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Est. 1988

User Manual

PC104pPWR

PC104p Power Supply
“28V” or 12V input
±12V, 5V, 3.3V, -5V output

Revision A1

Corresponding Hardware:

10-2010-0501 Rev A

Corresponding Firmware: N/A

PC104pPWR28
PC104pPWR12
PC104 Stack Power Supply

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The electronic equipment described herein generates, uses, and can radiate radio frequency energy. Operation of this equipment in a residential area is likely to cause radio interference, in which case the user, at his own expense, will be required to take whatever measures may be required to correct the interference.

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Connection of incompatible hardware is likely to cause serious damage.



Table of Contents

PRODUCT DESCRIPTION	4
CONNECTORS AND OPTIONS	7
APPLICATIONS GUIDE	9
Interfacing	9
Construction and Reliability	10
Thermal Considerations	10
WARRANTY AND REPAIR	11
Service Policy	11
Out of Warranty Repairs	11
For Service Contact:	11
SPECIFICATIONS	12
ORDER INFORMATION	13



Product Description

PC104pPWR is a power supply which can be strapped for “12V” or “28V” operation. When in the 12V configuration “12V ONLY” is visible in the silk-screen. PC104pPWR is referred to as PC104pPWR28 or PC104pPWR12 for the two configurations.

Previously PC104pPWR28 and PC104pPWR12 were implemented on separate PCB's. With the Revision D upgrade for PC104pPWR28 the two designs have been combined. This manual refers to this new combined implementation. The general description will still apply to the previous designs, but specific technical numbers [currents etc.] and reference designators will likely have changed. Manuals for the previous versions are available via request. Please contact sales@dyneng.com with the revision and design.

PC104pPWR28 is designed to accept voltages from 14 to 34V with some margin to accommodate a wide range of potential power sources. If you are using Aircraft power, running from a 19.5 V battery, etc. PC104pPWR28 can handle the requirement. The current rating is 10A at the input connector. The output power is rated for 4A on the +12, -12, and -5V supplies plus 10A on the +5 and +3.3V supplies. The currents shown are the maximum recommended values and should be derated for inrush and temperature considerations.

PC104pPWR28 has an upstream power supply which converts the 28V power to 12V. The power supply can generate 18A at 12V. The 12V is used directly as 12V at the connector and internally to generate the other voltages. When configured to operate from 12V [car battery etc.] the input voltage is used for the 12V output voltage, plus the conversion of the other voltages.

PC104pPWR provides the voltages required for the PCI version PC104p and the ISA version PC104. Both connectors are supplied to allow use in either environment. All voltage rails are fuse protected.

An ordering option is defined to remove the PC104 connector. In addition it is possible to mount non pass-through connectors to the design. Please contact sales@dyneng.com for this option.

The higher the voltage, the larger the wattage input to the board for a given current. PC104pPWR is specified for 20A per pin at the power connector. We have de-rated to 9A per pin or 18A total on the reference voltage. This allows for adequate ground return after conversion.

With an 18A limit on the 12V regulator, 216W are available after the initial conversion stage. With the 12V version of the board this will require 18A in as well. With a 28V RMS voltage, the input current will be ~8.6A accounting for the conversion efficiency.



With smaller loads on the back end smaller current requirements will exist for the front end.

The external reference voltage is converted to 12V. The 12V is used internally to source the rest of the supplies plus the 12V rail in the stack. The 12V power supply requires more than 12V as a reference to generate a true 12V output.

The 12V supply will turn on with voltages as low as 7.5V. The 12V will really be 6.X in this case. As the reference voltage comes up to 13+ volts the output will rise to be a true 12V. The higher the current load [across all of the output supplies] the higher the reference will need to be to have a true 12V output. In addition the 12V will have some ripple evident at the lower voltages with high loads. As the voltage rises the ripple is reduced.

For designs that do not require +12V or can live with a non-standard +12V lower reference voltages can be used without hurting the +12V supply. The total power sourced by the PC104pPWR28 will be reduced due to the wattage received being reduced. The 5V, 3.3V, -12V and -5V are well regulated even with the lower 12V output. The secondary supplies are cleaner when the 12V is in regulation due to the decreased ripple present at the secondary supply reference.

The power supplies are based on switching regulators. The efficiencies are high. To be conservative use a figure of 85% when calculating heat losses and cooling requirements for your designed load.

Calculation example: 1A @12V, 1A @-12V, 8A @5V, 8A @3.3V.
 $(1*12 + 1*12 + 8*5 + 8*3.3)/.85 \Rightarrow \sim 143W$. With the PC104pPWR12, 11.92A (12V) will be required to sustain this load. With the PC104pPWR28 ~6A(28V) will be required. In both cases the 12V current is under 18A so the total power is ok.

PC104pPWR is designed with a multi-layer PCB using high temperature ROHS compliant FR4. PC104pPWR can be manufactured with ROHS compliant techniques or with standard lead based solder. For ROHS processing specify -ROHS in your part number. The default is standard processing.

The power supply components are rated for at least industrial temp operation -40 ⇔ +85C.

The power supplies are placed to minimize switching noise and losses. The switch power node between the FET, inductor and DIODE are very tight. The reference side has bulk capacitors located strategically – at the FET of each supply plus near the cable connections. All planes are 4 oz copper. Other design features include being careful about crossing the output side with the control side of the regulators, keeping the



lengths from the current limiting resistor back to the regulator short and placement of the output caps. The supplies have been analyzed for ripple current requirements. Low ESR tantalum parts are used with at least 2x the voltage to provide a long life.

The ground planes are tied to the PC104 connector mounting holes. The ground plane is one of the 4 oz planes. The power supplies are designed with cooling features tied to the ground plane to help spread the thermal load through the planes. For chassis that tie the PC104 stack mounts to the chassis wall, the mounts can provide effective conduction cooling.

PC104p-Chassis http://www.dyneng.com/pc104p_chassis.html uses the mounting hardware along with thermal contacts to conduct the heat to the chassis wall where the built in heat-sink can be used for convection or the mounting plate for conduction cooling.

A fan board may be required in cases where the thermal load exceeds the conduction cooling path capabilities. The fan board circulates the air inside the sealed chassis helping to move the heat load from the cards to the chassis wall. The chassis wall has heat sink groves cut both internally and externally.

<http://www.dyneng.com/pc104p-COOL.html> is the URL to the fan board for PC104.

LED's are provided on the 12V, 5V, 3.3V, -5V and -12V. The LED's are located after the fuses to show the PC104 stack power is available.

The fuses are implemented with self healing SMT devices. Once a fuse is tripped it will remain tripped until the device cools down. The device will then be able to reconnect without user intervention.

With this revision the fuses have been moved ahead of the 5, 3.3 and -5V supplies to allow for regulation without the fuse voltage drop in the path.



Connectors and Options

P1 is the external reference power connector. Pins 1,2 are tied to the reference voltage. Pins 3,4 are ground. The board side connector is a right angle header with shroud and captured fasteners. The cable side has friction locks that interact with the shroud plus hardware to screw into the captured fasteners. A secure mounting system. The power connector is through hole to provide strength. The board side pins are rated at 20A. The cable side contacts at 17+. The current will be limited by the wire gage selected.

The PC104pPWR28 comes with the mating connector and 20 AWG wire. White in the reference voltage positions and black in the ground positions. 12" lengths are supplied. 105C PVC jacketed wire is standard. The cable side has screw clamps for the wire connection. The wire gage can be changed by the client.

Onshore Technology OSTTS04715C or equivalent connectors can be used on the cable side. The cable is supplied with a straight connector. Right angle and offset connectors are available. Direct to board cable mounting is also an option for custom requirements.

The power supply cable can be supplied with your connector installed. Please contact Dynamic Engineering with your requirements.

VIO is selected with **J3**. VIO is 3.3 with the shunt installed and 5V with it open. In some cases customers prefer to lock the VIO to 3.3. Please add -3.3VIO to the part number for this option.

PC104pPWR has accommodations for adding fans to an air-cooled chassis. 4 - 2 pin header positions are available along with fused 5V or 12V power to operate the fans. The headers can be mounted to front or rear surfaces and can be mounted with right angle headers as well. The fuses are rated for 2A. The fan power counts in the total for the power supply. F9 selects 5V and F14 selects 12V. Please add -FAN5 or -FAN12 for the 5V and 12V fan options and add "RA" for right angle and "R" for rear mounted. -FAN5R would be a standard header mounted in 4 positions on the rear with 5V power. -FAN12RAR would be 12V fan option, 4 places, right angle header, rear mount. Pin 1 is the FANPWR and pin2 is ground on each of the headers. [[J4](#), [5](#), [6](#), [7](#)]

The power pins for the PCI and ISA connectors are standard. PC104pPWR can be plugged into any standard stack and energize the appropriate power rails. A listing of the specific pin connections follows. Please note that the other signals are passed through allowing PC104pPWR to be placed anywhere in the stack.



J1 is the PCI connector and has the following Power/Ground connections:

+5V: A26, A22, B27, B21, C28, C24, D2, C1

+3.3V: D17, A17, B15, C14, D13, A12, B11, C10, D8, A8

VIO: A2, B6, B25, C19, D23 <= Set to 5V or 3.3V with J3

+12V: A29

-12V: A30

Ground: A1, C4, B3, A5, D5, C7, B9, A10, D11, C12, B13, A14, D15, C16, B18, A20, D20, C22, B23, A24, D25, C26, D27, A28, D30, MH1, MH2

J2(A&B) form the PC104 (ISA) connector

+5V: B3, B29, D16

-5V: B5

+12V: B9

-12V: B7

Ground: B1, B31, B32, A32, D18, D19, C0, D0

Please note that the Mounting holes are grounded to allow the stacking support HW to tie into the ground plane for additional conduction cooling.



Applications Guide

Interfacing

Some general interfacing guidelines are presented below. Do not hesitate to contact the factory if you need more assistance.

ESD

Proper ESD handling procedures must be followed when handling the PC104pPWR. The card is shipped in an anti-static, shielded bag. The card should remain in the bag until ready for use. When installing the card the installer must be properly grounded and the hardware should be on an anti-static work-station.

Watch the system grounds. All electrically connected equipment should have a fail-safe common ground that is large enough to handle all current loads without affecting noise immunity. Power supplies and power consuming loads should all have their own ground wires back to a common point.



Construction and Reliability

PC104 Modules were conceived and engineered for rugged industrial environments. The PC104pPWR is constructed out of 0.062 inch thick high temp FR4 material.

Surface-mount and through hole components are used.

The PC104pPWR is secured into the stack by a combination of the connector retention and the connector mounting hardware. All 4 standoffs should be installed to support the stability and cooling requirements of the PC104pPWR.

Thermal Considerations

PC104pPWR is an efficient power supply. With high loads the low percentage of thermal waste can still add up to a number large enough to require thought.

Use a figure of 15% for the power dissipated within the supplies. This is a conservative number. If your system load is 100W then the input requirement will be $100 / .85 = 117.65W$ with the power supply dissipating about 18W.

PC104pPWR can be mounted into many different chassis configurations. PC104pPWR is designed to spread the dissipated power out over the board through heavy planes, and to make use of the mounting hardware to spread within the stack. If the chassis selected ties [thermally] to the mounting hardware; the external chassis can be used to dissipate the thermal load. The PC104p-Chassis is a good example of this approach. Your chassis situation may require a fan. <http://www.dyneng.com/pc104p-COOL.html> is recommended for additional cooling.

Warranty and Repair

Please refer to the warranty page on our website for the current warranty offered and options.

<http://www.dyneng.com/warranty.html>

Service Policy

Before returning a product for repair, verify as well as possible that the suspected unit is at fault. Then call the Customer Service Department for a RETURN MATERIAL AUTHORIZATION (RMA) number. Carefully package the unit, in the original shipping carton if this is available, and ship prepaid and insured with the RMA number clearly written on the outside of the package. Include a return address and the telephone number of a technical contact. For out-of-warranty repairs, a purchase order for repair charges must accompany the return. Dynamic Engineering will not be responsible for damages due to improper packaging of returned items. For service on Dynamic Engineering Products not purchased directly from Dynamic Engineering contact your reseller. Products returned to Dynamic Engineering for repair by other than the original customer will be treated as out-of-warranty.

Out of Warranty Repairs

Out of warranty repairs will be billed on a material and labor basis. The current minimum repair charge is \$125. Customer approval will be obtained before repairing any item if the repair charges will exceed one half of the quantity one list price for that unit. Return transportation and insurance will be billed as part of the repair and is in addition to the minimum charge.

For Service Contact:

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Specifications

Output Interface:	PC104, PC104p, PCI-104, PC/104+ compatible
Input Connector:	OSTOQ047551 or equivalent
Cable Connector:	OSTTS04715C or equivalent
Dimensions:	PC104 module
Construction:	High temp FR4 Multi-Layer Printed Circuit, Surface Mount and through hole Components
Power:	“28V” or 12V in. VIO, 5V, 3.3V, +12, -12, -5V supplied to stack. Fuse protected.
User	PCI VIO select

Order Information

PC104pPWR28

http://www.dyneng.com/pc104p_pwr28.html

Standard version 28V reference supply in PC104 format with all stack voltages.

PC104pPWR12

http://www.dyneng.com/pc104p_pwr12.html

Standard version 12V reference supply in PC104 format with all stack voltages.

-ROHS

Add ROHS processing

-3.3VIO

force to 3.3VIO operation

-CC

Conformal Coating option

-NM5

Delete -5V supply

-P

Delete PC104 connector [ISA] and -5V supply

-FAN(5,12,RA,R)

Add FAN fuses with 5V,12V, Right Angle or Vertical header, Rear or Front mount.

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