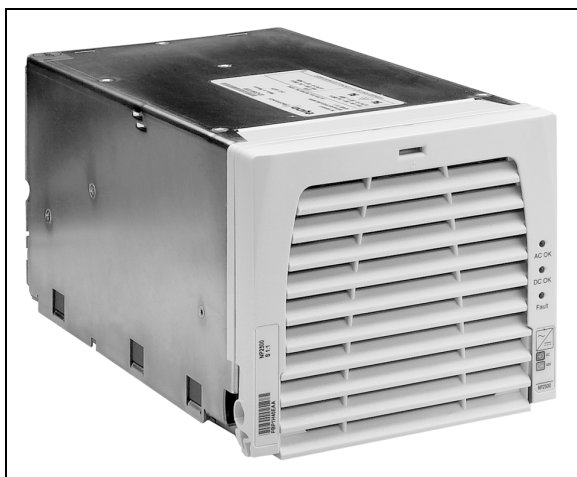


## NP2500 Constant Current Front-End Power Supply 150 Vac to 264 Vac Input; 42 Vdc to 58 Vdc Output



### Applications

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

### Description

The NP2500 front-end power supplies are specifically designed to operate as an integral part of a complete distributed power system requiring modular ac-to-dc bulk intermediate voltages. Features reflect an emphasis on worldwide acceptance of this power system.

\* IEC is a trademark of International Electrotechnical 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

- 2600 Watt output from  $52 \leq V_{out} \leq 58$  Vdc
- 50A output from  $42 \leq V_{out} < 52$  Vdc
- 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)
- Output may be powered-up with 25,000  $\mu$ F capacitive load
- Active load sharing
- Remote sense
- Remote On/Standby
- Over-temperature protection
- Optically isolated alarm signals with a common return
- Front panel LED status indicators
- Power Factor Correction (meets EN61000-3-2)
- CISPR Class B EMI (radiated and conducted)
- UL†60950 Recognized, CSA‡ C22.2 No. 60950-00 Certified, and EN 60950 (VDE§0805):2001-12 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

## Electrical Specifications

Table 1. Input

Parameter	Min	Typ	Max	Unit	Note
Input Voltage					
Turn-on	—	170	175	Vac	Unit will turn on when input voltage is within the range of 170 and 175V.
Normal Operation	170	200-240	264		Output will not go out of regulation with line excursions to 300 Vac.
Power Limited Operation	155	—	170		Once powered up, unit enters power-limited mode of operation for falling line voltages below 170 Vac, within specified range. Unit resumes normal operation for increasing line voltages from 170 to 175 Vac.
Shutdown	—	150	—		Unit will shut down if line voltage is between 138 and 150 Vac for more than 100ms.
Frequency	47	—	63	Hz	—
Input Current	—	—	14 13	A A	at 208 Vac at 240 Vac
Inrush Current			40	A <sub>peak</sub>	Measured at 25°C for all rated line conditions. Does not include charging of X-capacitors.
Input Leakage Current	—	—	3.2	mA	255 Vac, 60 Hz.
Power Factor	0.975	0.995	—	—	From 50% to full load.
Efficiency	—	90	—	%	at 230 Vac with V <sub>OUT</sub> ≥ 52 V.
Hold Over Time	20	—	—	ms	Alarm 5 ms prior to shutdown. Output voltage allowed to droop to 46V into a 2600W constant power load.
Total Harmonic Distortion			6	%	From 50% load to full load.

Table 2. Output

Parameter	Min	Typ	Max	Unit	Note
Vo Set Point	—	52	—	Vdc	Set point tolerance is 1%. Factory default output voltage set to 52V.
Total Output Power (See Note)	—	—	2600	W	When input voltage is between 170 and 264 Vac, and output voltage is in the range 52 ≤ Vo ≤ 58. Tolerance on max output power is +50W.
	—	—	50	A	When input voltage is between 170 and 264 Vac, and output voltage is in the range 42 ≤ Vo < 52. Tolerance on max output power is +1A.
	—	43	—	A	Output is current limited to 43A ± 1.5A when operated from 155 to 170 Vac.
Programmable Vo 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.

**Electrical Specifications** (continued)

**Table 2. Output** (continued)

Parameter	Min	Typ	Max	Unit	Note
V <sub>fullpower</sub>	—	—	2600	W	From 52 < V <sub>OUT</sub> ≤ 58 (see Note)
V <sub>hiccup</sub>	—	10	12	Vdc	Current tail does not start before 12V.
I <sub>LIM</sub>	—	52.5	—	A	At 52V.
I <sub>shortcircuit</sub>	—	—	10 200	A %	Average over hiccup period. Excluding current pulses less than 500µs.
Ripple and Noise	—	—	250	mVp-p	20 MHz bandwidth under any load condition.
Transmission Noise	—	—	45	dBrnC	
Psophometric noise	—	—	2	mV	
Output Rise Time	20	—	150	msec	Measured between the 10% and 90% points of the output-voltage-rising waveform for any rated load condition.
Turn-On Overshoot	—	0	1.5	Vdc	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 load change at 25% to 75% load 10% step load change at 0% to 25% load 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	25,000 µF Typ.
Current Share Tolerance	—	2	—	%	Of full scale rating.
Reverse Output Current Protection	—	—	0.5	A	ORing diode.
Turn-on Delay	—	—	1.5	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  $42 \leq V_o \leq 58V$  with the output performance as noted above. Users may also margin the output voltage to any voltage in the range  $42 \leq V_o \leq 58V$  with an optional Network Protocol Card. When the rectifier is programmed to an output voltage within the range of  $52V \leq V_o \leq 58V$ , 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  $42V \leq V_o < 52$ , the output current is maintained at that for 52V, therefore, the rectifier produces less power. For example, if the NP2500 is programmed to 48V, the resultant output power would be 2448W (48V x 51A---51A is the current limit set point for the NP2500). Consult factory for more details.



## Environmental Characteristics

Table 3. 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.
Sound Pressure	—	—	60	dB(A)	Sound pressure level measured on a system consisting of three rectifiers operating with normal fan speed in Power systems shelf from the bystander position per Telcordia GR-63-CORE (NEBS).
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 NP Shelf and 3 rectifiers in 19 in. rack.
Harmonic Emissions					Per EN/IEC61000-3-2
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/IEC61000-4-2 (6 kV contact discharge, 8 kV air discharge).
Radiated Immunity	3	—	—	level	Error free per EN/IEC61000-4-6 (10 Vrms) Error free per EN/IEC61000-4-3 (10 V/m)
Electrical Fast Transient Burst	3	—	—	level	Error free per EN/IEC61000-4-4 (1 kV on I/O and control ports, 5 kHz repetition rate) for occurrences at 1 minute intervals.
Lightning Surge error-free damage-free	4	—	—	level	Will operate with 320V surge of 2 second duration. EN/IEC61000-4-5 Level 4 (4 kV) ANSI C62.41 B3 (6 kV)
Conducted Immunity	3	—	—	level	Error free per EN/IEC61000-4-6 (10 Vrms)
Reliability (calculated)	375k	—	—	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 EN61000-3-2.

#### 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 or by power cycling.

#### 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.

#### 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 line 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.

#### 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 200 - 240V line voltage; consult the factory for any particular regional application concerns.

### Input Connector

The ac input connection is through an IEC320 type connector system rated for the currents involved.

### Grounding

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

## Connector Information and Signal Definitions

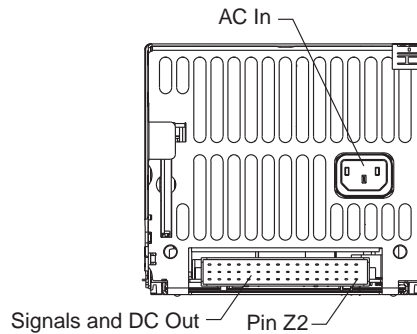


Figure 2. NP2500 Connectors

### DC Connector

Each NP2500 rectifier has a DIN 41612 Type F Connector with level 2 gold plating.\* Pin-out configuration and function descriptions are as described in Table 4.

Table 4. Rectifier Output Connector Pin Outs

	32	30	28	26	24	22	20	18	16	14	12	10	8	6	4	2
<b>D</b>	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>B</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)
<b>Z</b>	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)

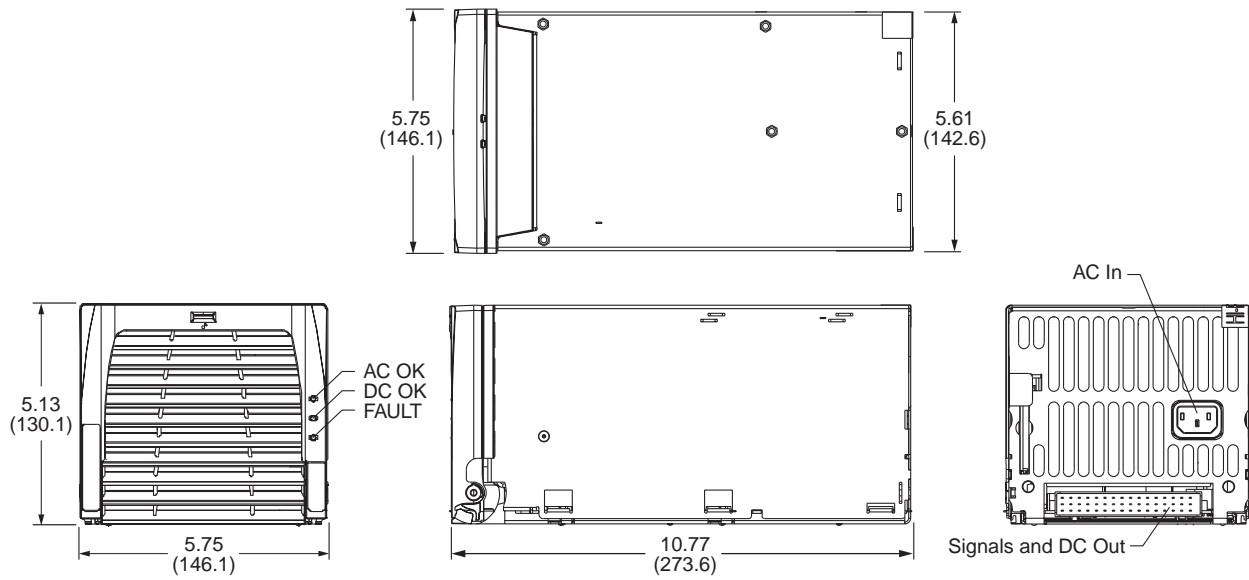
Note: The (Bus) and (Line) suffixes are indications of how signals are wired on the standard 19 inch NP Shelf.

(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.

**Physical Specifications**



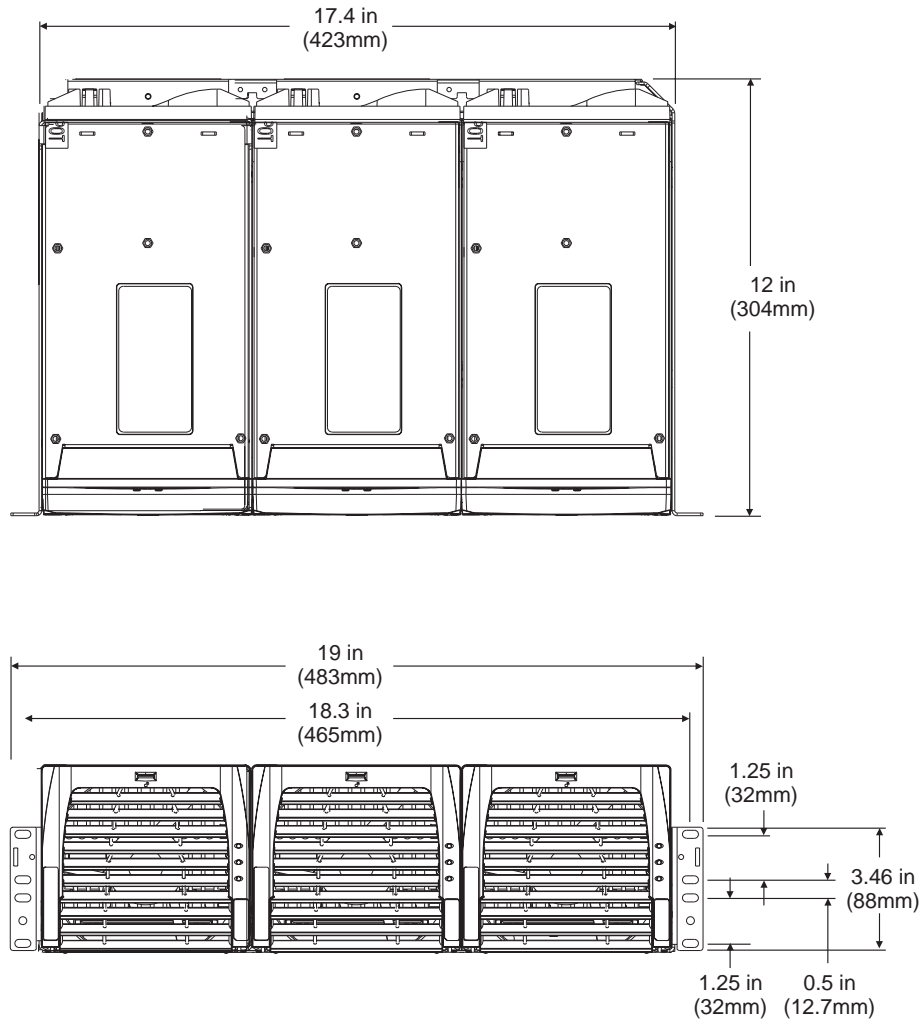
**Figure 3. NP2500 Rectifier Specifications**

**Table 5. Rectifier Physical Specifications**

Parameter	Min	Typ	Max	Unit	Notes
Length	—	10.77	—	inches	—
Width	—	5.61	—	inches	Chassis
	—	5.75	—	inches	Face plate
Height	—	5.13	—	inches	Chassis
	—	5.13	—	inches	Faceplate
Weight	—	9.5	—	lbs.	Without shipping package
Weight	—	11	—	lbs.	With shipping package



**Physical Specifications** (continued)



**Figure 4. NP2500 System Dimensions - Three NP2500 Rectifiers in NP Shelf**

**Warranty Information**

When used within specified operating conditions, Tyco Electronics 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 Tyco Electronics for repair. Tyco'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 Tyco Electronics or an authorized agent. Additional details are provided in contract documents and other full-warranty statements.

## Ordering Information

Table 6. Product Codes

Product	Description	Comcode	Shipping Weight
NP2500 Rectifier	One (1) NP2500 Rectifier, 2600W, 52V, 50A	108959511	11 lbs
NP Shelf	One (1) NP Shelf with dc output cables*, holds up to three (3) rectifiers	108645573	9 lbs
NP Shelf LC	One (1) NP Shelf without dc output cables, holds up to three (3) rectifiers	108961806	8 lbs
3U NP Shelf	One (1) 3U NP Shelf, holds two (2) NP2500 Rectifiers with one (1) distribution module (includes one (1) 150A circuit breaker and one (1) RJ45 connector), without dc output cables	108966383	17 lbs

\* includes redundant 6 gauge, 3 ft 10 in length dc output cables

Table 7. AC Cord Sets

Region	AC Cord Sets	Wall Plug	Comcode
International Harmonized Cord, Blunt-Cut	15A / 250Vac	N/A	848672804
Argentina	15A / 250Vac	IRSM 2073:1982	848679726
Australia / New Zealand	15A / 250Vac	AS3112	848672812
China	15A / 250Vac	GB2099.1-1996	848679734
Europe	16A / 250Vac	IEC884 / CEE 7/7 Exception to CEE 7/7: Switzerland SEV1011	848672796
Italy	16A / 250Vac	MP231 CEI 23-16 / VII	848672788
Japan	15A / 250Vac	JIS 8303	848679742
North America	15A / 250Vac	NEMA L6-20	848667622
North America	15A / 250Vac	NEMA 6-20P	848667614
United Kingdom	15A / 250Vac	BS546 / A	848672770

Notes:

- 1) The appliance connector used on all of the region-specific ac cord sets is the IEC 320 C-14, right angle.
- 2) All ac cord sets are 10 feet in length.

### Safety Consideration:

The NP2500 rectifier is provided with an input connector evaluated for use at maximum 15A, 250V. Refer to Table 7 to order the appropriate Tyco cordset for this rectifier.

The safety agency condition of acceptability requires the following of the power supply cord when a cord-set per Table 7 is not utilized in the end-use equipment:

1. The mating appliance connector to the NP2500 shall be agency tested for 15A, 250V.
2. The minimum conductor size shall be 1.5mm<sup>2</sup> <HAR> or 14 AWG <SJT> or equivalent type.
3. An ac line plug, suitable for the country of use, shall be used or specified.

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