# A0750 AC-DC POWER MODULE

## AC Input: 85V to 264V, Single DC Output: 24V to 28V, 750W

## FEATURES

- High power density, 7.7W / $in^3$
- Net Weight:< 2.2 KG
- Low profile : 40.8mm
  (fit 1U 19“ shelf – R2250 series)
- Efficiency: 77% ~ 86 % typical
- Power factor correction
  (meet IEC1000-3-2 requirements)
- Overvoltage & overcurrent protection
- Overtemperature warning & protection
- Redundant parallel operation -up to 12 units.
- Remote On/Off and Remote sense
- Active load sharing
- Hot insertion/removal (Hot Swap)
- Power fail warning and fault alarm
- Low start-up temperature: - 30ºC
- $I^2C$ for voltage, current, temperature report & Power Supply ID.
- Front panel LED indicators
- 400Hz input available
  (with wattage derating)
- Meet UL60950, EN60950 and CE mark requirements.

The Powerstax A0750 series of front-ends power modules is specifically designed to operate as an integral part of a complete distributed power system, with or without battery backup.

A full complement of protection, alarm and control features has been incorporated into the power unit to provide the versatility of applications.

When up to 3 x A0750 are used with the 1U high R2250 19“ rack, a total 2,250W (or 1,500W of N+1) of 24VDC or 28VDC output can provide a low profile, flexible and scalable solution.

The flexible feature set makes this front-end power module an excellent choice for applications requiring modular AC-to-DC power systems such as distributed power and DC UPS.

## Applications

- ✓ Advanced workstations
- ✓ Telecom / Datacom equipment
- ✓ Midrange computers
- ✓ Mainframes
- ✓ File servers
- ✓ LAN/WAN applications
- ✓ Mass storage

**Powerstax plc** Tel: +44 (0) 1252 407800 Fax: +44 (0) 1252 407810 E-mail: sales@powerstaxplc.com www.powerstaxplc.com

## Input Specification

| Parameter | Min | Typ | Max | Unit | Condition |
|---|---|---|---|---|---|
| Input voltage | 85 | - | 264 | Vac | |
| Input Frequency | 47 | - | 63 | Hz | 400Hz available with safety approvals. Consult APC for details |
| Inrush Current (peak) | - | - | 50 | A | ≧ 50% of full load |
| Power Factor | 0.95 | 0.99 | - | - | |
| Inoutr Leakage Current | - | - | 1.7 | mA | 264Vac, 50Hz |
| Lighting Surge & Transients (damage free operation) | - | - | - | - | 1) IEC1000-4-5 Level 3<br>2) IEC1000-4-4 Level 3 |
| Hold Up Time | 20 | - | - | mS | At 24V, 600W |
| EMC (conducted) | - | - | - | - | CISPR22 Class B, EN55022 Class B, with 3dB margin |

## Line Harmonics

Active power factor correction circuitry ensures that this power supply meets requirements of IEC 1000-3-2

## Efficiency and Power Factor vs. Input Voltage at full load

| Input voltage | Efficiency (Typical) | Power Factor (Typical) |
|---|---|---|
| 90Vac | 83% | 0.99 |
| 100Vac | 84% | 0.99 |
| 120Vac | 85% | 0.99 |
| 160Vac | 85% | 0.98 |
| 190Vac | 86% | 0.98 |
| 220Vac | 86% | 0.98 |
| 240Vac | 87% | 0.98 |
| 264Vac | 88% | 0.98 |

Notes:
When using this table to calculate line cord requirements, allow, at a minimum, an extra 3% for variations between units. Actual measured results will depend upon the harmonic content of the input voltage waveform.

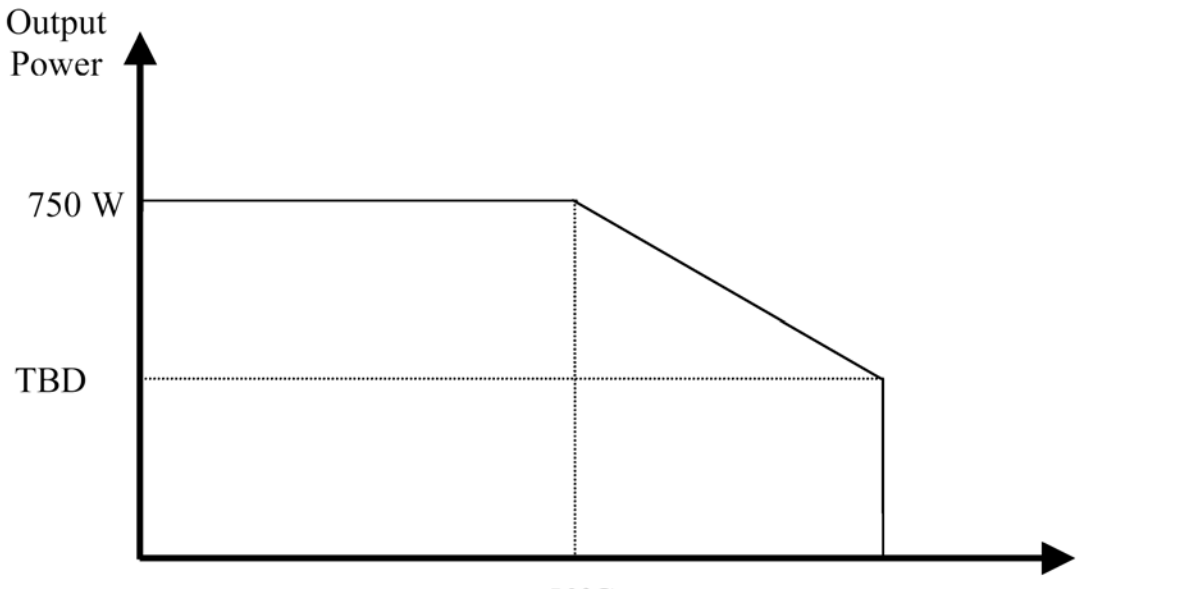
# Product Specification

## Output Specification

| Parameter | Min | Typ | Max | Unit | Note |
|---|---|---|---|---|---|
| Vo set point: | | | | | |
| Powerstax A0750 | - | 24.0 | - | Vdc | |
| | - | 28.0 | - | | |
| Regulation (line, load, temperature & set point) | -2.0 | - | 2.0 | % | Measured at remote sense |
| Remote-sense Drop | - | - | 0.5 | Vdc | |
| Io (rated) | | | | | |
| Powerstax A0750 (24Vo) | 0 | - | 31.25 | Adc | 750W maximum |
| Powerstax A0750 (28Vo) | 0 | - | 26.78 | | 750W maximum |
| Ripple (20MHz bandwidth) | - | - | 150 | mVp-p | |
| Noise (20MHz bandwidth) | | | 300 | mVp-p | Under any load conditions |
| Transmission Noise (C message) | - | - | 45 | dBrnc | |
| Output Rise Time | 10 | - | 100 | mS | Rise from 10% to 90% of final output level (resitive load) |
| Overvoltage Protection | 29 | - | 32 | Vdc | Reset by cycling ac input, On/Off, or reinsertion |
| Output Current Limit (Steady state) | - | - | 40A | Adc | |
| Transient Response | | | | | 25% step load transient with slew rate 0.1A/us within the range from 25% to 75% of full load. |
| Voltage Range | -2.0 | - | 2.0 | % | |
| Active Current Sharing Differential | - | - | ±3.2 | A | Single-wire current share at full load |
| Efficiency | 80 | 81 | - | % | At full load, 120Vac with Oring diode |
| | 83.5 | 84 | - | % | At full load, 264 Vac with Oring diode |
| Reserve Output Current Protection | - | - | - | - | Oring diode |
| Start-Up delay | - | 1.3 | 2 | s | Measured from application of valid ac voltage |
| Turn-On delay | - | - | 250 | ms | Measured from DC on/off |

## Environmental Characteristics

| Parameter | Min | Typ | Max | Unit | Note |
|---|---|---|---|---|---|
| Storage Temperature | -40 | - | 85 | °C | |
| Operating Temperature (note 1) | 0 | - | 60 | °C | Derating (TBD) |
| Acoustics | - | 47 | 52 | dBA | ISO 7779 SPL |
| Humidity (non-condensing) | 5 | - | 95 | % | |
| Altitude | -200 | - | 13,000 | Feet | Derated at 2°C/1000 ft. above 8000 ft. |
| ESD | - | - | - | - | IEC1000-4-2 Level 3 stand-alone |
| Isolation Voltage | 3,000VAC | | | | Primary to Secondary |
| | 1,500VAC | | | | Primary to chassis GND |
| | 1,500VAC | | | | Secondary to chassis GND |
| MTBF | $4 \times 10^5$ | - | - | hours | @110V Input 80% load, $T_A$ = 30°C |
| Vibration | | | | | Meet IEC68-2-6 |
| Shock | | | | | Meet IEC68-2-36 |
| Weight | - | 2.2 | - | Kg | |




**Note 1 : Operation Derating Curve**

## Power Module Interfaces

### *Input Voltage*

The product can be used with any standard global line voltage; consult Powerstax for any particular regional application concerns.

### *Input / Output Connector*

The input / output connector is PCIB24W9M400A1 / Postronic, with 9 power pins and 15 signal pins. 3 out of the 9 power pins are for the AC input.

## *Connector Pin Assignment - view into rear of power unit*

**Please refer to " Definition of Terms " for detailed description for each pin**

| | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 V+ | 3 V+ | 5 V+ | 7 ON/OFF | 10 RS- | 13 CS | 16 OTP | 19 DC FAIL | | 23 LINE | |
| | | | 8 N.C. | 11 SDA | 14 Signal RTN | 17 A2 | 20 A1 | | | |
| 2 V- | 4 V- | 6 V- | 9 RS+ | 12 SCL | 15 A3 | 18 A0 | 21 INT. BUS | 22 FG | | 24 Neutral |

## SMBus Function

| Function | Command Code | Protocol*1 | | | Unit |
|---|---|---|---|---|---|
| Temperature | 0x08 | Read | Word | No PEC | ° K |
| Voltage | 0x09 | Read | Word | No PEC | mV |
| Current | 0x0A | Read | Word | No PEC | mA |
| Manufacture Date*2 | 0x1B | Read | Word | No PEC | |
| Serial number | 0x22 | Read | Word | No PEC | |
| Manufacturer Name | 0x20 | Read | Block*3 | No PEC | |
| Device Name | 0x21 | Read | Block*3 | No PEC | |
| Manufacture Data (Version) | 0x23 | Read | Block*3 | No PEC | |

1. Reference: System management bus specification v1.1

2.The date is packed in the following fashion:
(Year - 1980) * 512 + Month * 32 + Day = data byte high: data byte low

| Field | Data byte | *Allow value* |
|---|---|---|
| Day | Bit 0~4 | 1 - 31 (corresponds to date) |
| Month | Bit 5~8 | 1 - 12 (corresponds to month number) |
| Year | Bit 9~15 | 0 - 127 (corresponds to year biased by 1980) |

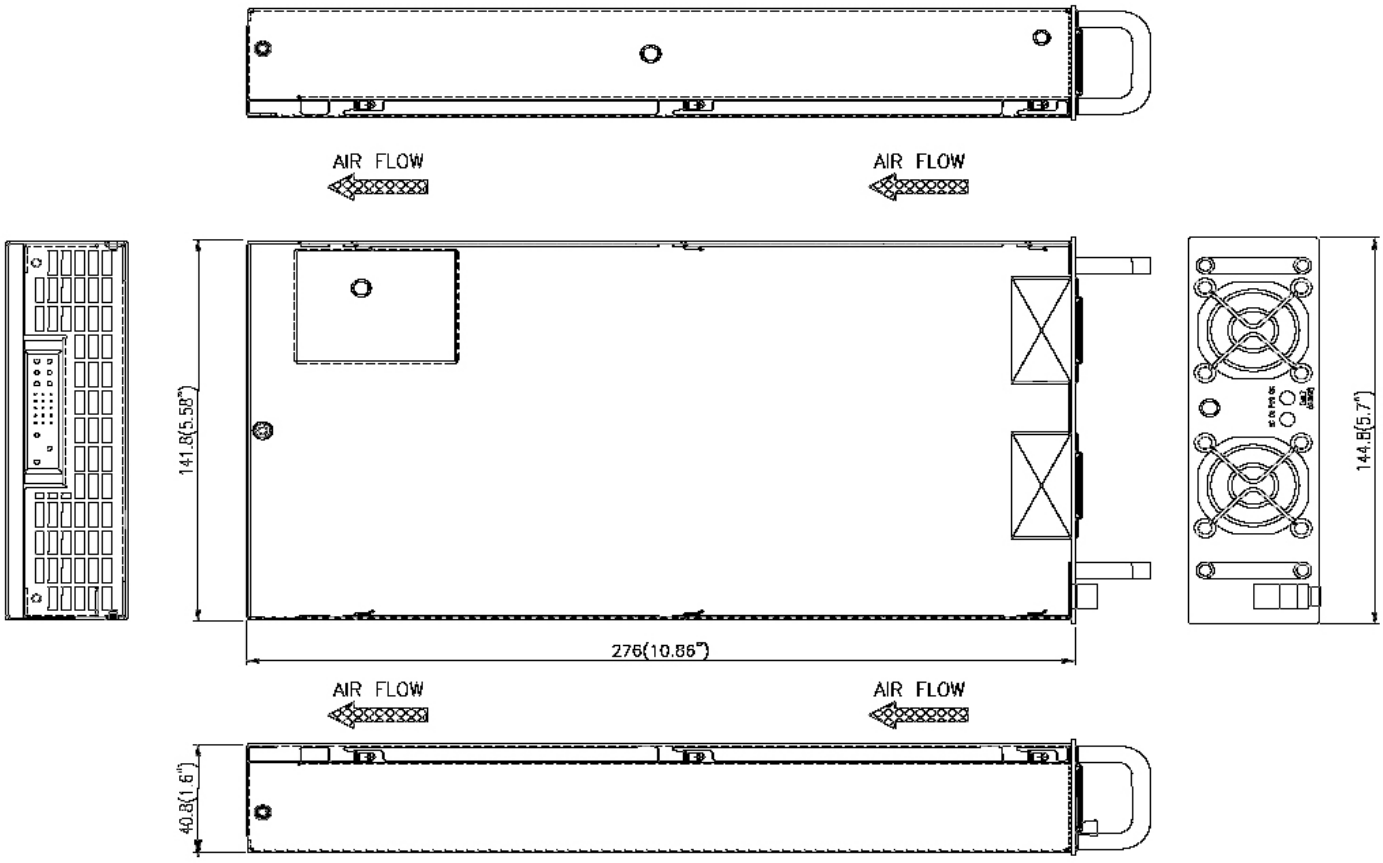
Example: 2001/11/29 = 10101101111101 (bin) = 2B7D (hex)
Where 2B(hex) is data byte high, 7D(hex) is data byte low.

3.Read block data byte 1~N is in ASCII code, where N is the value of byte count.

Address Definition

| | Shelf | P.S. No. | Address | A3 | A2 | A1 | A0 |
|---|---|---|---|---|---|---|---|
| *RACK* | 1 | 1 | 0x00 | 0 | 0 | 0 | 0 |
| | | 2 | 0x02 | 0 | 0 | 0 | 1 |
| | | 3 | 0x04 | 0 | 0 | 1 | 0 |
| | 2 | 4 | 0x20 | 0 | 1 | 0 | 0 |
| | | 5 | 0x22 | 0 | 1 | 0 | 1 |
| | | 6 | 0x24 | 0 | 1 | 1 | 0 |
| | 3 | 7 | 0x40 | 1 | 0 | 0 | 0 |
| | | 8 | 0x42 | 1 | 0 | 0 | 1 |
| | | 9 | 0x44 | 1 | 0 | 1 | 0 |
| | 4 | 10 | 0x10 | 1 | 1 | 0 | 0 |
| | | 11 | 0x12 | 1 | 1 | 0 | 1 |
| | | 12 | 0x14 | 1 | 1 | 1 | 0 |

## Mechanical Outline




## Model Reference Guide

**Powerstax A0750 — 085 — 280 — XXX**

1U high AC:DC power module 750W

Input Voltage
085 = 85 to 264VAC

Output Voltage
280 = 28.0V
240 = 24.0V

Features:
Customer Unique
Factory allocated

## Definition of Terms

**AC Line Discrimination**
The unit senses the input line range at power up and shuts the unit down if the input drops below the line range for a specified period of time.

**Current Monitor**
The output current could be reported through the I2C bus.

**Front Panel LEDs**
**LED 1** -- AC OK (green)**:** Input voltage OK
**LED 2** -- Output OK (green)**:** The unit is powered up and operating normally
or
Output fail (amber)**:** The unit has detected an internal fault.

**Input Overcurrent Protection**
An internal fuse is provided for input protection in compliance with safety agency requirements.

**Current Share Bus (CS)**
A single-wire interface between each of the power units forces them to share the load current equally.

**Overcurrent Protection**
In the event of an overload condition, the power supply limits the output current.

**Overvoltage Protection**
The power unit turns itself off before the output voltage reaches the OVP threshold.

**I²C Serial Bus Interface support**
The power unit provides I²C serial bus interface to receive/transmit data

***SCL*****:** Clock signal input for I²C functionality.

***SDA*****:** Data signal I/O for I²C functionality.

***A0~A3*****:** Address pin for I²C address Bit 0~3.

**ORing Diode**
A diode at the output of the power unit protects the DC bus during a power supply failure or hot plugging of the power unit.

**Overtemperature Protection**
In the event of an overtemperature condition, the power unit protects itself by shutting off, restarts automatically after cooling down.

**Remote Sense ( RS+, RS-)**
These signals permit the power units to compensate for a voltage drop across the output distribution.

**On/Off**
This is an input signal referenced to the negative output. Shorting this signal to the negative output will turn on the power unit.

**Status Signals**
The following are the optically isolated open-collector signals:

***DC FAIL***: This signal indicates the output fail. It becomes low with a turn on delay of 100 to 500mS afterthe output voltage reaches in the regulation window. It will go to a high level at least 1mS before output voltage runs out of regulation window.

***OTP****:* This signal indicates fan fail or over temperature. It becomes low with a turn on delay of 100 to 500mS after the output voltage reaches in the regulation window. It will go to a high level 200mS before the unit shuts down if a fan fail or over temperature is sensed.

The logic low level is lower than 0.6V with the sink current of the photo-transistor less than 1mA.

**INT. bus**
Intermediate DC bus. It is a DC output from the power module for shelf internal usage. There is a reserved slot for a DC-DC converter on the back plane of the power shelf. The DC-DC may transfer DC bus voltage to a standby DC output that may be customized upon request.

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