

Electrical Specification for: **48V 1.6KW 1U AC-DC Power Supply**

Digital Power Model: **PS-1648**



**Input:**

Input Voltage: 90 – 254Vac continuous, 47-63Hz , single phase  
 Maximum Input Current : 14A at 100Vac , 9A at 200Vac  
 Inrush Current: Less than 50A  
 Power Factor: 0.98 typical at 230Vac, full load  
 0.99 typical at 115Vac, full load  
 Efficiency 88% typical at 200Vac, full load and 25°C ambient temperature  
 84% typical at 100Vac, full load and 25°C ambient temperature  
 Turn ON 87 – 90Vac  
 Turn OFF <80Vac  
 Input Protection: Internal Line Fuse: STP – 5X20 16A / 250 Vac High Capacity.  
 Brown– Out: 75 to 300Vac

**Output Voltages & Currents:**

<i>Input Range</i>	<i>Output Voltage</i>	<i>I Min. Load</i>	<i>I Max. Load</i>	<i>Max. Power</i>
90Vac – 140Vac	48V	0	25A	1200W
180Vc – 264Vac	48V	0	34A	1600W
90Vac – 254Vac	11.2 – 12.5 V (Auxiliary) (1)	0	0.3A	3.6W

**Output:**

Line Regulation: ± 0.4% for Vin (Min) to Vin (Max).  
 Load Regulation: ± 0.5% for load changes from zero to full load.  
 48V/24V Ripple & Noise 240mV/200mV pk-pk Max @ 20 MHz bandwidth with 1u ceramic and 10 electrolytic on measure point.  
 Output Voltage Adjustment Range ± 10%  
 Output voltage set point: 48 ± 0.15V  
 Overshoot & Undershoot: Less than 1% at turn ON-OFF  
 Transient Load Response: ± 3% Max. (2% typical) deviation for load change of 50% to 100%, at slew rate of 1A/usec, recovery time less then 1mSec  
 Hold-up Time: 10 mSec typical at 100Vac input and less than 80% of full load.  
 Turn-On Rise Time: 50mSec Max.  
 Over-current Protection: 105 to 125% of IMax, constant current limit, automatic recovery, when cause of overload or short is removed  
 Over-voltage Protection: Shut down at 110 ÷ 130% of nominal output, AC input must recycled to restart.  
 Temperature Protection: Shutdown due to excessive ambient temperature at over heating or malfunction of cooling fans, unit recovers automatically typical hysteresis 30°C.  
 Remote Sense on V1 800mV Max. voltage compensation for cable losses with respect to the main output  
 Current Share ± 10% Maximum , N+1 Redundancy Single wire.  
 Hot Swap Internal O-Ring diode (FET)  
 1 - Need minimum load of 48V/1A

**Signals & Commands**

*Important note:* All signals and commands refer to +12V RTN.

(See attached pin assignment table)

Remote ON/OFF control	By electrical signal or dry contact, ON 0-0.6V or short OFF 2-15V or open.
DC_ OK#:	Open collector active high when the output drops 10% below nominal.
AC_ OK:	Open Collector Active high when AC out of range.
Temperature Warning:	Open collector active high at 10°C below shut down.
I <sup>2</sup> C (IPMI interface) - <i>OPTION</i>	Internal I <sup>2</sup> C/IPMI interface Card

**Front Panel Indicators**

AC_OK	Green LED illuminates for AC OK
DC_ OK#	Green LED illuminates for DC OK
DC_ FAIL	Red LED illuminates for DC FAIL

**Environmental Specifications:**

Temperature:	Operating: -5°C to +50°C (de-rating linearly to 70 °C with 50% de-rating). Storage: -40°C to +85°C.
Temperature Coefficient:	0 to 70°C ± 0.02%/°C
Cooling:	By internal fans, Variable speed control.
Humidity:	10 to 90% RH non-condensation.
Altitude:	Operating 10,000 ft. Non- operating 40,000 ft.
Vibration and Shock	Meet ETS 300 019

In addition the unit meet HP Shock and Vibration as follow:

Test	Parameter	Frq(Hz)	Duration Min.	PSD(g <sup>2</sup> /HZ)	Acceleration(gRMS)	Slop(db/oct)	Axes
Operation	Random	5-350	10	0.0002	0.3	0	
		350-500	10	-	0.3	-6	
		500	10	0.0001	0.3	-	
Non Operation	Random	5-100	10	0.02	2.41	0	
		100-137	10	-	2.41	-6	
		137-350	10	0.0107	2.41	0	
		350-500	10	-	2.41	-6	
		500	10	0.0052	2.41	-	
	Sinusoidal	5-500	10		0.75(g)		

**Safety Regulatory & EMC Specifications (Designed to meet):**

MEETS FCC CLASS B, CISPR 22 CLASS B, EN55022 CLASS B with an external TBD line filter

EN61000-3-2	HARMONICS
EN61000-3-3	VOLTAGE FLUCTUATION
EN6000-4-2	ESD +8KV AIR +4KV CONTACT DISCHARGE, performance criteria B
EN61000-4-3	RADIATED IMMUNITY: 80-1000Mhz 3V/m, AM 80% (1KHz), criteria A
EN61000-4-4	FAST TRANSIENT: 1KV for AC power port, 0.5KV for DC power I/O and signals Port, performance criteria B
EN61000-4-5	SURGE: 2KV common mode and 1KV differential mode
EN61000-4-6	3VRMS, 80% A.M. BY 1kHz
EN61000-4-8	3A /m at 50Hz, performance criteria A.
EN61000-11	VOLTAGE Dips and interruption: 30% reduction for 10mSec –Criteria B, 60% For 100mSec. Criteria C, 95% reduction for 5000mSec Criteria C.

**Dielectric Withstand:**

Input to Case	1500VAC
Input to Output	3000VAC
Output to Case	500VDC

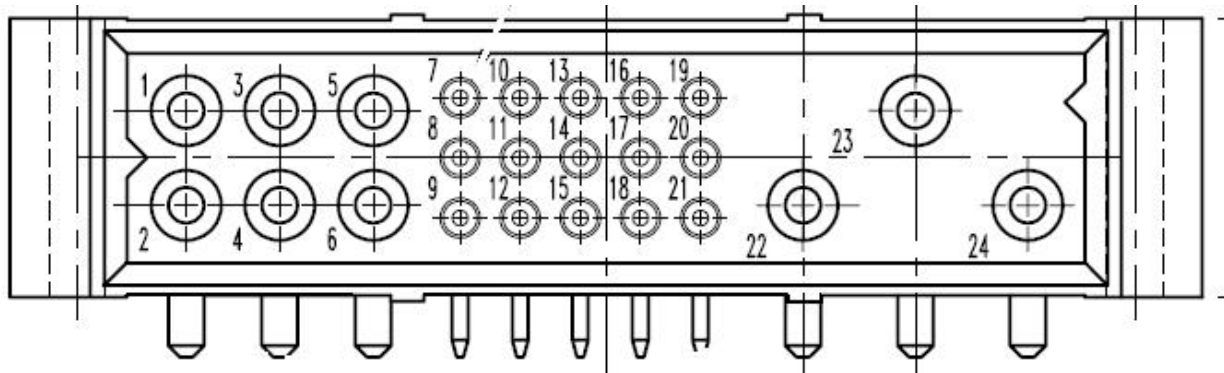
**Safety Agency Compliances:**

Safety	UL60950, EN60950-1 , CB REPORT
leakage current:	Less than 1.1mA at 230Vac
MTBF:	300,000 hours minimum per BELCOR 332,issue 6 specification @ 30°C

**Mechanical Dimensions**

Size (W,H,D)	127X41X290 mm see Outline Drawing
Weight	2.0Kg
I/O Connector	Positronic Right Angle PCB mount PCIB24W9M400A1
Mating Connector	Positronic type PCIB24W9F400A1-S1031

Right angles (90°) PCB mount male connector POSITRONIC# **PCIB24W9M400A1**



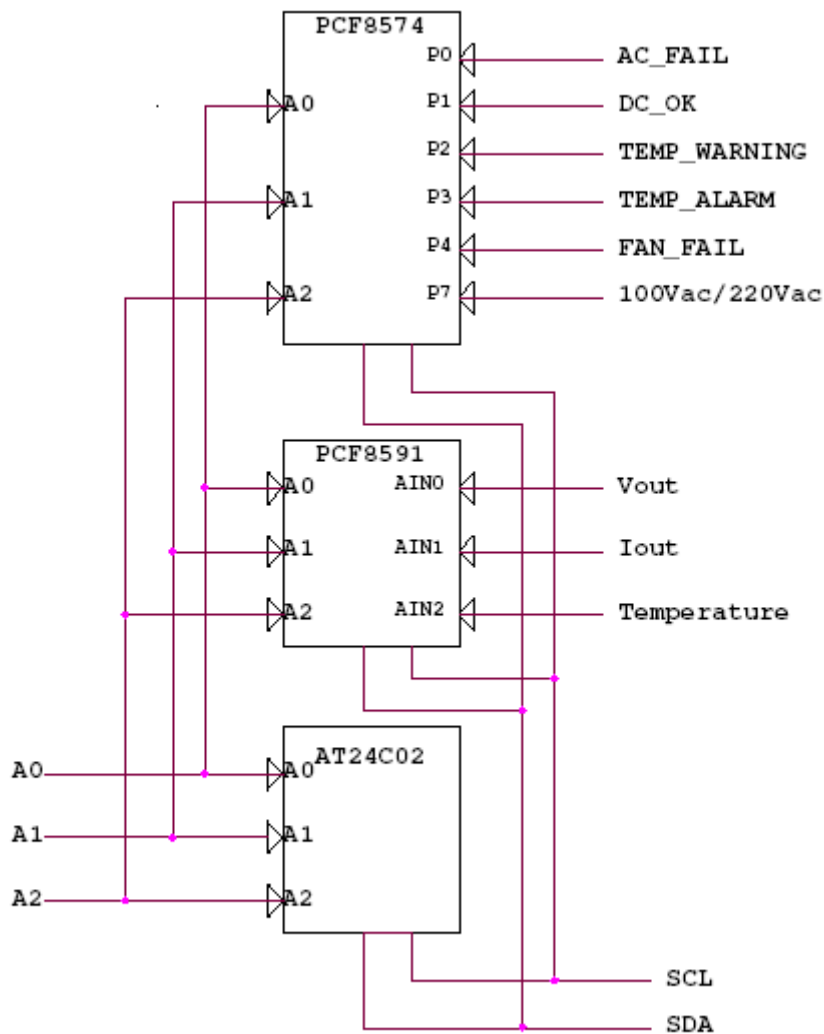
## Internal I<sup>2</sup>C Interface

The PS-1648 provide power good ,output current ,output voltage, internal temperature and fault reporting through I2C related to 5V no internal pull-up resistors.

The address lines are internally pulled-up to +5V by 10K resistors.

The block diagram below showed the I2C interface typical connection.

### Internal I<sup>2</sup>C Basic Functionality



### Status Signals Report

The power supply provides by a PCF8574 (8 bit register) through I2C protocol the signals status while "0" indicates OK and "1" indicates fault.

### PCF8547 Function

BIT	FUNCTION	DESCRIPTION
0	DC_OK#	Output voltage is less than 80% of nominal output
1	TEMP_ALARM	Supply shut down by over temperature protection circuit
2	TEMP_WARNING	Internal temperature is 10% below shut down point
3	FAN_FAIL	Failure of one or two of internal fans
4	AC_FAIL	Input voltage lower than 82Vac
5	INHIBIT	Output Voltage shut down
6	N.C	Remain "0"
7	100Vac / 200Vac	Indicate Input range 100Vac "0" or 220Vac "1"

### PCF8574 Slave Address

BYTE	BIT							
	7(MSB)	6	5	4	3	2	1	0(LSB)
address	L	H	L	L	A2	A1	A0	R/W

### EEPROM Circuit AT24C02

The EEPROM data is arranged by "fields", each containing specific information. The overall size of data inside the chip is 256 bytes from address 0 to address 255.

Address	Data type	EEPROM data
0	DPC internal use	Do NOT change this field
1÷29	Manufacturer	Digital Power Corporation
30÷37	Date code	MMM/YYYY MMM for month (JAN,FEB...) YYYY for 4 digits year
38÷42	Serial Number	5 ASCII digit SN
43÷44	Revision	A1
45÷55	Part Number	900-1648-00
56÷85	Customer	XXX
86÷99	Model Number	CP-1648
100÷124	Standards	UL/CE/CB_REPORT
125÷255	DPC internal use	0xFF

### Slave AT24C02 Address

Bit	7	6	5	4	3	2	1	0
Rate	1	0	1	0	A2	A1	A0	R/W

### PCF8591 8-bit A/D

The PCF8591 8-bit include four analog inputs and one analog output provides output voltage, output current and internal temperature via I2C bus.

### PCF8591 Slave Address byte

1	0	0	1	A2	A1	A0	r/w
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### Control byte

The second byte sent to a PCF8591 will be stored in its control register and is required to control the device function  
The control bit for four single-ended inputs (programming we use) is as follows.

	msb				lsb			
Bit	7	6	5	4	3	2	1	0
Rate	0	0	X	X	0	X	X	X
Voltage	0	0	0	0	0	0	0	0
Current	0	0	0	0	0	0	0	1
Temperature	0	0	0	0	0	0	1	0
N.C	0	0	0	0	0	0	1	1

### Resolution and Accuracy

PS-1648	Range	Resolution	Accuracy
Output Voltage	0-60V	0.2344V/Bit	2% of full scale±
Output Current	0-33A	0.1733/Bit-1.617A	10% of full scale±
Internal Temperature	0-110°C	0.4252°C/Bit	3°C of full scale±

### A/D Conversion

$$V_{out} = \text{bit rate} \times 0.2344(\text{V})$$

$$I_{out} = \text{bit rate} \times 0.1733-1.617(\text{A})$$

$$\text{Temperature} = \text{bit rate} \times 0.4252(^{\circ}\text{C})$$





### Pins Assignment

Pin #	Signal Name	Remarks
1,2,4	48V	48V Floating Positive output voltage
3,5,6	48V_RTN	48V Floating Negative output voltage
7	Enable (ON/OFF)	Turn the output to On and Off by electrical signal or dry contact Between pins 7 and pin 10(signal return) 0-0.6V or Short : On 2-15V or Open : Off The maximum sink current is 2.5mA
8	+SENSE	Positive sensing , Should be connected to the positive terminal of the load.
9	DC _ OK#	Open collector , 50K pull-up resistor referenced to pin 10, Active high when Vout less than 80%± 5%. The maximum sink current is 10mA and maximum external voltage is 15V
10	12V_GND Signal _ Return	Return for the following control and supervisory signals : On/Off , DC_OK , Over_ Temperature Alarm, AC Fail , Auxiliary 12V supply The Signal Return is isolated from the output terminals
11	AC _ FAIL	Open collector , 50K pull-up resistor referenced to pin 10, Active high when Vin less than 80Vrms ± 5%. The maximum sink current is 10mA and maximum external voltage is 15V
12	Over Temperature Alarm	Open collector , 50K pull –up resistor referenced to pin 10, Active high when the internal temperature is 10°C below thermal shut down. The maximum sink current is 10mA and maximum external voltage is 15V
13	-SENSE	Negative Sensing, Should be connected to the negative terminal of the load.
14	PS Present	Connected to pin 10 (signal return)
15	Current Share	Current Sharing Signal , When units are connected in parallel ,the CS pins of the units should be connected to allow current balance Between the units
16	+12V Auxiliary	Auxiliary voltage output 11.5 to 12.5V referenced to pin 10.
17	SDA	Serial Data used in the I2C interface
18	SCL	Serial Clock used in the I2C interface
19	A0	I2C interface address line
20	A1	I2C interface address line
21	A2	I2C interface address line
22	AC Ground	AC ground connection ,
23	AC Phase	AC line connection
24	AC Neutral	AC neutral connection

Front Panel



Rear Panel

