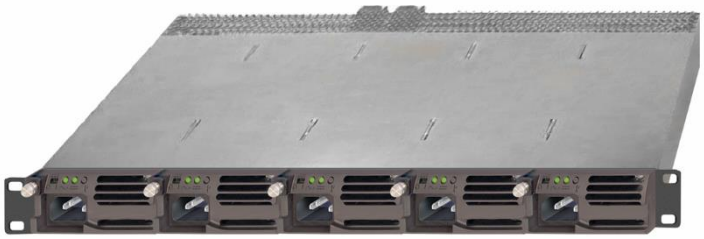
FNP600/850/1000
AC-DC Power Supply
FNR-5-12G/FNR-5-48G Power Shelves



The FNP600/850/1000 power factor corrected (PFC) front ends provide (depending on model) either a 12 VDC or a 48 VDC output for telecom, datacom, and other distributed power applications. Their small 1U by 2U size allows for configurations of either height in hot-swap redundant systems while their internal fan and cooling design permits wide use with reliable operation.

Status is provided with front panel LEDs, logic signals, and via the I^2C management interface bus. In addition, the I^2C bus can enable the power supply, control fan speed, and on the 12 VDC models it allows for adjusting the output voltage from 7 to 12 VDC. This powerful feature allows the same power supply to be used in various applications where bus voltages driving isolated dc-dc converters and POL regulators may be different.

Also, the FNP850-12R is uniquely designed with airflow from the rear of the power supply to the front. This airflow direction supports those critical applications where space limitations and/or higher ambient temperatures near the rear of the rack system, prohibit the discharge of higher temperature airflow from regular front-to-rear cooled power supplies.

The FNP600/850/1000's meet international safety requirements and are CE marked to the Low Voltage Directive (LVD).

Key Features & Benefits

- RoHS lead free solder and lead solder exempted products are available
- High density front-ends 10.5 to 16.1 W/in^3
- Universal input voltage range (90-264 VAC) with PFC
- 1U or 2U height configurations
- Droop current share with ORing FETs
- I^2C interface status and control
- Standby voltage of 12 VDC @ 0.5 A
- Overtemperature, overload, and overvoltage protection
- Status LEDs: AC OK, DC OK, Overtemperature
- FNP850-12 model has airflow direction from front-to-rear or from rear-to-front (-12R model)
- ON/OFF Enable switch - shuts OFF Vo1; Vaux and fan are operational.

Applications

- Telecom
- Datacom
- Distributed Power Systems

North America
+1-866.513.2839

Asia-Pacific
+86.755.29885888

Europe, Middle East
+353 61 225 977

tech.support@psbel.com
belpowersolutions.com

bel POWER SOLUTIONS & PROTECTION
a bel group

© 2015 Bel Power Solutions, Inc.

Please read our datasheet & drawing disclaimer here.

Model Selection

MODEL	NOMINAL OUTPUT VOLTAGE (VDC) [1]	ADJUSTMENT RANGE (VDC)	MAXIMUM OUTPUT CURRENT (Amps)	LINE REGULATION (%)	LOAD REGULATION (%) [2]	RIPPLE & NOISE pk-pk % [3]	COMPATIBLE SHELF
FNP600-12	12 12 (Standby)	7 to 12 N/A	51 0.5	0.17 8	6 8	1 1	FNR-5-12
FNP850-12	12 12 (Standby)	7 to 12 N/A	73 0.5	0.17 8	6 8	1 1	FNR-5-12
FNP850-12R [4]	12 12 (Standby)	7 to 12 N/A	73 0.5	0.17 8	6 8	1 1	FNR-5-12
FNP600-48	48 12 (Standby)	44 to 50.5 N/A	12.6 0.5	0.17 8	6 8	1 1	FNR-5-48
FNP1000-48	48 12 (Standby)	44 to 50.5 N/A	21 0.5	0.17 8	6 8	1 1	FNR-5-48

[1] Models with 5V and 3.3V standby voltages are also available. (Contact factory.)
[2] Primary 12V and 48V outputs have built-in droop regulation.
[3] Maximum peak-to-peak noise expressed as a percentage of output voltage; 20 MHz bandwidth.
[4] FNP850-12R model has airflow from rear to front.

Ordering Information

Options	Suffixes to Add to Part Number
RoHS lead solder exemption	No RoHS suffix character required.
RoHS compliant for all 6 substances	Add "G" as the last character of the part number.

Input Specifications

PARAMETER	CONDITIONS/DESCRIPTION		MIN.	NOM.	MAX.	UNITS
AC Input Voltage	Single-phase continuous input range.		90		264	VAC
Input Frequency	AC input.		47		63	Hz
Hold-up Time	After last AC line peak at full power.	At 115 VAC	20[1]			ms
Input Current	At full-rated load.	At 90 VAC			14	A rms
Inrush Surge Current	Internally limited. Vin = 230 VAC, T = 25 °C				34	A pk
Power Factor	Per EN61000-3-2		0.97			W/VA

[1] FNP1000-48 model has a hold-up time of 16 ms

Output Specifications

PARAMETER	CONDITIONS/DESCRIPTION		MIN.	NOM.	MAX.	UNITS
Efficiency:	Full rated load at 230 VAC input.	FNP600-48 FNP1000-48 FNP600-12 FNP850-12	88 88 84 84	89.5 89.5 87 87		%
Minimum Load	Minimum loading required to maintain regulation.		0			A
Output Power		FNP1000 FNP850 FNP600			1006 856 600	W
Overshoot	Output voltage overshoot at turn-on.				3	%
Transient Response	Maximum recovery time to within 1% of initial set point due to a 50% load change, 1A/µs.	12V or 48V output: Standby output:			400 2	µs ms
	Maximum deviation:	12V or 48V output: Standby output:			2 4	%
Turn-On Delay	Time required for initial output voltage stabilization after application of AC input..				1.5	Sec
Output Regulation	See Model Selection table.					

866.513.2839
tech.support@psbel.com
belpowersolutions.com

© 2015 Bel Power Solutions, Inc.

Protection

PARAMETER		CONDITIONS/DESCRIPTION	MIN.	NOM.	MAX.	UNITS
Overvoltage Protection	FNP600-12 & FNP850-12	Latch-style overvoltage protection. Output adjusted to 12V:	14.4	15	15.6	V
	FNP600-12:	Latch-style overvoltage protection.	8.75	9.04	9.33	V
	FNP850-12:	Output adjusted to 7V:	8.44	8.75	9.1	
	FNP600-48 & FNP1000-48	Latch-style overvoltage protection. Output adjusted to 48V:	57[1]		60	V
Overcurrent Protection (Power supply recovers when short is removed.)	FNP600-12	Current limit.12V output:	54	56	61	A
		12V Standby output:	0.55	0.75	1.0	
	FNP850-12	Current limit.12V output:	77	80	88	A
		12V Standby output:	0.55	0.75	1.0	
	FNP600-48	Current limit.48V output:	13	14	16	A
		12V Standby output:	0.75		1.75	
	FNP1000-48	Current limit.48V output:	22	23	25	A
		12V Standby output:	0.75		1.75	
Short-Circuit Protection	Power supply recovers when short is removed.					
Overtemperature/ Fan Failure Warning	FNP 12V or 48V Vo1 supply output will shut down in the event of an overtemperature condition or blocked fan rotor. Supply's fan and Vaux are active. Power supply will recover when OT condition is removed. Amber OT LED will turn ON to indicate fault condition. OT/Fan Fail is an open-collector signal with 20-mA pull-down. High signal indicates a normal operating condition. Output will go low at least 100 ms before OT condition shuts down the power supply. Internally pulled up to 5V with a 5.1 kΩ resistor. Note. [2]					

[1] FNP1000-48 overvoltage protection range is 56 V minimum and 60 V maximum.
[2] A pull-up to 3.3V can be achieved by terminating the logic signal with a 10 kΩ resistor to logic ground.

Control and Monitoring

PARAMETER	CONDITIONS/DESCRIPTION		MIN	NOM	MAX	UNITS
DC OK	TTL open-collector signal with active 20-mA pull-down. Represents percent of output voltage where signal is OK. Below this voltage, a signal high condition indicates an output which is out of tolerance. Green DC OK LED on front panel indicates normal operation[1]. Internally pulled up to 5V with a 5.1 kΩ resistor. Note. [2]		90		110	%
Input Power Fail Warning	TTL open-collector signal with active 20-mA pull-down. High indicates an input power fail. Power Fail Warning will turn OFF green AC OK LED. Represents the time after warning signal before Vout drops to 95% due to loss of input power.[1] Internally pulled up to 5V with a 5.1 kΩ resistor. Note. [2]		5			ms
Power Supply Present Signal	Resistance of connection to logic ground which allows user to determine if power supply is present. [1]			10		Ω
Current Share	Main output only. Difference in current between two supplies at >10% load value.	FNP600-12:			5	A
		FNP850-12:			7	
		FNP600-48:			2	
		FNP1000-48:			2	
Remote Sense	Total voltage compensation for cable losses with respect to the main output.				0.5	V
Output Enable	Open circuit or logic high from ENA pin to Vo1 RTN shuts OFF Vo1; Vaux and fan are operational. Logic low (2 mA sink capability) or jumper will turn ON Vo1 within 500 ms. Open circuit voltage on enable pin is 3.3 VDC. Externally applied voltage to the enable pin should NOT exceed 7 VDC. Signal is referred to as Logic Return (LRTN).					

[1] Also available on I^2C data line.
[2] A pull-up to 3.3V can be achieved by terminating the logic signal with a 10 kΩ resistor to logic ground.

866.513.2839
tech.support@psbel.com
belpowersolutions.com

© 2015 Bel Power Solutions, Inc.

I²C Bus Management Interface

PARAMETER	CONDITIONS/DESCRIPTION
Static	Includes static information such as: part number and revision level, output rating, serial number, date code, and manufacturing location.
Status (Logic 1 or 0)	Power Supply OK. AC Input OK. DC Output OK. Power Supply Seated. Overtemperature. Overcurrent. Fan OK.
Real-Time Monitoring	Output voltage (main output) 0.1V LSD. Output current (main output) 0.1A LSD. Time in service.
Control Signals	Enable for main output. Output voltage to: (0.01V resolution on 12V supplies; 0.05V resolution on all 48V supplies). Fan speed level.

Safety, Regulatory, and EMI Specifications

PARAMETER	CONDITIONS/DESCRIPTION		MIN	NOM	MAX	UNITS
Agency Approvals	UL60950-1 (UL), CSA C22.2 60950-1 (cUL), EN60950-1 (TUV), IEC60950-1 and CE (LVD)					
Electromagnetic Interference	FCC CFR title 47 Part 15 Sub-Part B, EN55022/CISPR 22.	Conducted: Radiated:	B A			Class
Harmonics	Per IEC61000-3-2.		A			Class
Voltage Fluctuation and Flicker	Per IEC61000-3-3.		Pass			
ESD Susceptibility	Per EN61000-4-2, Level 4. Criterion B		8		.	kV
Radiated Susceptibility	Per EN 61000-4-3, Level 3. Criterion A		10		.	V/M
EFT/Burst	Per EN 61000-4-4, Level 4. Criterion B		±4		.	kV
Input Transient Protection	Per EN 61000-4-5, Class 3. Criterion B	Line-to-Line: Line-to-Ground:	1 2		.	kV
RF Conducted Disturbances	Per EN 61000-4-6, Level 3. Criterion A		10		.	V
Voltage Interruptions	Per EN 61000-4-11, performance criterion B 30%. Per EN 61000-4-11, performance criterion C 60%. Per EN 61000-4-11, performance criterion C 95%.		10 100 5		. 	ms ms Sec
Voltage Sag Immunity	Per SEMI F47-0999 > 100 VAC. No output voltage interruption.				.	
Leakage Current	Per EN60950-1.	At 240 VAC:			3.5	mA

866.513.2839
tech.support@psbel.com
belpowersolutions.com

© 2015 Bel Power Solutions, Inc.

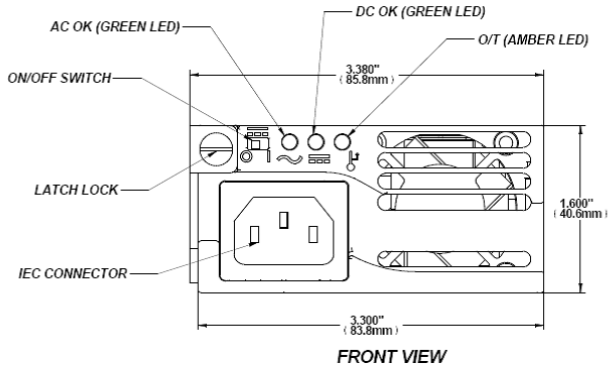
Environmental Specifications

PARAMETER		CONDITIONS/DESCRIPTION	MIN	NOM	MAX	UNITS
Altitude		Operating. Non-Operating.			10K 40K	ASL ft ASL ft
Operating Temperature	FNP600-12: FNP850-12: FNP600-48: FNP1000-48:	Internal DC fan for cooling. At 100% load: At 50% load:	0 0		50 70	ºC
	FNP850-12R:	Internal DC fan for cooling. At 100% load: At 94% load: At 50% load:	0 0 0		40 50 70	ºC
Storage Temperature			-40		85	ºC
Temperature Coefficient		0 ºC to 70 ºC (after 15-minute warm-up).			0.02	%/ºC
Relative Humidity		Non-condensing			95	%RH
Shock		Operating: half-sine, 10 ms, 3-axis. Non-Operating: half-sine, 10 ms, 3-axis.			+20 +40	Gpk
Vibration		Operating: swept sine 5-2000-5 Hz, 5-32 Hz, 0.02îDA, 32-2000 Hz. Non-operating: random 10-2000 Hz.			1 6.15	Gpk Grms

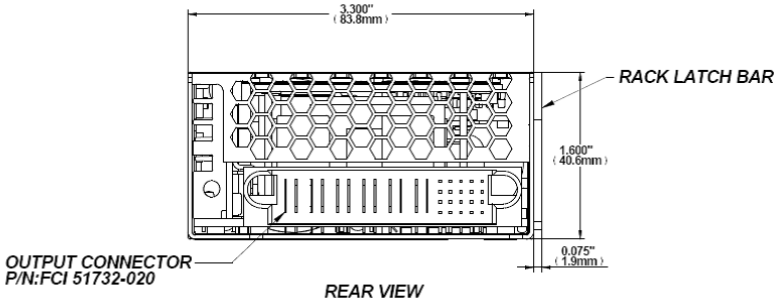
Reliability

PARAMETER	CONDITIONS/DESCRIPTION	MIN	NOM	MAX	UNITS
MTBF	(Calculated) MILHDBK 217F Ground Benign. Demonstrated. Useful Life.	100 000 250 000 10			hrs hrs yrs

Mechanical Drawings



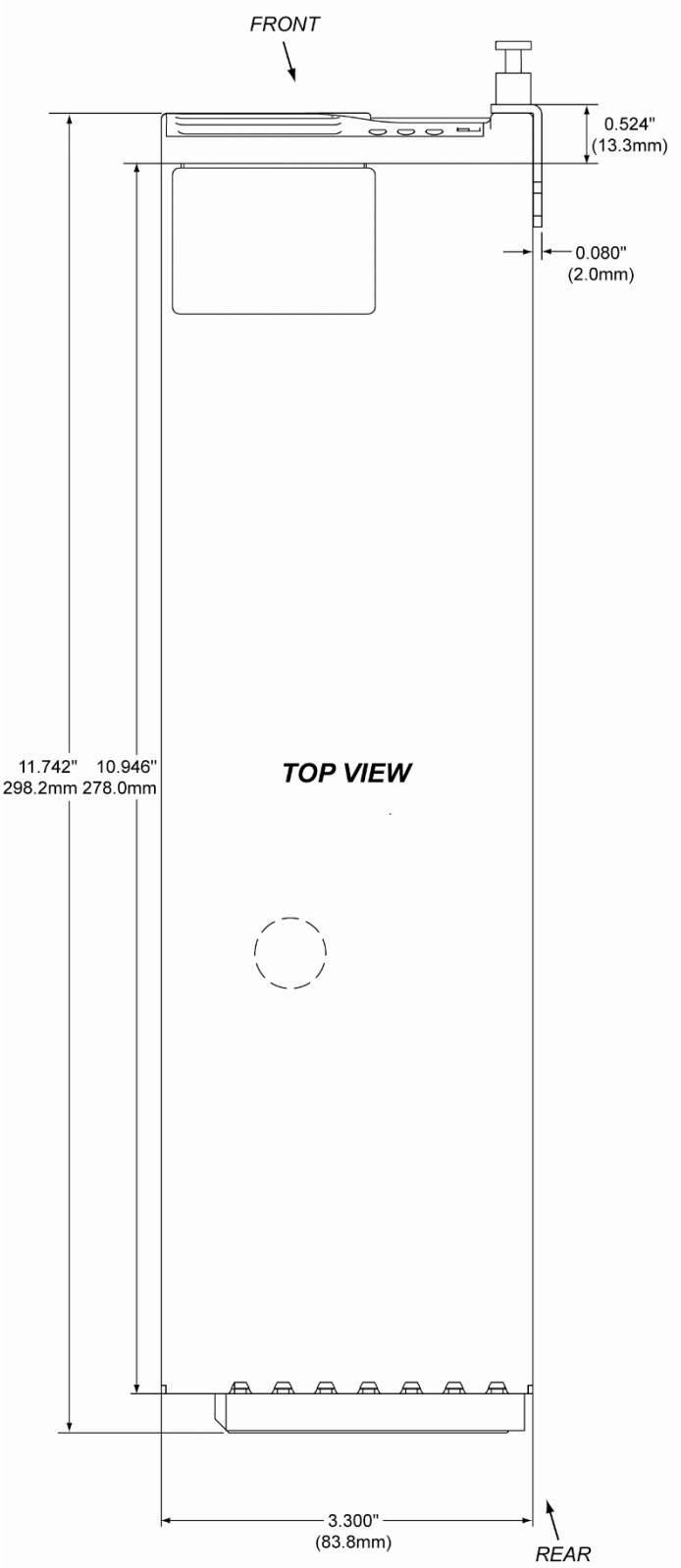
FRONT VIEW



REAR VIEW

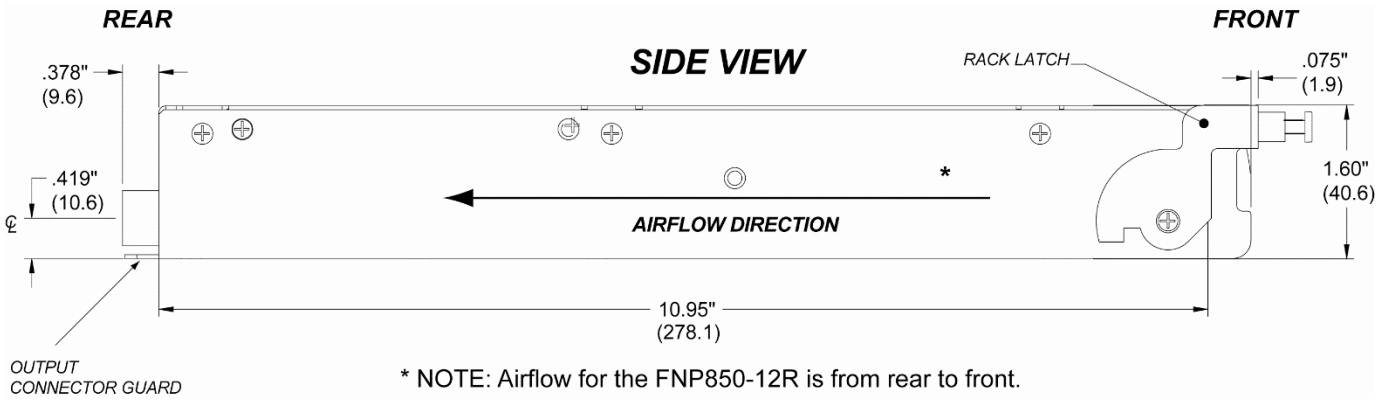
866.513.2839
tech.support@psbel.com
belpowersolutions.com

© 2015 Bel Power Solutions, Inc.



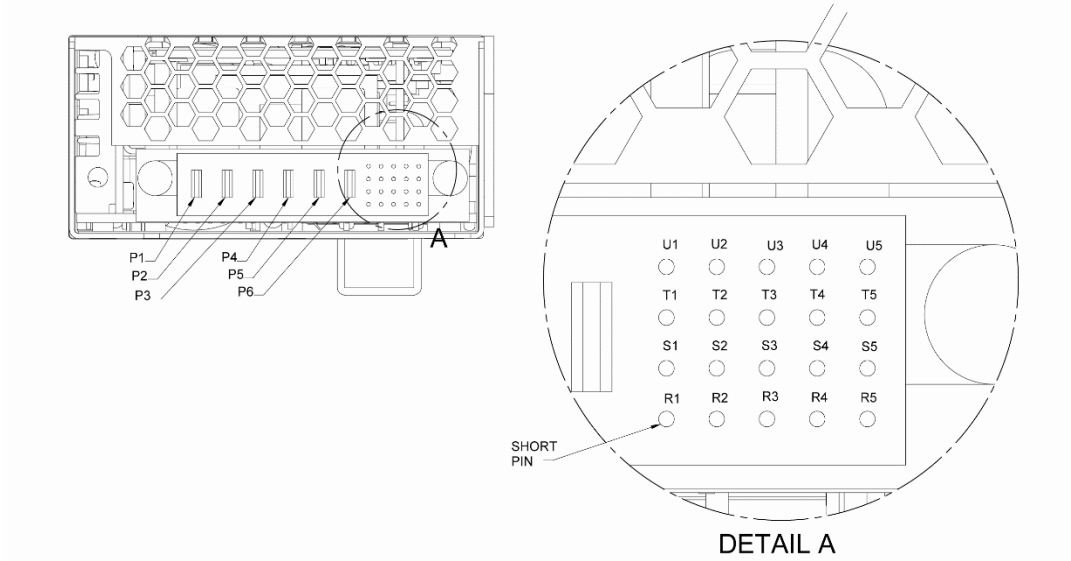
866.513.2839
tech.support@psbel.com
belpowersolutions.com

© 2015 Bel Power Solutions, Inc.



Connector Information

Power Supply:	Input - IEC 320 input (Male) standard line cord connection Output - P/N FCI 51732-020LF	
Mating Connections:	Input - IEC 320 output (Socket) Standard line cord (15A) Output - P/N: FCI 51742-10602000AALF (Backplane) P/N: FCI 51762-10602000AALF (Right Angle)	
Input IEC Connector:	**Input**	**Location**
	Chassis (Safety) Ground	Ground
	Line 1 (Line)	L
	Line 2 (Neutral)	N



866.513.2839
tech.support@psbel.com
belpowersolutions.com

© 2015 Bel Power Solutions, Inc.

Output Pin Assignments

SIGNAL	PIN LOCATION	GROUND REFERENCE	NOTE
Over Temperature / Fan Fail	U1	Logic Ground (LRTN)	Open collector 20mA,int.pull-up 5.11kΩ to 5V DC
AC Power Fail Warning	U2	Logic Ground (LRTN)	Open collector 20mA,int.pull-up 5.11kΩ to 5V DC
Power Supply Present	U3	Logic Ground (LRTN)	10Ω resistance int. connected to LRTN
Output Voltage Fault	U4	Logic Ground (LRTN)	Open collector 20mA,int.pull-up 5.11kΩ to 5V DC
Internal Ground	U5	Internal Ground (SRTN) [2]	
ADDR0, I²C Address Bus	T1	Internal Ground (SRTN)	
ADDR1, I²C Address Bus	T2	Internal Ground (SRTN)	
ADDR2, I²C Address Bus	T3	Internal Ground (SRTN)	
ADDR3, I²C Address Bus	T4	Internal Ground (SRTN)	
ADDR4, I²C Address Bus	T5	Internal Ground (SRTN)	
DATA, I²C Data Line	S1	Logic Ground (LRTN)	
CLOCK, I²C Clock Line	S2	Logic Ground (LRTN)	
Auxiliary Power +12V	S3	Aux Ground	
Auxiliary Power Ground	S4	Aux Ground	
Logic Ground	S5	Logic Ground (LRTN)	
Output Enable [1]	R1	Logic Ground (LRTN)	Open circuit or “High” to LRTN shuts OFF Vo1
Vsense+	R2	Vsense-	
Vsense-	R3	Vsense-	
Output Margin	R4	Internal Ground (SRTN)	OPTIONAL; External resistance needed to adjust Vo1 lower than it is set originally
Active Current share	R5	Internal Ground (SRTN)	OPTIONAL
Vout+	P1, P2, P3	Vsense-	
Vout-	P4, P5, P6	Vsense-	

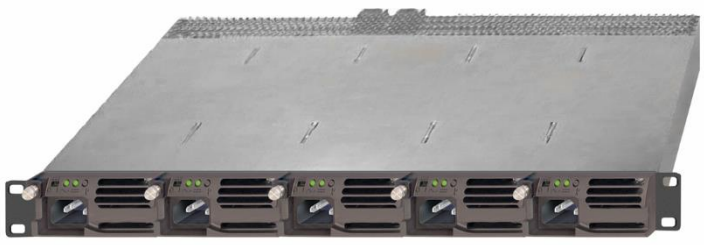
[1] Short pin length
[2] SRTN (Internal Ground) is internally connected to Vout-

FNR-5-12G and FNR-5-48G Power Shelves

Each rack (power shelf) is 1U high with backplane and designed for up to five front-end models in parallel or in n+1 operation. Each power shelf has:

- Output terminals with two M4-screws on each power tab.
- Two fast-on contacts for system earthing.
- Address coding over five pole DIP switch on each unit, 37-pin D-Sub connector with I²C-lines, monitoring signals and support functions.
- Provides a start-up synchronization circuit and EMV filters.

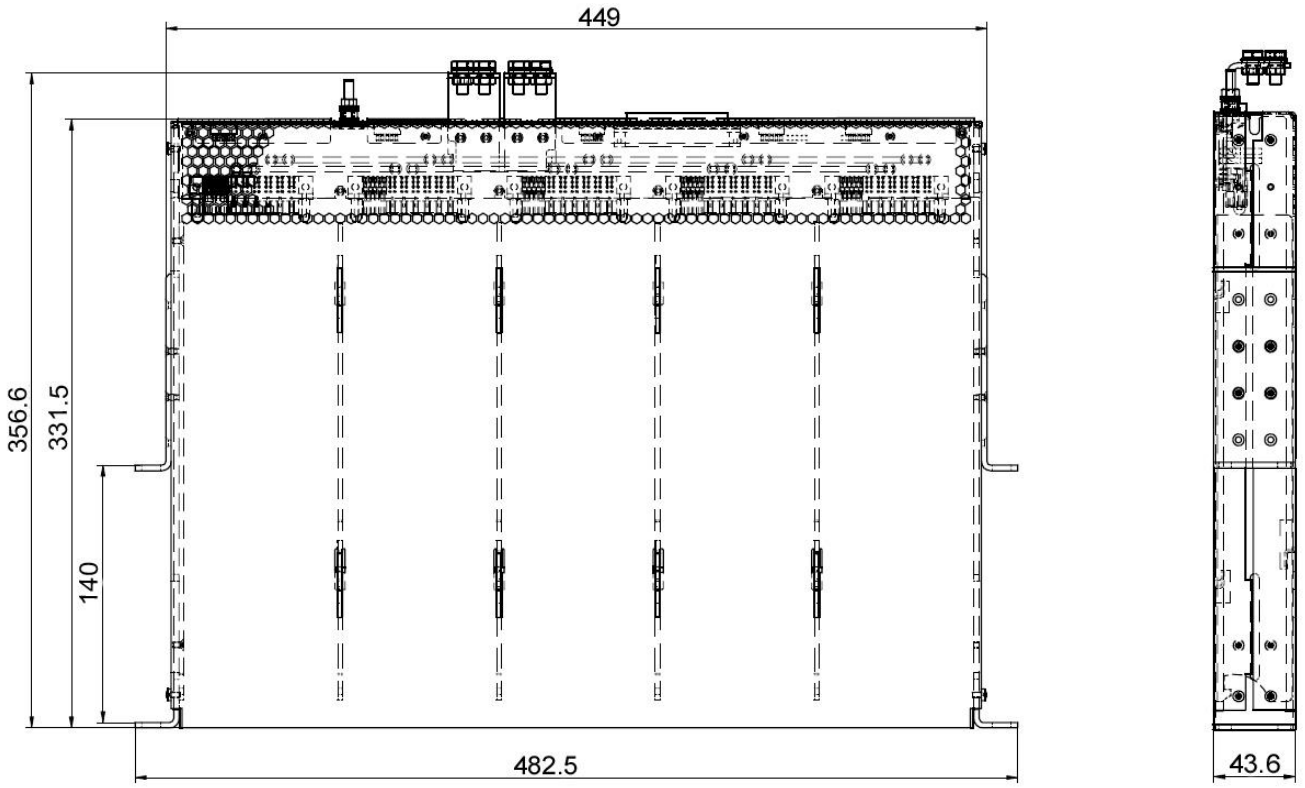
Overall Mechanical Dimensions (W x H x D): 17.68” (449 mm) x 1.72” (43.6 mm) x 13.05” (331.5 mm)



866.513.2839
tech.support@psbel.com
belpowersolutions.com

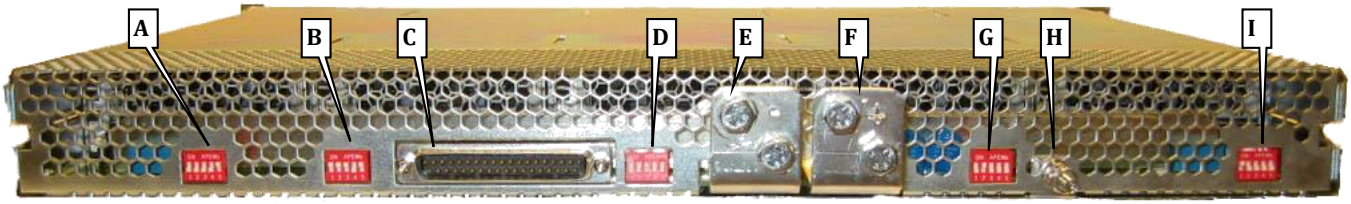
© 2015 Bel Power Solutions, Inc.

FNR-5-12G and FNR-5-48G Power Shelf Front View



Mechanical Data (FNR-5-12G and FNR-5-48G Power Shelves)

Output Connector Descriptions (FNR-5-12G & FNR-5-48G)

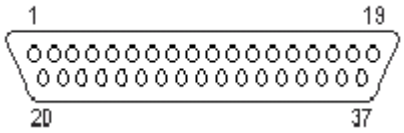


LOCATION	DESCRIPTION
A	5-Bit DIP switch for I²C addressing of PSU 1
B	5-Bit DIP switch for I²C addressing of PSU 2
C	37-pin SUB-D connector, controlling and auxiliary power (output 2)
D	5-Bit DIP switch for I²C addressing of PSU 3
E	Output 1 minus
F	Output 1 plus
G	5-Bit DIP switch for I²C addressing of PSU 4
H	Earth connection
I	5-Bit DIP switch for I²C addressing of PSU 5

866.513.2839
tech.support@psbel.com
belpowersolutions.com

© 2015 Bel Power Solutions, Inc.

SUB-D Output Connector Pinout and Signal Specification



OUTPUT CONNECTOR DESCRIPTION	PIN LOCATION	TYPE	LOW LEVEL HIGH LEVEL	V max I max
Overtemperature / Fan Fail PSU1	1	OC-output, protected by 16 V Zener diode and a 10 Ω resistor in series, referenced to logic GND	<0.4 V @ 20 mA Pull up	15 V 20 mA
Power Supply Present PSU 1	2	Resistor 10 Ω connected to logic GND	Open Pull up	10 V 10 mA
Power Supply Present PSU 2	3	Resistor 10 Ω connected to logic GND	Open Pull up	10 V 10 mA
Open	4			
Overtemperature / Fan Fail PSU 3	5	OC-output, protected by 16 V Zener diode and a 10 Ω resistor in series, referenced to logic GND	<0.4 V @ 20 mA Pull up	15 V 20 mA
AC Fail / Power down warning PSU 3	6	OC-output, protected by 16 V Zener diode and a 10 Ω resistor in series, referenced to logic GND	<0.4 V @ 20 mA Pull up	15 V 20 mA
Power Supply Present PSU 3	7	Resistor 10 Ω connected to logic GND	Open Pull up	10 V 10 mA
DC Fail / Output voltage fault PSU 3	8	OC-output, protected by 16 V Zener diode and a 10 Ω resistor in series, referenced to logic GND	<0.4 V @ 20 mA Pull up	15 V 20 mA
Overtemperature / Fan Fail PSU 2	9	OC-output, protected by 16 V Zener diode and a 10 Ω resistor in series, referenced to logic GND	<0.4 V @ 20 mA Pull up	15 V 20 mA
NC	10, 11			
Output inhibit PSU 1-5	12	Active low (DC-DC stage off when pin is open or on high potential) Referenced to logic GND	<0.8 V >2.0 V	10 V 3.5 mA
V sense +	13	Open or connected to Vo1+ at the load Internally (PSU) connected to Vo1+ over 100 Ω		dU < 3 Vpp 30 mA
V sense -	14	Open or connected to Vo1- at the load Internally (PSU) connected to Vo1- over 100 Ω		dU < 3 Vpp 30 mA
NC	15			
AC Fail/ Power-down warning PSU 4	16	OC-output, protected by 16 V Zener diode and a 10 Ω resistor in series, referenced to logic GND	<0.4 V @ 20 mA Pull up	15 V 20 mA
DC Fail/ Output voltage fault PSU 4	17	OC-output, protected by 16 V Zener diode and a 10 Ω resistor in series, referenced to logic GND	<0.4 V @ 20 mA Pull up	15 V 20 mA
AC Fail/ Power-down warning PSU 5	18	OC-output, protected by 16 V Zener diode and a 10 Ω resistor in series, referenced to logic GND	<0.4 V @ 20 mA Pull up	15 V 20 mA
DC Fail/ Output voltage fault PSU 5	19	OC-output, protected by 16 V Zener diode and a 10 Ω resistor in series, referenced to logic GND	<0.4 V @ 20 mA Pull up	15 V 20 mA
AC Fail/ Power-down warning PSU 1	20	OC-output, protected by 16 V Zener diode and a 10 Ω resistor in series, referenced to logic GND	<0.4 V @ 20 mA Pull up	15 V 20 mA
DC Fail/ Output voltage fault PSU 1	21	OC-output, protected by 16 V Zener diode and a 10 Ω resistor in series, referenced to logic GND	<0.4 V @ 20 mA Pull up	15 V 20 mA

866.513.2839
tech.support@psbel.com
belpowersolutions.com

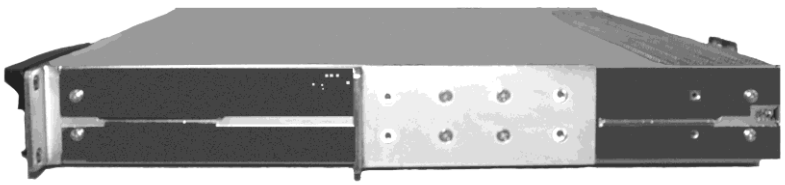
© 2015 Bel Power Solutions, Inc.

SUB-D Output Connector Pinout and Signal Specification (continued)

OUTPUT CONNECTOR DESCRIPTION	PIN LOCATION	TYPE	LOW LEVEL HIGH LEVEL	V max I max
AC Fail/ Power-down warning PSU 2	22	OC-output, protected by 16 V Zener diode and a 10 Ω resistor in series, referenced to logic GND	<0.4 V @ 20 mA Pull up	15 V 20 mA
DC Fail/ Output voltage fault PSU 2	23	OC-output, protected by 16 V Zener diode and a 10 Ω resistor in series, referenced to logic GND	<0.4 V @ 20 mA Pull up	15 V 20 mA
DATA, I2C data line	24	I2C compatible signal referenced to logic GND	5 V or 3.3 V logic	-
CLOCK, I2C clock line	25	I2C compatible signal referenced to logic GND	5 V or 3.3 V logic	-
Auxiliary power +12 V (Output 2)	26	Vo2+ Aux output, insulated from main output	-	-
Auxiliary power ground (Output 2)	27	Vo2- Aux output, insulated from main output	-	-
Logic Gnd	28	Auxiliary GND, Need to be external connected Vo2-,. Wire separately from auxiliary and main output GND to minimize noise and avoid voltage drops on signal- and I2C return. Leave open if not used.	-	-
Output margin PSU 1	29	Open or connected to V sense- V sense- (+8 % Vo1) or V sense+ (-8 % Vo1)	- -	60V -
Output margin PSU 2	30	Open or connected to V sense- V sense- (+8 % Vo1) or V sense+ (-8 % Vo1)	- -	60V -
Output margin PSU 3	31	Open or connected to V sense- V sense- (+8 % Vo1) or V sense+ (-8 % Vo1)	- -	60V -
Output margin PSU 4	32	Open or connected to V sense- V sense- (+8 % Vo1) or V sense+ (-8 % Vo1)	- -	60V -
Output margin PSU 5	33	Open or connected to V sense- V sense- (+8 % Vo1) or V sense+ (-8 % Vo1)	- -	60V -
Overtemperature / Fan Fail PSU 4	34	OC-output, protected by 16 V Zener diode and a 10 Ω resistor in series, referenced to logic GND	<0.4 V @ 20 mA Pull up	15 V 20 mA
Power Supply Present PSU 4	35	Resistor 10 Ω connected to logic GND	Open Pull up	10 V 10 mA
Overtemperature / Fan Fail PSU 5	36	OC-output, protected by 16 V Zener diode and a 10 Ω resistor in series, referenced to logic GND	<0.4 V @ 20 mA Pull up	15 V 20 mA
Power Supply Present PSU 5	37	Resistor 10 Ω connected to logic GND	Open Pull up	10 V 10 mA

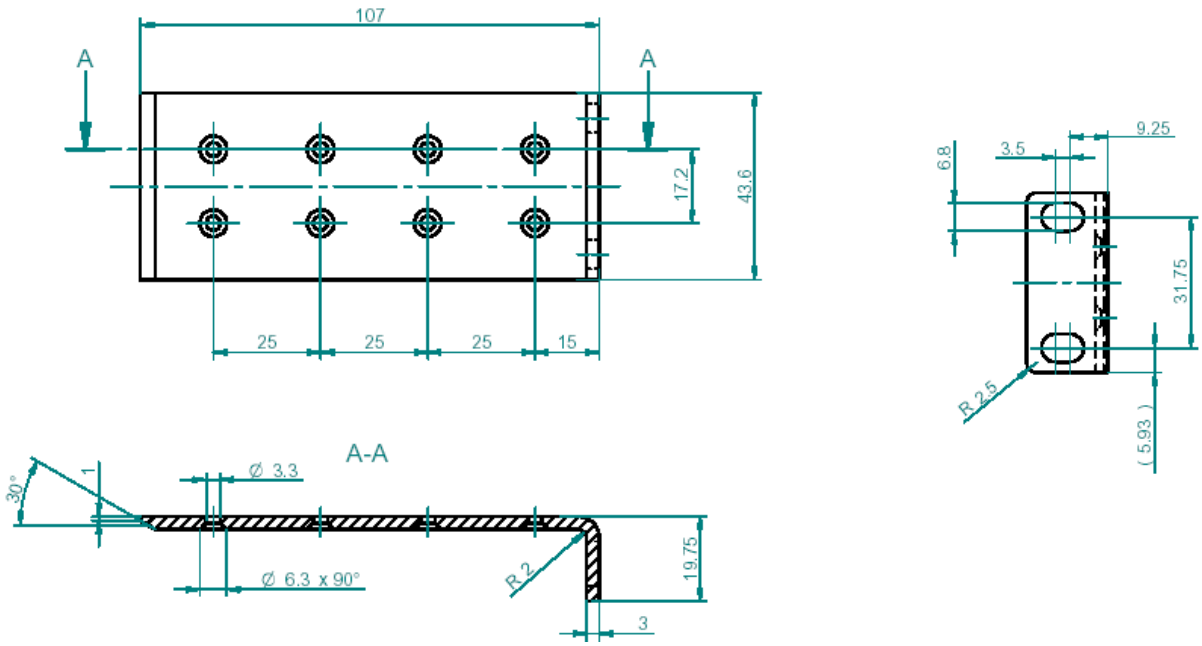
Accessories

Center Angular Brackets are set in the middle for shelf mounting:



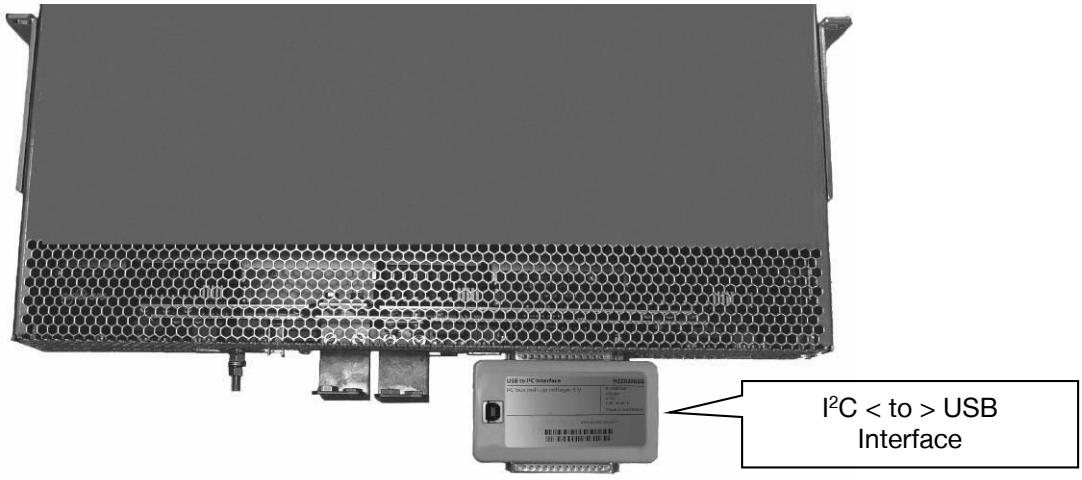
866.513.2839
tech.support@psbel.com
belpowersolutions.com

© 2015 Bel Power Solutions, Inc.



Center Angular Bracket sets can be ordered from Bel Power Solutions part no.: HZZ01222
Note: Each Center Angular Bracket set contains 2 brackets and 8 screws.

I²C to USB Interface Demonstration Kit HZZ02002G



An I²C to USB Interface Demonstration Kit can be ordered from Bel Power Solution part no.: **HZZ02002G.**

For more information on these products consult: tech.support@psbel.com

NUCLEAR AND MEDICAL APPLICATIONS - Products are not designed or intended for use as critical components in life support systems, equipment used in hazardous environments, or nuclear control systems.
TECHNICAL REVISIONS - The appearance of products, including safety agency certifications pictured on labels, may change depending on the date manufactured. Specifications are subject to change without notice.

866.513.2839
tech.support@psbel.com
belpowersolutions.com

© 2015 Bel Power Solutions, Inc.