

NP Rectifier and NP Shelf



NP1200 Rectifiers,

NP0800 Rectifiers,

NP Shelves, and NP1200 System



Introduction

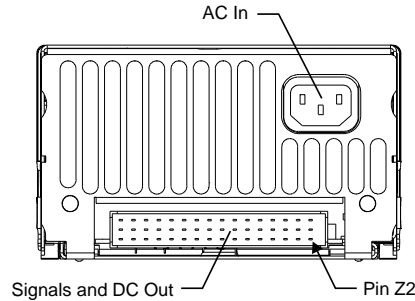
The NP0800 and NP1200 rectifiers are designed for worldwide application in any 2U high space where nominal 48 V is needed. This application note is divided into four sections:

- Connector information and signal definitions.
- Applying the NP rectifiers in a 19 inch rack.
- Applying the NP rectifiers in a workstation drive bay.
- Applying the NP rectifiers in a custom or embedded application.

Connector Information and Signal Definitions

The NP0800 and NP1200 feature an IEC*320 ac input connector and a 48 pin DIN 41612 Type F output connector with level 2 gold-plated contacts.

*IEC is a trademark of International Elektrotechniker Commission.



4-0001

Figure 1. NP0800 and NP1200 Connectors

dc Connector

Each NP0800 and NP1200 rectifier has a DIN 41612 Type F connector with level 2 gold-plated contacts. Pin out configuration and function descriptions are as described in Table 1.

Table 1. 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)	FUTURE USE 2 (Bus)	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.

Connector Information and Signal Definitions (continued)

Functions of Pins and Alarms

The following is an explanation of the power pins and other pins that must be terminated for proper operation.

V_{OUT+}

Output positive power pins (electrically floating). Rated at 5 A per pin maximum. All pins labeled V_{OUT+} should be wired in parallel to provide sufficient current carrying capability to the using equipment.

LONG PIN V_{OUT+}

This pin should be connected in parallel with all the other V_{OUT+} pins to insure hot-swap capability.

V_{OUT-}

Output negative power pins (electrically floating). Rated at 5 A per pin maximum. All pins labeled V_{OUT-} should be wired in parallel to provide sufficient current carrying capability to the using equipment.

LONG PIN V_{OUT-}

This pin should be connected in parallel with all the other V_{OUT-} pins to insure hot-swap capability.

RS+ and RS-

Remote sense leads RS+ and RS- should be terminated to V_{OUT+} and V_{OUT-}, respectively, for proper operation of the power supply. These are terminated for the customer in the standard shelf for 19 inch racks, but with wire set configurations this termination must be made by the customer on the system backplane. The power supply can compensate for a 1 V drop (total, round trip) due to distribution losses.

I_SHARE

This signal pin should be connected to all other I_SHARE signal pins in adjacent rectifiers if current sharing is desired. The signal level varies linearly with average rectifier current; 0 V with respect to V_{OUT-} corresponds to 0 A per rectifier, 5 V corresponds to 25 A per rectifier.

EX_BIAS_12—15 V

This signal pin should be connected to all other EX_BIAS_12—15 V pins if the red fault LED is to be illuminated in units exhibiting a specific subset of failure mechanisms. This subset includes: blown AC fuse, boost stage fail, BIAS fail.

SHELF PRESENT

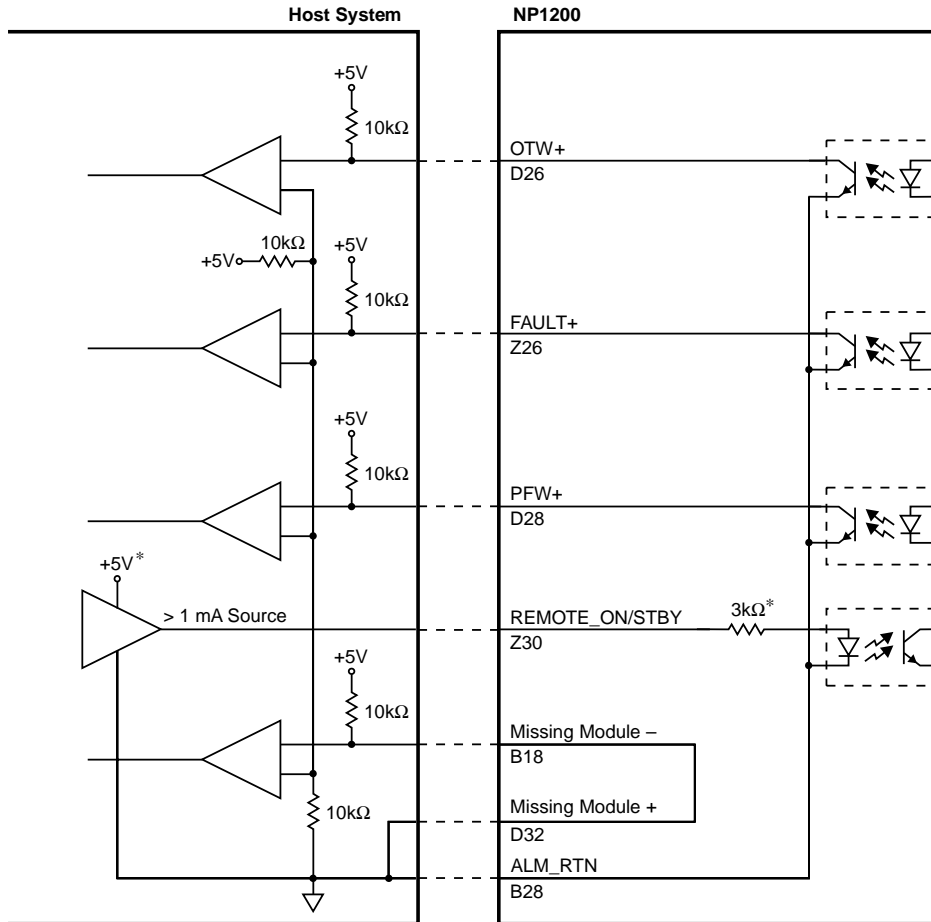
Indicates to a rectifier that a shelf is present. For proper operation of the power module, this pin must be connected to V_{OUT-} in the using system.

Isolated Analog Alarm Pins

These signals are all floating with respect to V_{OUT}. OTW+, FAULT+, and PFW+ are all active low opto-isolated outputs returning through ALM_RTN. REMOTE ON/STBY is an opto-isolated input returning through ALM_RTN. These signals can be combined with Missing Module- and Missing Module+ to determine the status of a power module using the circuit elements and the state diagram in Figure 2 and Table 2.

Connector Information and Signal Definitions (continued)

Isolated Analog Alarm Pins (continued)



*On series 2.0 and higher, the REMOTE_ON/STBY resistor is 909Ω and 3.3V logic can be used to drive 1mA through the opto-isolator.

4-0002

Figure 2. Circuit Elements

OTW+

Active low opto-isolated output returns through ALM_RTN. This signal indicates loss of cooling or ambient temperatures exceeding 60 °C, and that output power will be lost after 8 seconds.

FAULT+

Active low opto-isolated output returns through ALM_RTN. This signal indicates that a failure has been detected in the unit.

PFW+

Active low opto-isolated output returns through ALM_RTN. This signal provides a 5 ms warning before output power will be lost in the event of an ac failure or other detectable rectifier failure.

Connector Information and Signal Definitions (continued)

Isolated Analog Alarm Pins (continued)

REMOTE ON/STBY

Opto-isolated input returns through ALM_RTN. 1 mA @ 5 Vdc* puts the unit into standby. Toggling this signal resets the unit.

* 1 mA through a 909W current limiting resistor allows this circuit to be driven from 3.3V logic on series 2.0 and higher rectifiers.

ALM_RTN

Independent return for all opto-isolated signals.

Missing Module– and Missing Module+

Continuity between these pins indicates the presence of the power module.

Table 2. State Diagram

CONDITION	RECTIFIER LED STATE			MONITORING SIGNALS (Isolated Contact Closure to Alarm Return (ALM_RTN))			
	ac OK (grn)	dc OK (grn)	Fault (red)	Fault (active low, Low = Fault)	OTW (active low, Low = Alarm)	PFW* (active low, Low = warning)	Missing Module (Continuity between MM+ and MM–)
OK	1	1	0	Open	Open	Open	Pulled Low
Thermal Alarm (ambient)	1	0	0	Open	Pulled Low	Open	Pulled Low
Thermal Alarm (fan fail)	1	0	1	Pulled Low	Pulled Low	Open	Pulled Low
Blown ac Fuse in Unit	1	0	1	Pulled Low	Open	Pulled Low	Pulled Low
Low or No ac (single unit)	0	0	0	Open	Open	Pulled Low	Pulled Low
ac Not Present in any Rectifier	0	0	0	Open	Open	Open	Pulled Low
Boost Stage Failure	1	0	1	Pulled Low	Open	Pulled Low	Pulled Low
Overvoltage Latched Shutdown	1	0	1	Pulled Low	Open	Open	Pulled Low
Overcurrent	1	0	0	Open	Open	Open	Pulled Low
Any Internal Failure	1	0	1	Pulled Low*	Open	Pulled Low	Pulled Low
1 Missing Module (all else OK)				Open	Open	Open	Open
Standby (remote)	1	0	0	Open	Open	Open	Pulled Low

* PFW provides a warning 5 ms before the output goes out of regulation.

Serial Communication Pins (Optional)

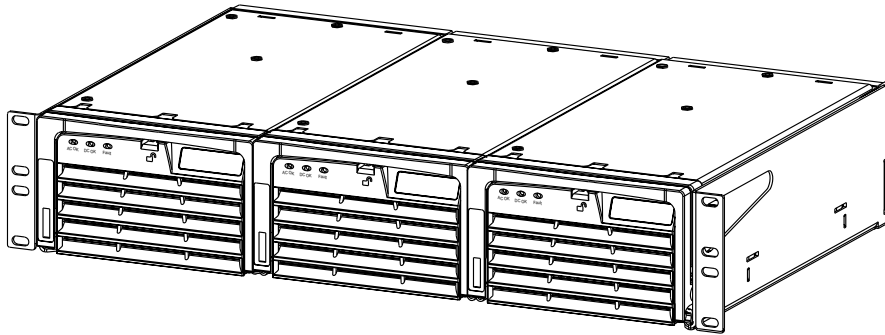
The following pins can be used for optional serial communication to the power module.

RS485+, RS485–, SERIAL RTN, SERIAL CLOCK, SERIAL DATA, SERIAL INTERRUPT, A0, A1, A2, A3, A4 and FUTURE USE 2.

Are all wired to the optional Control Enhancement Card (PCMCIA form factor) inside the rectifier. All serial communication lines are referenced to VOUT– with level shifting.

Applying the NP0800 or NP1200 in a 19 inch Rack

Use this method if you want to apply the NP0800 or NP1200 rectifiers external to the using equipment but in adjacent rackspace. Figure 3 shows three rectifiers. Possible product line extensions include a 1+1 system where either the left or right slot is replaced with a front access module providing access to ac inputs, dc outputs, and control I/O on the front face.



4-0003

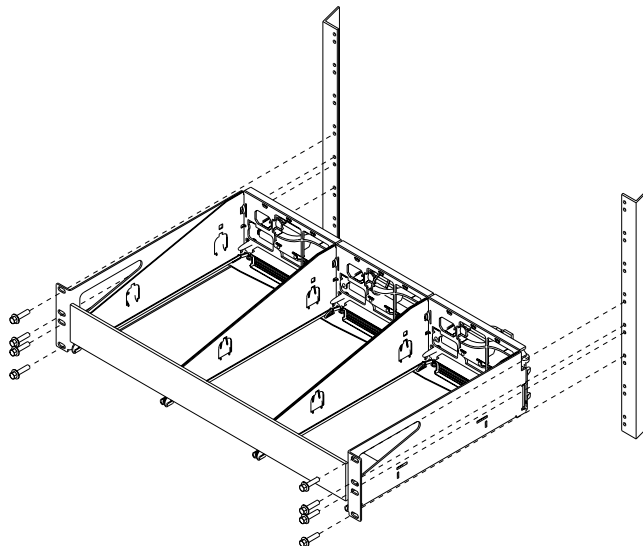
Figure 3. Three (3) NP Rectifiers

Following is a procedure for mounting an NP System in a frame followed by a procedure for attaching input and output wiring to an NP System.

Note: If the rear of the NP System will not be accessible when installed in the frame, reverse the order and attach the wires to the NP System before mounting the system in a frame. The wire exits on the NP Shelf are designed to support either installation sequence.

A. Mounting a Shelf in a Frame

1. Install the NP Shelf into rack/frame with packaging spacer bar (aluminum bar across the front) installed to maintain rectifier spacing.



A1

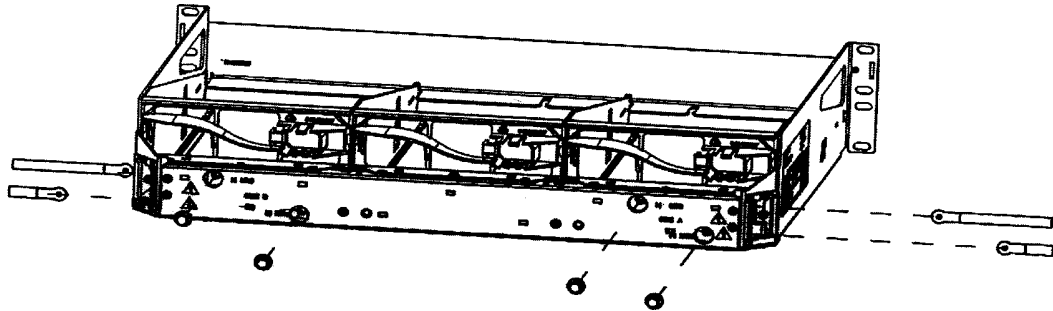
Figure 4. Mounting a NP Shelf in a Frame

Applying the NP0800 or NP1200 in a 19 inch Rack (continued)

2. Remove the packaging spacer bar after the shelf is secured to the rack/frame (i.e., after two screws per side have been tightened). Then insert the remaining screws.

B.Attaching Input and Output Wiring to an NP System:

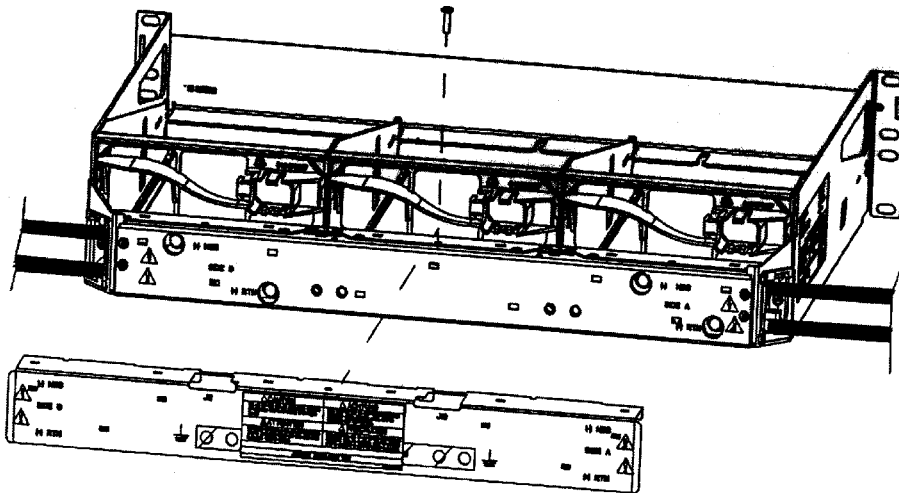
1. Check to see if DC Output cables are installed on the shelf. If the cables are already installed, skip to Step 3. If not, route DC output cables through the openings at the ends of the shelf. Negative terminals are toward the top. Positive terminals are toward the bottom. These terminals are arranged for #10 or 5mm ring lugs. Attach the cables with the M5x8 screws (provided) using a 8mm or 5/16" nut driver. Torque to 35 in-lbs [4 Nm]. Suggested torque wrenches are: NAPA SER 2955 or NAPA SER 3261.



B1

Figure 5. Attaching DC Output Cables

2. To install the safety cover, first remove the black screw from the top of the shelf. Then, insert the cover through the back of the shelf and slide *down* until it snaps into place. Replace the black screw and hand-tighten.



B2

Figure 6. Installing the Safety Cover

Applying the NP0800 or NP1200 in a 19 inch Rack (continued)

3. (This step is optional) If required by the using equipment, connect the provided ground cable between the shelf and auxiliary earth ground point. M5-.8 x 8 screws are provided for connection to the NP Shelf.

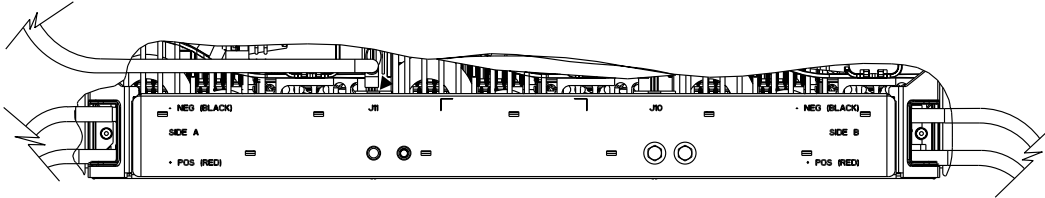


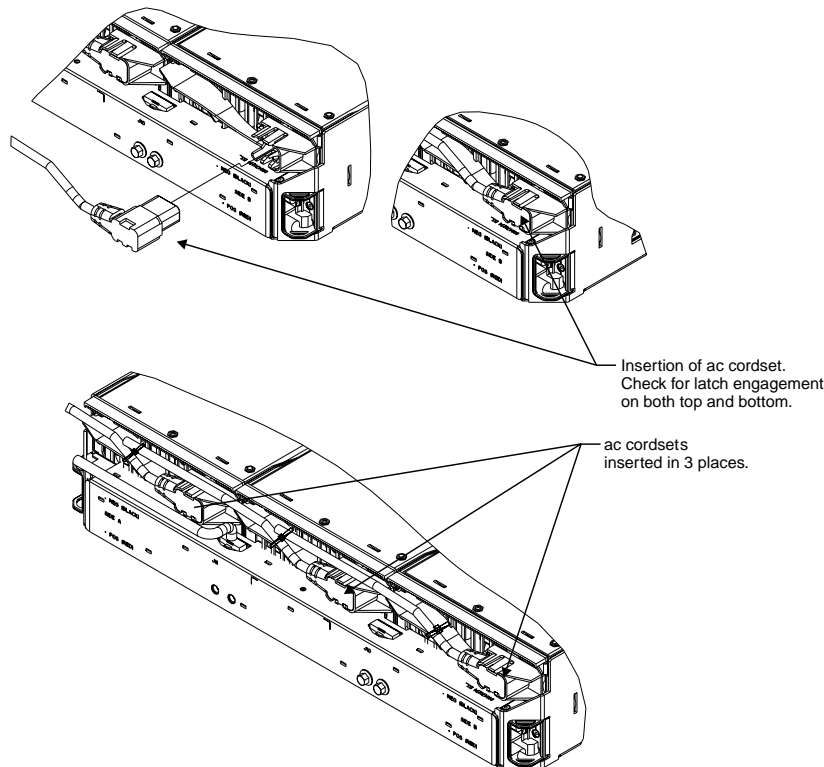
Figure 7. Grounding connection for Double-Hole Lug

B3

WARNING: If one side of the DC output is connected to ground, the NP Shelf chassis must also be connected to the same ground. Failure to do so may cause damage to the AC safety earth ground in the case of a DC fault.

4. The ac power is applied using three (3) ac cordsets purchased specifically for the country of use. (See Table 6) Each rectifier should be connected to a minimum of 10 A when supplied with a service voltage of 200 V or higher. A minimum service of 15 A is required for 120 V applications.

The right angle IEC320 end of each country specific cordset should be snapped into each of the three positions in the shelf. Care should be taken to dress the wire to the left when inserting the wires from the back of the shelf. See Figure 8.



4-0004

Figure 8. Installing ac Cordsets

Applying the NP0800 or NP1200 in a 19 inch Rack (continued)

5. Secure the load side of the DC output cables.

If the cables were supplied attached, (NP Shelf) remove the covers from the end of the dc output cables and connect to the loads. Cables are intended to terminate into a terminal block. The recommended terminal block is a Phoenix terminal block part number MKDSP 10/2-10,16 order number 17 06 78 5. To realize the full capability of the power shelf, both pairs of 6 AWG wire must be terminated at the using equipment. Each Phoenix terminal should be torqued to 1.2 to 1.5 Nm (10.6 to 13.2 inch-lbs).

6. If applicable, connect and strain relieve the office alarm cable(s) into J10 and/or J11.

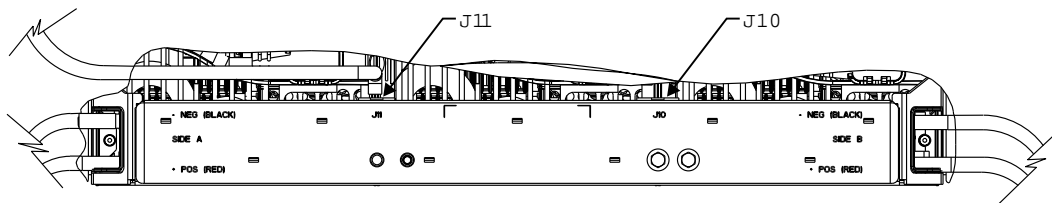
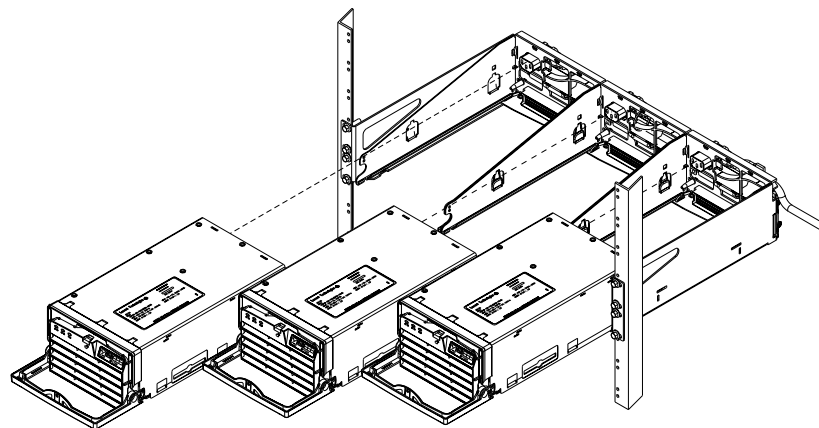


Figure 9. Securing Alarm Cable Sets J10 & J11

7. To install rectifiers, first open the rectifier handle by inserting a flat bladed screw driver into the slot on the top center of each rectifier face. Gently pry to release the handle latch and position the handles as shown below. Then, insert each rectifier into the shelf until the handle begins to close from interaction with the shelf. Close the handle to draw and latch the rectifier into its fully mated position.

B6



B7

Figure 10. Installing Rectifiers

8. Connect the ac power supply cords to appropriately rated outlets (*see safety guideline AC input connection section for further information*).


Applying the NP0800 or NP1200 in a 19 inch Rack (continued)

9. For North America 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. The following information provides guidance on typical color codes used for the conductors:

Location	Conductor Color	Connection
North America (Connections to 120 volt or 240 volt nominal systems – 2 pole with a 3rd wire for safety grounding)	Black	Phase
	White	Neutral (may also be used as a phase to obtain 240 volts in North America)
	Green	Safety Ground/Earth
North America/Europe	Brown	Phase
	Blue	Neutral (may also be used as a phase to obtain 240 volts in North America).
	Green/Yellow	Safety Ground/Earth

WARNING: The AC safety earth ground is provided through each cord. Make sure the equipment is plugged into an AC receptacle with a safety earth ground.

10. PRODUCT RATING INFORMATION

INPUT, AC			OUTPUT, DC	
V _{IN}	I _{IN} (max)	FREQ.	V _{OUT}	P _{OUT} (max)
100, 120 V ~ 200-240 V ~	15, 12 A 7.4 A	50/60 Hz	48-56 V** 	1200 W max per rectifier *

* Actual system output based on sum of rectifier capacities

** For the specific DC output voltage, refer to the white label on the side of the NP1200 rectifier.

Applying the NP0800 or NP1200 in a 19 inch Rack (continued)

Electrical Interface

Control is available through two connectors on the top of the support tube at the back of the shelf. These control connectors are labeled J10 and J11 and present signals from rectifier slots 1 through 3 as shown in Table 3.

Table 3. Control Connectors

43045-1411 Molex*	J10	43045-1211 Molex*	J11
1	RS485+ (B)	1	REMOTE_ON/STBY (1)
2	RS485- (B)	2	REMOTE_ON/STBY (2)
3	SERIAL RTN (B)	3	REMOTE_ON/STBY (3)
4	SERIAL DATA (B)	4	PFW+ (1)
5	SERIAL CLOCK (B)	5	PFW+ (2)
6	Missing Module 1+	6	PFW+ (3)
7	RS- (B)	7	FUTURE USE 2 (B)
8	SERIAL INTERRUPT (B)	8	OTW+ (B)
9	A4 (B)	9	FAULT+ (B)
10	A3 (B)	10	ALM_RTN (B) and Missing Module 1-
11	EX_BIAS_12—15 V (B) [†]	11	Missing Module 3+
12	A2 (B)	12	I_SHARE (B)
13	Missing Module 2+		
14	RS+ (B)		

* Molex is a registered trademark of Molex, Inc.

[†] For rectifiers series 1:2 and higher.

Note: These part numbers provide for gold-plated contacts

The standard 19 inch shelf can be optionally equipped with a DB9 wireset that presents ALM_RTN, FAULT+, OTW+, Missing Module 3+ (the end of a daisy chain through the three power modules), and a consolidated PFW+. Order per Table 8. The pin assignments for this wireset are listed in Table 4.

Table 4. Pin Assignments

DB9	Signal
1	PFW+ (1, 2, and 3 together)
2	OTW+ (B)
3	FAULT+ (B)
4	ALM_RTN (B) and Missing Module 1-*
5	Not Connected
6	ALM_RTN (B) and Missing Module 1-*
7	ALM_RTN (B) and Missing Module 1-*
8	Not Connected
9	Missing Module 3+*

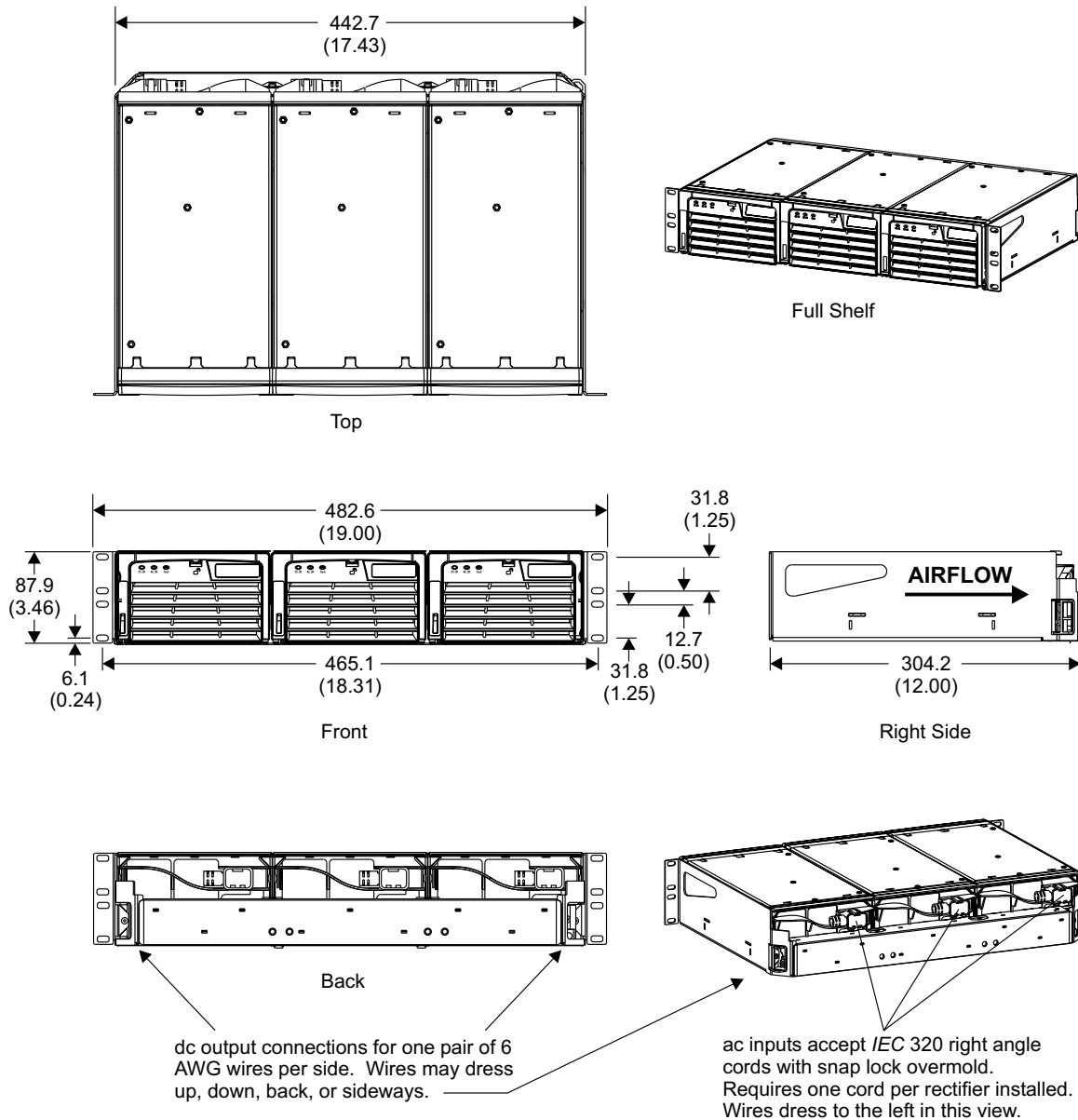
* Continuity between 4 and 9 indicates all power modules are installed.

Note: This optional wireset is configured for redundant monitoring; i.e., there are two identically wired DB9 connectors available on the host end of the wireset.

Applying the NP0800 or NP1200 in a 19 inch Rack (continued)

Mechanical Interface

Dimensions are in millimeters (inches). Mechanical specifications for mounting the shelf in a frame can be found in Figure 11.



4-0006

Figure 11. Mounting Dimensions for NP Shelf

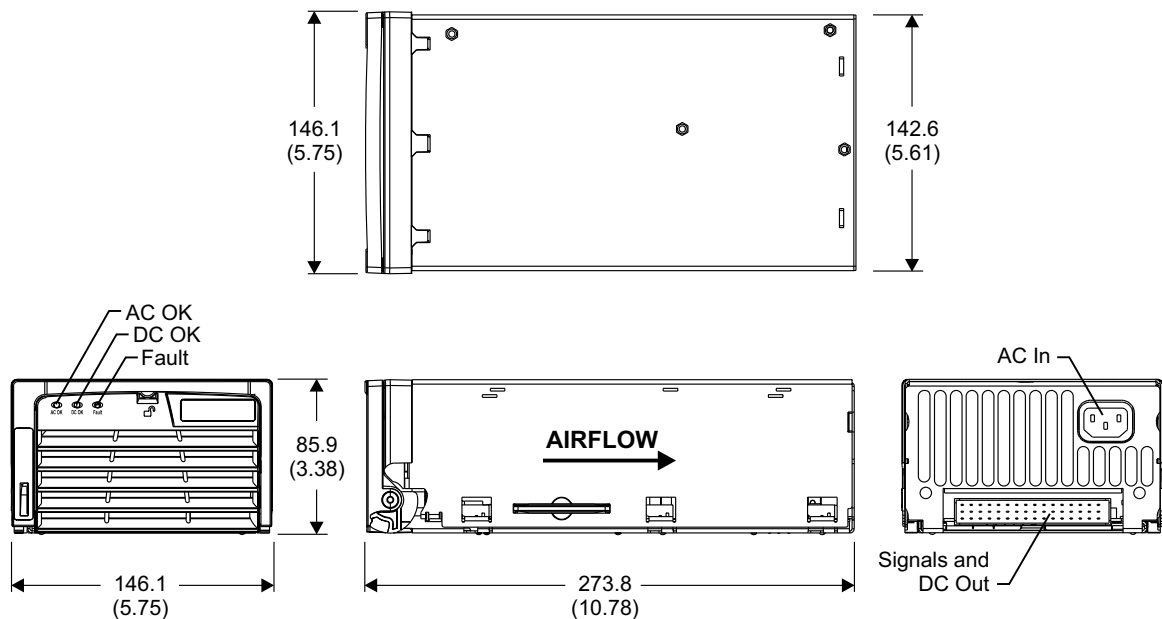
Applying the NP0800 or NP1200 in a Workstation Drive Bay

Use this method if you want to quickly and reliably apply NP0800 or NP1200 rectifiers in your chassis. Brackets mount on standard floppy drive bay centers and provide hot-swap capability. Bracket includes a wireset enabling simple connection directly to the system backplane. Please contact your factory representative for availability.

Applying the NP0800 or NP1200 in a Custom or Embedded Application

Use this method if the drive bay brackets, for applying the NP0800 or NP1200 in a workstation drive bay, consume too much space or if you wish to plug the units directly into a backplane of your design. To apply the NP0800 or NP1200 in a custom application, purchase both the shelf liner and DIN connector assembly shown in Table 9 for each rectifier position.

Dimensions are in millimeters (inches).

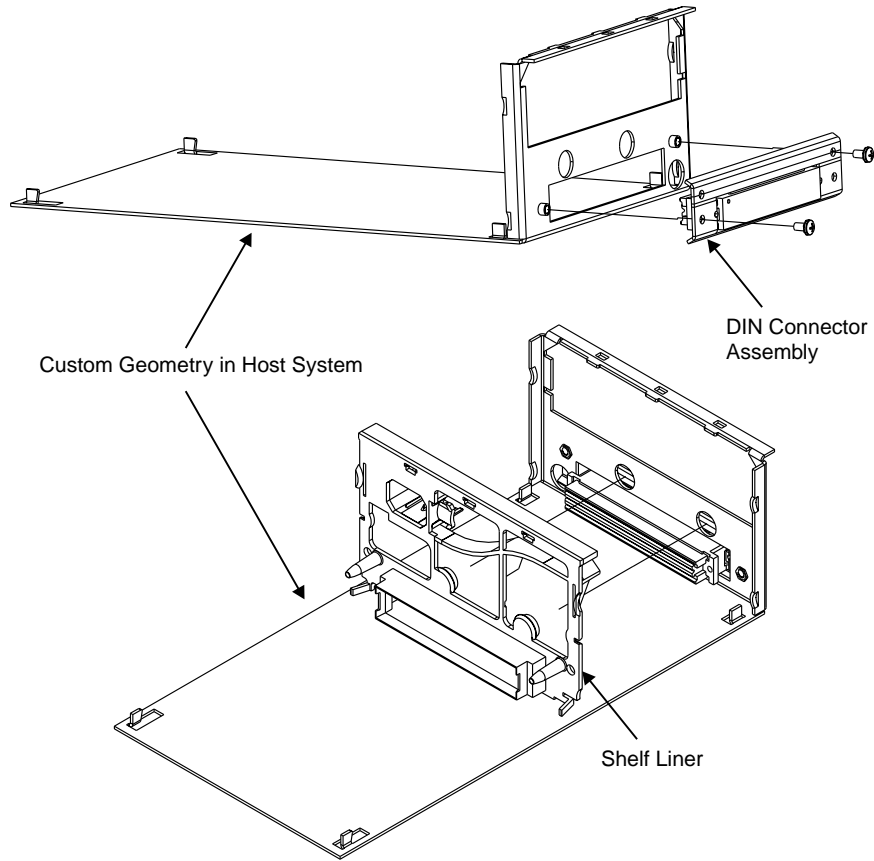


4-0007

Figure 12. Outline Diagram

Detail Drawings

The 0.060 inch thick sheet metal part shown in figures 14—17 positions and retains the shelf liner and output connector with respect to the latch seating features to assure proper seating of the power module.

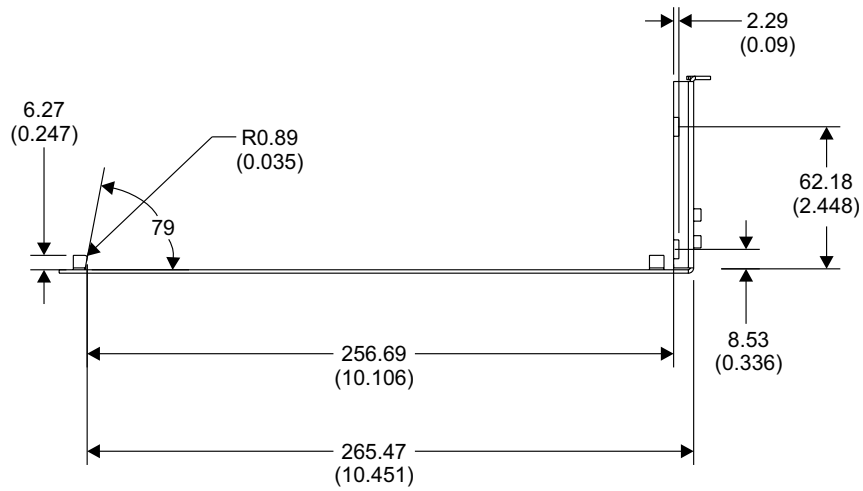


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Figure 13. Host System

Detail Drawings (continued)

Features that interact with the power module for secure reliable application is shown in Figure 14.
Dimensions are in millimeters (inches).



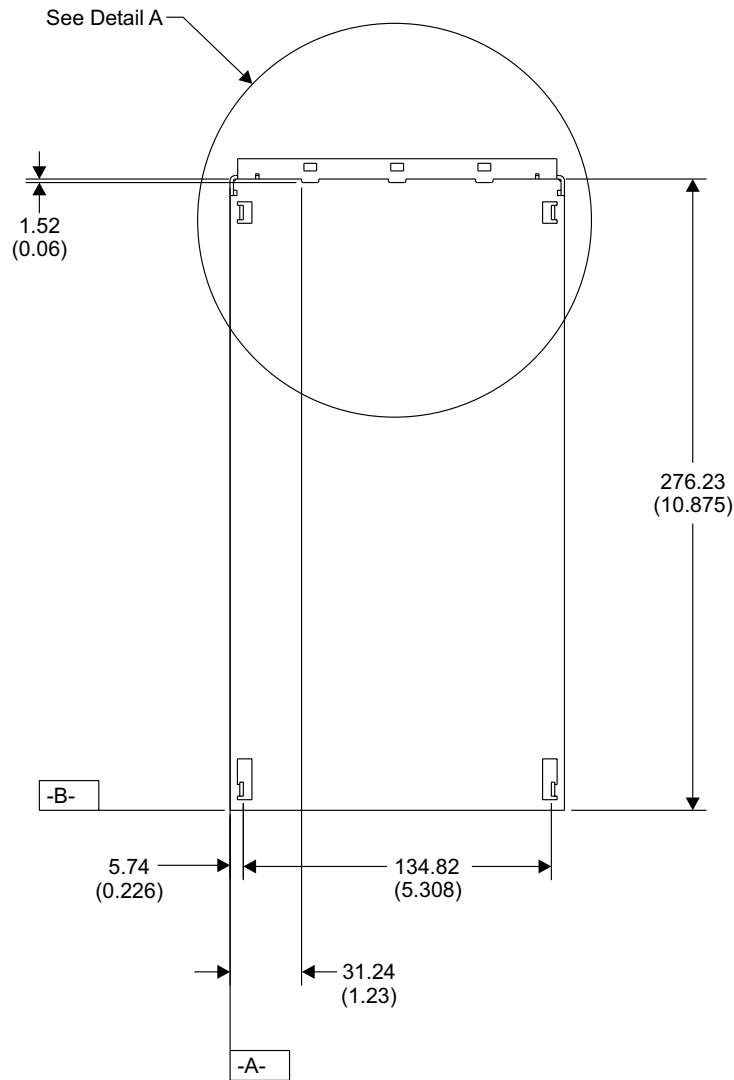
4-0009

Figure 14. Interaction with the Power Module

Detail Drawings (continued)

Additional detail with emphasis on positioning the shelf liner are shown in Figures 15 & 16.

Dimensions are in millimeters (inches).



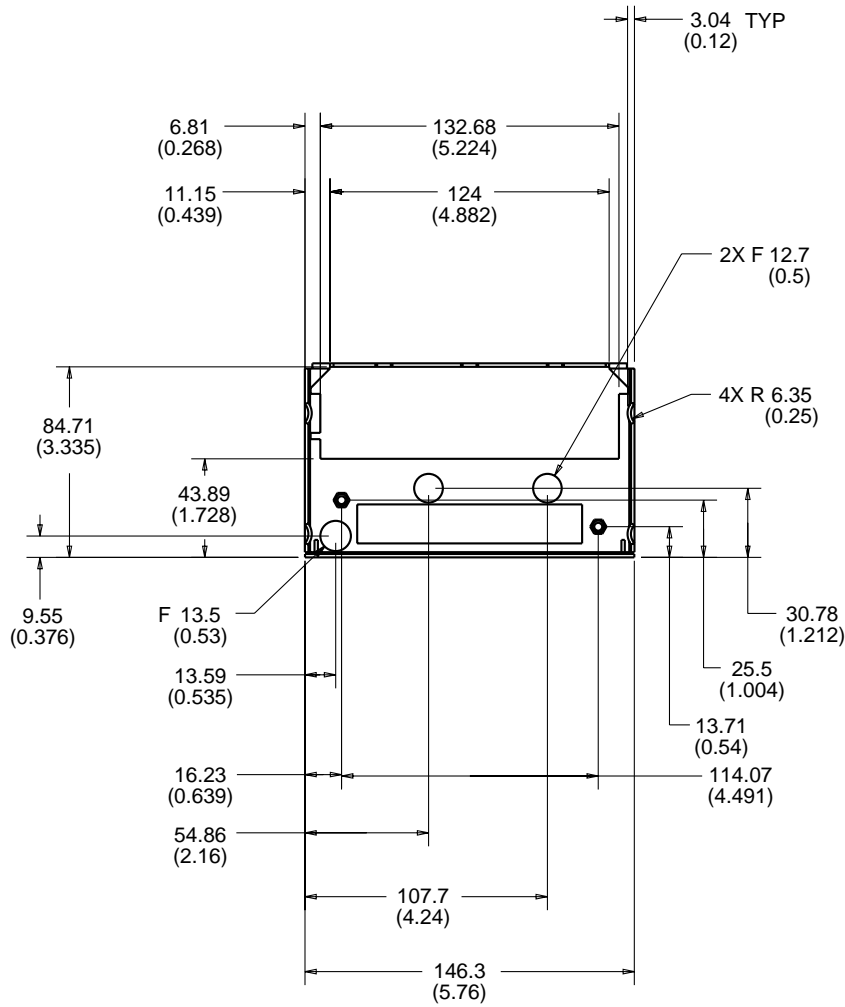
4-0010

Figure 15. Shelf Liner

Detail Drawings (continued)

Details showing air passageway and lance feature details for seating the power module and shelf liner is shown in Figure 17.

Dimensions are in millimeters (inches).



4-0012

Figure 17. Details the Air Passageway

Ordering Information

Table 5. Product Codes

Product	Includes	Part Number
NP1200 System	Three (3) NP1200 Rectifiers, 52 V One (1) NP Shelf w/dc cables*	108842865
NP1200 System LC	Three (3) NP1200 Rectifiers, 52 V One (1) NP Shelf without dc cables	108962341
NP1200	One (1) NP1200 Rectifier, 52 V	108547886
NP0800	One (1) NP0800 Rectifier, 52 V	108957929
NP Shelf	One (1) NP Shelf w/dc cables*	108645573
NP Shelf LC	One (1) NP Shelf without dc cables	108961806
19 inch midmount rack ears	2 rack ears with fasteners for NP shelf	848652426
23 inch midmount rack ears	2 rack ears with fasteners for NP shelf	848652848
NP expansion slot chassis	Empty Power Module Chassis to fill empty slots	108959925

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

Table 6. DC Output Cables (required with NP1200 System LC, and NP Shelf LC)

One DC cable required per load termination, maximum 2 DC cables per NP Shelf.

Product	Includes	Part Number
Juniper Networks 10ft output cable	10ft cable set terminated with double hole lug: Panduit part number LCD2-14A-Q	848652657

ac Cord Sets

The NP0800 and NP1200 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	Part Number
North America	15 A/125 Vac, 10 A/250 Vac*	IEC 320 C-13 Right Angle	NEMA 5-15P	848545166
Italy	10 A/250 Vac	IEC 320 C-13 Right Angle	MP231 CEI13-16/VII	848545216
Europe	10 A/250 Vac	IEC 320 C-13 Right Angle	IEC 884/CEE 7/7 Exception to CEE 7/7: Switzerland SEV 1011	848545208
United Kingdom	13 A/250 Vac	IEC 320 C-13 Right Angle	BS1363, w/13 A fuse	848545224
Australia	10 A/250 Vac	IEC 320 C-13 Right Angle	AS3112	848545232
Argentina	10 A/250 Vac	IEC 320 C-13 Right Angle	IRSM 2073:1982	848545240
China	10 A/250 Vac	IEC 320 C-13 Right Angle	GB2099.1-1996	848545190
Japan	15 A/125 Vac	IEC 320 C-13 Right Angle	JIS 8303	848545182

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

Ordering Information (continued)**Table 8. Alarm Cable**

Product	Includes	Part Number
Analog Alarm Cable	One (1) DB9 Cable Harness (see Table 4.)	848545257

Custom Installation

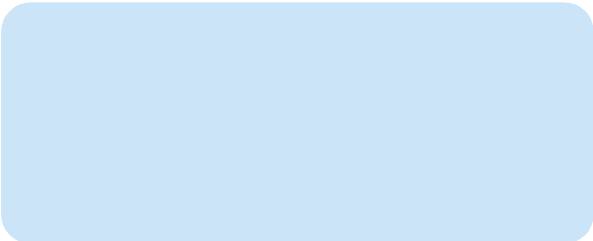
Please order items from Table 9 if you wish to use the NP0800 or NP1200 rectifier without the NP shelf. This allows you, the customer, to order the shelf liner and the mating dc DIN connector.

Table 9. Product Codes

Part Name	Includes	Part Number
Shelf Liner	One (1) Plastic Shelf Liner	848470357
DIN Connector Assembly	One (1) DIN Connector, one (1) metal plate, two (2) screws	TBD



Tyco Electronics Power Systems, Inc.
3000 Skyline Drive, Mesquite, TX 75149, USA
+1-800-526-7819 FAX: +1-888-315-5182
(Outside U.S.A.: **+1-972-284-2626**, FAX: +1-972-284-2900)
<http://power.tycoelectronics.com>



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