designed to meet EN55022 (CISPR 22) class-B conducted emissions.

dc Output

The PS3000 shelves provide a single output voltage (48 V, 54.5 V, 56.25 V) depending on which rectifier is selected. Care should be taken to ensure that rectifiers with different output voltages are not assembled in the same shelf. The maximum output current will be the sum of the output currents of each rectifier.

The maximum output power capacity of the shelf is limited by input voltages as given in Table 2. These limits are a consequence of the derating guidelines of regulatory agencies.

Table 2. Maximum Output Power

ac Input Voltages	ac Input Feeds	Maximum Power Out (Watts)	Remarks
120	1	1400	—
200	1	2560	—
240	1	3000	—
120	2	3000	—
220	2	4000	With RM2000 Rectifiers

Table 3 shows the possible different configurations of the power shelf, and the maximum outputs available with and without redundancy.

Output Connection

PS3000A3 and PS3000A2 shelves have two studs, Bus+ (V+) and Bus- (V-), on its backplane. The PS3000A4 shelf comes with three tabs on the output bus bar at the back for the output connection (V+, V-, and frame GND).

The Bus+ (V+) and Bus- (V-) are floating with respect to frame GND. It may be connected to either bus depending upon the customer requirements for positive bus or negative bus.

Host Interface Connector

The power shelf has a controller slot used to map the interface controls of the rectifiers, to allow customers to receive and process the signals according to their own individual choices. When viewed from the front, this is in the rightmost slot.

The alarms and control signals from the different rectifiers and the battery backup units are routed to a circuit board inserted into this controller slot. The signals from this card are routed to a 25-pin, female, subminiature (DB25) connector, called the host interface connector on the backplane. This can be connected to the external system for control and/or monitoring functions.

The standard configuration of the PS3000 power shelf provides a passive controller card which consolidates alarm and control signals of multiple rectifiers in one shelf. For example, in a PS3000A4 shelf, the four FAULT signals from the four rectifiers are routed into the controller card where these signals are consolidated to form a single FAULT signal. Table 4 describes the signal at this connector and the signals available at each pin.

This slot is also configurable to accept a controller which is capable of managing up to eight rectifiers, provide office alarms, and also provide the battery management functions. Please contact your representative or Lucent Technologies for additional information.

Parallel Operation

The PS3000 power shelves are designed to operate in parallel to provide additional output power or to provide redundancy to the power system. The backplane is equipped with a pair of auxiliary postheader connectors, one for remote or local sense and the other for daisy-chaining critical signals. See the application manual for further details.

Battery Backup

The PS3000 shelf is designed to support multiple Lucent battery backup systems. With the standard alarm aggregation card, the shelf will support up to two battery backup units (BBUs). The controller will allow the batteries to float on the bus and also provide battery management functions. Please contact your representative or Lucent Technologies for additional information.

Alarm Aggregation Module Configuration

With the alarm aggregation module installed, the following signals appear on the host interface connector.

Table 4. Pinout with Alarm Aggregation Module

Pin Number	Signal Name	Remarks
1	NC	No connection.
2	RESET_RTN	RESET_RTN pin of all rectifiers connected together.
3	RESET*	RESET* pin of all rectifiers connected together.
4	INHIBIT*	INHIBIT* pin of all rectifiers connected together.
5	INHIBIT_RTN	INHIBIT* pin of all rectifiers connected together.
6	MARGIN+	MARGIN+ pin of all rectifiers connected together.
7	MARGIN-	MARGIN- pin of all rectifiers connected together.
8	HOST_RETURN	Reference pin.
9	FAULT*	FAULT+ (FAULT) pin of all rectifiers connected together.
10	OVERTEMP_WARNING*	OVERTEMP_WARNING* (OTW) pin of all rectifiers connected together.
11	POWER_FAIL_WARNING*	POWER_FAIL_WARNING* (PFW) pin of all rectifiers connected together.
12	MISSING_MODULE*	MISSING_MODULE+ (MM) signal of connected to MM- to the adjacent one to form a daisy chain. MM+ of the first one brought out to this pin. The other end connected to HOST_RETURN.
13	HOST_RETURN	Reference pin.
14	BAT_FAULT*/ BAT_NOT_AVAILABLE	Indicates that battery reserve energy is not available. Indicates that the battery string external to the BIU has a fault and should be serviced as soon as possible.
15	BIU_FAULT*/BBU_FAULT*	Indicates that the BIU has a fault and should be replaced as soon as possible. Indicates that the BBU has a fault and should be replaced as soon as possible.
16	BIU_OVERTEMPERATURE	—
17	BAT_ON_CHARGE1	This signal is deasserted (negated) when the BBU1 is providing power to the distribution bus.
18	BAT_ON_CHARGE2	This signal is deasserted (negated) when the BBU2 is providing power to the distribution bus.
19	HOST_RETURN	—
20	BAT_STATUS1	If the battery is being charged, then this signal indicates whether the battery has reached the nominal float voltage. If the battery is being discharged, this signal indicates whether or not the battery is approaching the low-voltage disconnect threshold.
21	BAT_STATUS2	Same as above for BBU2.
22	BAT_PRESENT1	A strap to alarm return that allows the system to detect an installed unit.
23	BAT_PRESENT2	Same as above for BBU2.
24	BAT_DISCONNECT	—
25	BAT_DISCONNECT_RTN	—

RM Series Rectifiers

General Description

The PS3000-Series Power Shelves are intended for operation with the RM-series rectifiers. These units convert the ac input power to a regulated, low-noise dc bus voltage. Units are available with maximum rated output power from 750 W to 2000 W.

High Availability Support

The power system units are designed for high availability applications with:

- ORing diode on the rectifier outputs to prevent one rectifier from bringing down the bus either during hot plug insertion or as the result of a rectifier fault.
- Connectors selected to support blind mating as well as hot insertion and removal.
- Current sharing between paralleled rectifiers and shelves to distribute the load evenly between multiple units.
- Redundant bias supplies to ensure proper response and error reporting when one of the rectifiers has failed.

Fault and Status Reporting

For accurate fault diagnosis and system management the RM-series rectifiers provide a number of optional status signals. Some of these signals are summarized in Table 5.

Table 5. Fault and Status Reporting Codes

Signal Name and Assertion Level	Assertion Meaning
Power Fail Warning (PFW)	The ac line voltage has fallen so low that the output voltage cannot be maintained. At time of assertion, at least 5 ms of reserve energy is available.
Fault (FAULT)	Each unit monitors the output voltage at the anode of the ORing diode. Fault is asserted if a fault is detected in the power unit.
Overtemperature Warning (OTW)	When asserted, the internal temperature of the unit is approaching levels that risk damage. Shutdown of the unit is imminent.

These signals are optically isolated from the dc bus voltage. For maximum noise immunity, all signals are routed with their individual signal returns to the power system controller. At the system controller, the signal returns are referenced to the V-.

RM Series Rectifiers (continued)

Fault Management

The rectifiers are fully protected against damaging either the load or themselves under single fault and abnormal operating conditions. See Table 6.

Table 6. Fault and Abnormal Conditions

Fault or Abnormal Condition	Response
ac Input Surges and Transients	The robust design of these units provides superior immunity to ac line transients and surges.
Loss of ac Input Power	The rectifier will continue operation without interruption or assertion of the POWER FAIL WARNING signal during 1/2 cycle outages of mains power. Typical holdup time is 20 ms.
Output Overvoltage	Under any single fault condition, the output voltage will not exceed 60 V.
Internal Overheating	The rectifier is fully protected against damage from excessive heat. The unit will automatically recover once it has cooled down.
Output Overload	When output current exceeds maximum limit, the rectifier goes into a constant power mode and output voltage falls. Any additional loading will cause rectifier to enter into a constant current mode and finally into a hiccup mode.

Visual Indicators

In addition to the status signals, the rectifiers have a number of LEDs to provide status information. These indicators are summarized in Table 7.

Table 7. Visual Indicator Codes

Name	Color	Illumination Meaning
PWR OK	Green	Rectifier is operating normally in a powered up condition.
FAULT	Yellow	A fault has been detected within the power unit.
TEMP	Yellow	The rectifier is in an over-temperature condition and shutdown has occurred.
ILIM	Yellow	The rectifier is operating in a current-limit condition.

The output power and signal connections are made through a DIN Style M connector. Each rectifier provides:

- V+ (dc bus voltage, positive)
- V- (dc bus voltage, return)
- FRAME GND, chassis connection

Either V+ or V- may be referenced to frame ground. Alternatively, the two outputs may be balanced about frame ground.

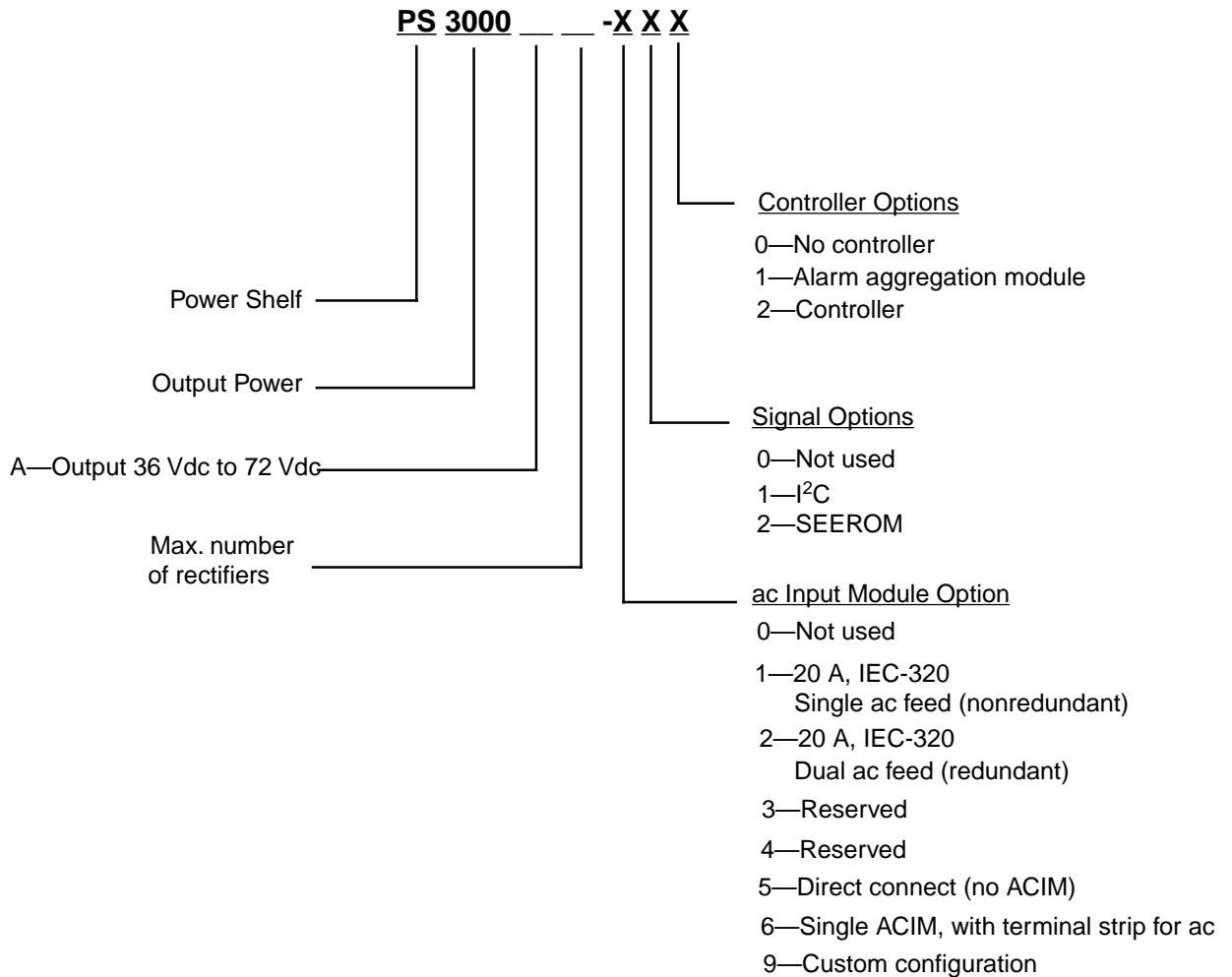
EMI Performance

- All standard configurations of the shelf used with the ac input module (ACIM) will meet CISPR Class B, conducted emissions—EN55022 stand-alone.
- The PS3000A2-211, equipped with the RM2000AA-900, will meet CISPR Class B, both conducted and radiated, in a stand-alone environment.

CE Marking

The CE mark on the product is applied to show conformance to the requirements outlined in the European Union's Low Voltage Directive (72/23/EEC) as amended by the CE marking directive (93/68/EEC).

Ordering Information



Outline Drawing

Dimensions are in millimeters and (inches).

Dimensions are same for all versions of power shelves.

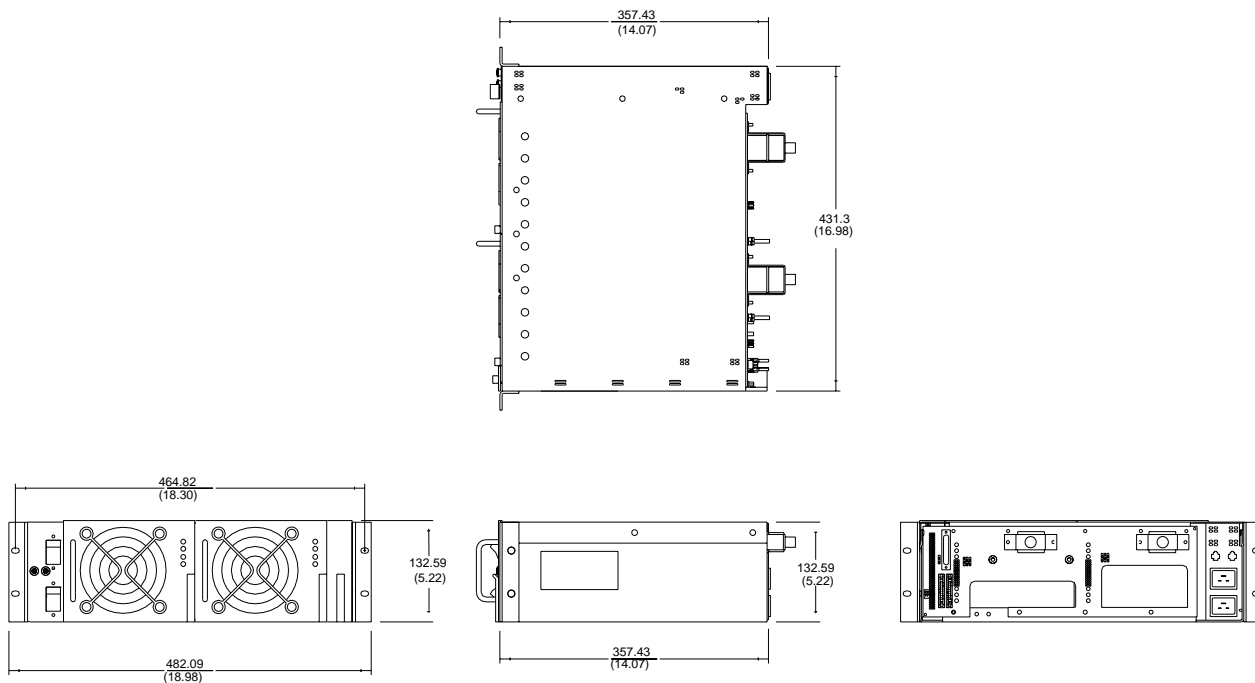


Figure 1. Power Shelf PS3000A2-211

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