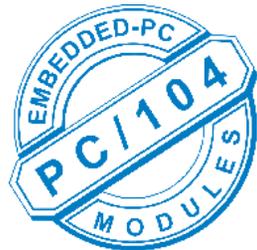




**PC/104 5V, 8A Regulated
Power Supply
(HD-40ADS-1)**

Operator's Manual
P/N: HD-40ADS-MAN
Revision: 2000/06/30



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ABOUT THIS MANUAL

This manual provides information about features and specifications, installation procedures and operating procedures for the HD-40ADS-1 Universal Input Regulated Power Supply. It is designed for the integrators of applications and for the operators of PC/104 embedded systems.

Warnings, Cautions and Notes

WARNING

Describes a potential hazard which could result in injury or death

CAUTION

Describes a procedure, which performed incorrectly, may result in data, equipment or system damage

Note: Describes additional information, defining a specific parameter, procedure or set-up condition.

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1. GENERAL INFORMATION

1.1. Description

The HD-40ADS-1 Universal Input AC Voltage Power Supply is a low noise highly efficient AC-DC converter, with a single fixed isolated output of $5V_{DC}^1$ (factory adjusted) which can float $500V_{AC}$ with respect to the ground potential. It is able to deliver $0 - 8A_{DC}^2$, while keeping voltage regulation within $0.8\%^3$.

If the load value decreases below 0.625Ω , the power supply switches automatically from Constant Voltage Mode to Constant Current Mode and the output voltage starts dropping to a value determined by the load value, according to the following formula:

$$V_{out} = I_{max} \times R_{load}$$

The power supply can sustain indefinitely an output short-circuit condition, situation when eventually may shutdown because of over-temperature, or may deliver continuously 8A, depending to the ambient temperature.

1.2. Features

As presented above, the power supply is fully protected to output over-power and over-current / short-circuit. When this situation occurs, the cooling fan may slow-down / stop, due to the fact that is taking its energy from the output. If the temperature exceeds the specified range, or if the fan stops (see above), the over-temperature protection will shut the power supply down completely. It will automatically resume it's normal operation after the fault condition has been removed. If the input voltage drops below the minimum specified value ($85V_{AC}$), the power supply will also shutdown with an automatic restart when the fault condition has been removed.

The power supply is equipped with an input EMI filter to stop the high frequency noise generated inside from propagating outside the system through the input cable.

Due to the highly efficient cooling system (fan combined with planar heatsinks), the power supply can be mounted in any position within the PC/104 stack system. The power supply is able to deliver full output power within the stack up to +50 °C ambient temperature.

Notes:

- 1 **Output voltage is set to 5V +/-20mV.**
- 2 **Maximum Output Current while in voltage mode is set to 8A +/-100mA.**
- 3 **Load regulation for 0 – 100% load variation, with constant line input voltage**

2. INSTALLING THE POWER SUPPLY

2.1. Introduction

This section provides procedures and information about properly installing the power supply in the PC/104 system. We recommend completing the procedures in the order provided.

2.2. Inspection

CAUTION

Do not attempt to remove the cover. Removal of the cover will void the warranty and possibly damage the unit.

Before installation of the power supply, review the following checklist:

1. Each package contains a power supply and an operator's manual. Provide a standard IEC 320 AC input cord rated for 250V_{AC} and 2A. Connect the chord to the female plug, provided with the unit.
2. Check the unit for visual damage.

If the unit is damaged, save all packing material and notify the carrier immediately. **DO NOT INSTALL or DO NOT ATTEMPT TO REPAIR the unit. Unauthorized repairs void any manufacturer's warranty!**

2.3. Installation onto PC/104 Modules

CAUTION

Before removing the unit from its protective anti-static bag, make sure that you are working in an anti-static environment.

This power supply is a PC/104 compliant product, and therefore conforms to the PC/104 form-factor. This unit conforms to all non-optional aspects of the PC/104 Specification, both mechanical and electrical.

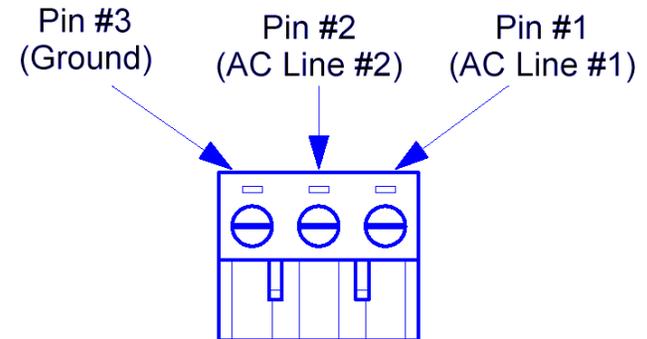
Due to the adopted internal cooling solution, this power supply can be mounted in any position within the system's stack, **without any deration of its maximum output power capability.**

CAUTION

Due to the large number of pins (64 plus 40) on the PC/104 bus, caution must be exercised when connecting or separating the modules to prevent the pins from bending.

2.4. AC Power Connection

Take a standard IEC 320 AC input cord rated for 250V_{AC} and 2A, length to suit the specific system requirements, and connect it to the female plug provided with the unit. Connect as illustrated below:



Connect the female plug to the PCB mounted AC male header. Connect the other end of the power to the AC source, taking the necessary precautions. After system mounting is complete, turn on the AC power switch.

WARNING

Exercise caution when operating and servicing the power supply. A Maximum voltage of 370V peak (depending with the Input AC Voltage supplied) may be present on the circuit board. Input filter capacitors store energy for some time after main power is removed. Only technically qualified personnel may remove the unit cover.

If the power supply module was installed correctly, the fan must start turning and +5V must be present on the PC/104 bus. If the system is not working properly, the fan is not rotating, or you suspect a failure of the power supply module, please refer to the “Troubleshooting” section (APPENDIX B).

2.5. Disconnect Sequence

To disconnect the power supply module, take the reverse steps as for the AC Power Connection sequence:

Turn off the AC source power switch, unplug the AC plug and power cord assembly and remove the power supply module from the system’s stack, exercising extreme caution to prevent bending the PC/104 bus pins.

3. OPERATING THE POWER SUPPLY

3.1. Introduction

The HD-40ADS-1 Power Supply accepts a wide range of AC input voltages (85 – 264V_{AC}), providing a single regulated +5V output voltage up to a maximum 8A output current. The Power Supply doesn’t need any pre-load to operate properly and is able to deliver full power from 0 to 50 °C ambient temperature.

3.2. Operation in Constant Voltage Mode

The Power Supply is intended to work in Constant Voltage Mode. In such conditions, it can deliver from 0 to 8A, while maintaining voltage regulation. Due to its optimized feedback, the power supply delivers a low noise +5V level, providing stability over all specified working conditions. The device uses a proprietary protection topology circuit, which ensures high reliability during start-up, output short-circuit, input voltage failure or output load transients.

In constant voltage mode, the cooling fan turns at it’s normal speed. The fan is internally tied to the +5V and acts as a pre-load if there is no external load connected to the output.

3.3. Operation in Constant Current Mode

If the external load value drops below 0.625Ω , the power supply automatically switches to constant current mode, the output current is limited to 8A and the output voltage starts dropping to a value determined by the load value, according to the following formula:

$$V_{out} = I_{max} \times R_{load}$$

In constant current mode, the fan may turn at a lower speed, or may stop completely (if the output is short-circuited). In an overload condition, the unit will deliver a continuous 8A, or may eventually shutdown due to a fault induced over-temperature condition (ambient temperature dependant).

3.4. Shutdown Mode

The power supply will shutdown under two conditions:

1. The input voltage falls below $85V_{ac}$. Under these conditions, the power supply will try to start up, causing the output rise and collapse. These cycles will repeat until the fault condition is corrected, after which the power supply will automatically resume working.
2. The power supply enters its thermal shutdown region, due to:
 - An output short-circuit.
 - The unit operating at full power at over elevated ambient temperatures (above $+55^{\circ}C$).

The power supply will automatically resume normal operation after the fault condition has been removed.

APPENDIX A. Electrical and mechanical specification.

1. Electrical Specification.

- **Input Characteristics:**

Operating Input Voltage	100 / 120 / 200 / 208 / 220 / 240V _{ac} , 1 ϕ
AC Input Voltage Range	85V _{ac} – 264V _{ac} , 1 ϕ
Source Frequency	47 – 63 Hz
Start-up Time Delay ¹	< 300ms, with no overshoot over 5V
Input Power Factor	0.6 typical @ 120V _{ac} input
Output Hold-up Time	> 20ms, for nominal AC input (208V _{ac}) and full load
Efficiency	69% typical @ full load
In-rush Current	< 20A _{pk} @ V _{in} =264V _{ac} , with power supply cold

- **Output Characteristics:**

Output Voltage	5V, single output
Output Current	8A, with current limit and short-circuit protection
Line Regulation (Voltage Mode)	0.8%, for input voltage variation over the AC input voltage range, with constant load
Load Regulation (Voltage Mode)	0.8%, for 0 – 100% load variation, with constant line voltage
Voltage Mode Transient Response	<1ms, with 300mV maximum overshoot when output current changes between 0.8A and 7.2A @ 5V output voltage and 208V _{ac} input voltage
Output Noise (0 – 20MHz bandwidth) ²	Max. 75mV _{pk-pk}
Output Ripple (0 – 20MHz bandwidth)	Max. 35mV _{RMS}
Output Voltage Temp. Coefficient	0.02% / °C

- **Environmental Specification:**

Operating Temperature Range	0 – 50 °C, no derating of output power
Storage Temperature Range	-20 to +70 °C
Cooling	Forced air fan cooled
• Other:	
Switching Frequency	160kHz – 200kHz
Protections	Input line fuses Over-temperature shut-down with automatic restart Output over-current and short-circuit
Insulation Voltage	Input to Output: 1500V _{ac} Input to Ground: 1500V _{ac} Output to Ground: 500V _{ac}
Insulation Resistance	Input to Ground: >30M with 500V Output to Ground: >20M with 1000V
Leakage Current	<3.5mA, input line to ground

Unit meets CSA C22.2 No. 950 and UL 1950

FOOTNOTES:

¹ Time measured from power on until 5V output is stable (within 5%)

² Peak-to-peak noise measured with an AC coupled 1:1 noise probe, 50Ω terminated.

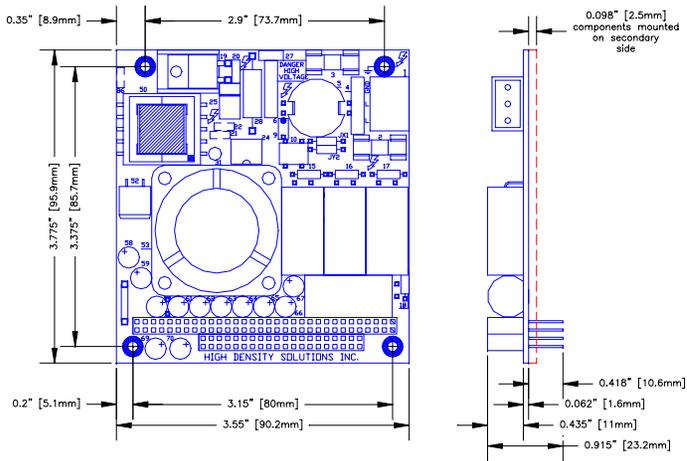
Mechanical Specification.

Dimensions

Weight

standard PC104
package (1 module)
100 grams

- Mechanical dimensions:**



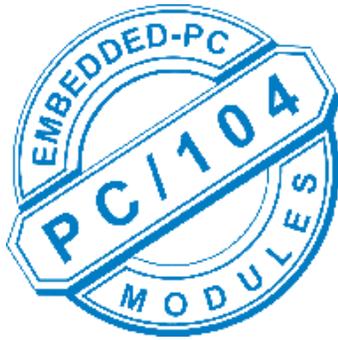
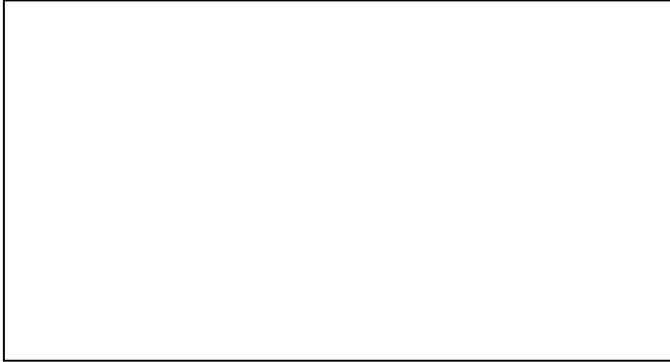
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APPENDIX B. Troubleshooting.

Fault Condition	Potential Problem	Solution
<ul style="list-style-type: none"> Cooling fan does not turn. 	<ul style="list-style-type: none"> Input voltage is not present. 	<ul style="list-style-type: none"> Check the AC lines connection and the power switch.
	<ul style="list-style-type: none"> Cooling fan rotor blades are mechanically restricted or jammed. 	<ul style="list-style-type: none"> Clear the space required for the power supply module as per PC/104 standard.
	<ul style="list-style-type: none"> Output is short-circuited. 	<ul style="list-style-type: none"> Remove the output short-circuit condition.
	<ul style="list-style-type: none"> Ambient temperature is higher than 55 °C. 	<ul style="list-style-type: none"> Ensure the appropriate ambient conditions.
	<ul style="list-style-type: none"> Input fuses blown. 	<ul style="list-style-type: none"> Replace input fuses.
	<ul style="list-style-type: none"> Internal failure. 	<ul style="list-style-type: none"> Contact the manufacturer.
<ul style="list-style-type: none"> Fan is turning at a lower speed, or intermittently. 	<ul style="list-style-type: none"> The power supply is in constant current mode. 	<ul style="list-style-type: none"> Re-establish the appropriate loading conditions.
	<ul style="list-style-type: none"> Input voltage value is under 85V_{AC}. 	<ul style="list-style-type: none"> Check the AC lines connection and the power switch.

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