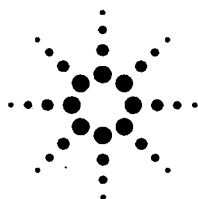




HP 75000 Series C

HP Z2532A 11-Slot C-Size VXI Mainframe and Power Supply

User and Service Information



Agilent Technologies



Manual Part Number: Z2532-90001
Printed in U.S.A. E1096



HP 75000 Series C

HP Z2532A

11-Slot C-Size VXI Mainframe and Power Supply

User and Service Information



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HP Z2532A 11-Slot C-Size VXI Mainframe and Power Supply User and Service Information



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Edition 1

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Documentation History

All Editions and Updates of this manual and their creation date are listed below. The first Edition of the manual is Edition 1. The Edition number increments by 1 whenever the manual is revised. Updates, which are issued between Editions, contain replacement pages to correct or add additional information to the current Edition of the manual. Whenever a new Edition is created, it will contain all of the Update information for the previous Edition. Each new Edition or Update also includes a revised copy of this documentation history page.

Edition 1 (Z2532-90001) October 1996

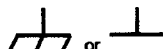
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Instruction manual symbol affixed to product. Indicates that the user must refer to the manual for specific WARNING or CAUTION information to avoid personal injury or damage to the product.



Indicates the field wiring terminal that must be connected to earth ground before operating the equipment—protects against electrical shock in case of fault.



Frame or chassis ground terminal—typically connects to the equipment's metal frame.



Alternating current (AC).



Direct current (DC).



Indicates hazardous voltages.

WARNING

Calls attention to a procedure, practice, or condition that could cause bodily injury or death.

CAUTION

Calls attention to a procedure, practice, or condition that could possibly cause damage to equipment or permanent loss of data.

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Edition 1 (Z2532-90001)

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Chapter 1

System Installation

Introduction

The HP Z2532A VXI mainframe and power supply is a custom designed VXI system. The mainframe backplane is in full compliance with the VXIbus specifications (Rev. 1.4) and VMEbus system specifications (Rev. C.1). The mainframe contains 11 slots for installing C-size VXI instruments.

The power supply is a VICOR MegaPAC™ DC Power Supply. See Appendix A for complete information on the power supply.

This chapter covers the HP Z2532A configuration which includes:

- System Components
- Installing the Power Supply and VXI Mainframe
- VXI Instrument Installation

System Components

Figure 1-1 shows the components of the HP Z2532A Mainframe/Power Supply system. Included are part numbers for the replaceable parts available.

Contact the Hewlett-Packard Atlanta, Georgia Sales Office for information on ordering replaceable parts.

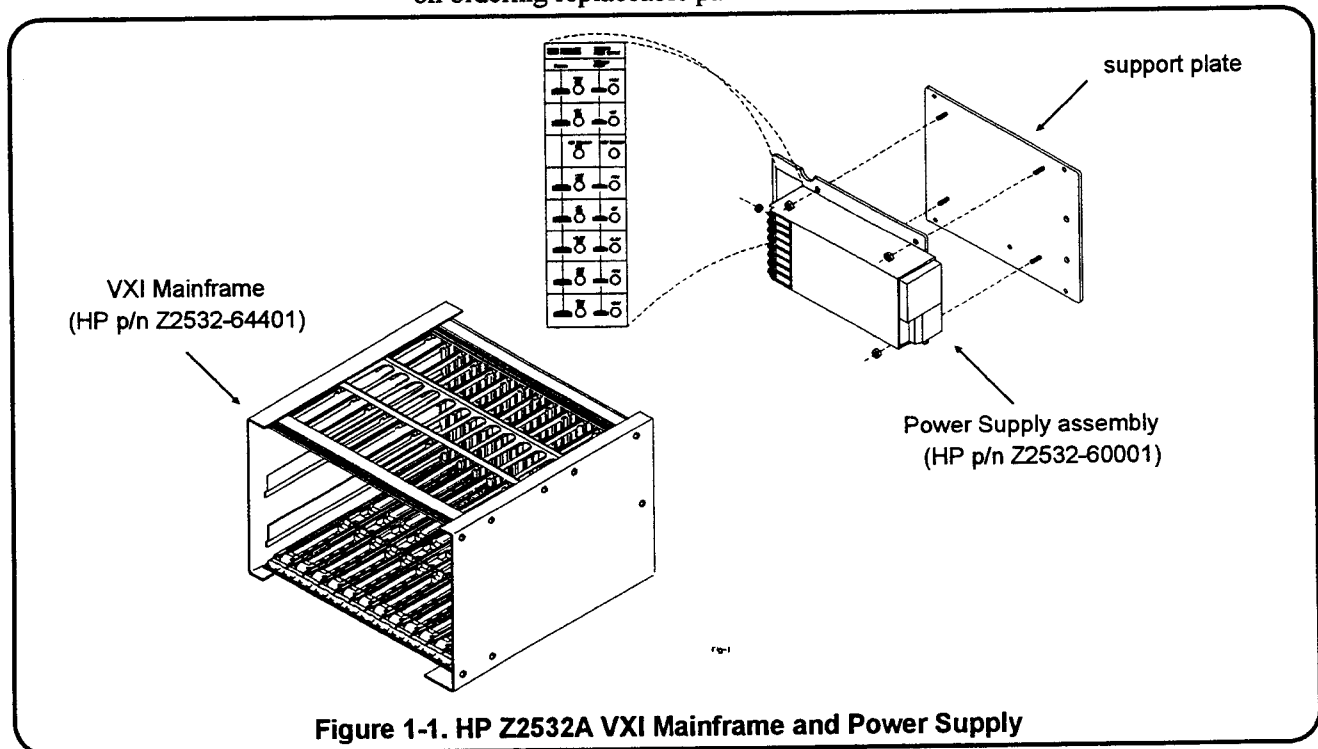


Figure 1-1. HP Z2532A VXI Mainframe and Power Supply

Installing the Power Supply and VXI Mainframe

Figure 1-2 represents the HP Z2532A system installed in a rack. The installation sequence is as follows:

1. Connect the support plate (HP p/n Z2532-00202) to the rack using four bolts (not included with the system).
2. Connect the power supply assembly to the support plate by placing the assembly over the four (threaded) posts. Secure the assembly to the support plate using four M6 X 1.0 hex nuts.

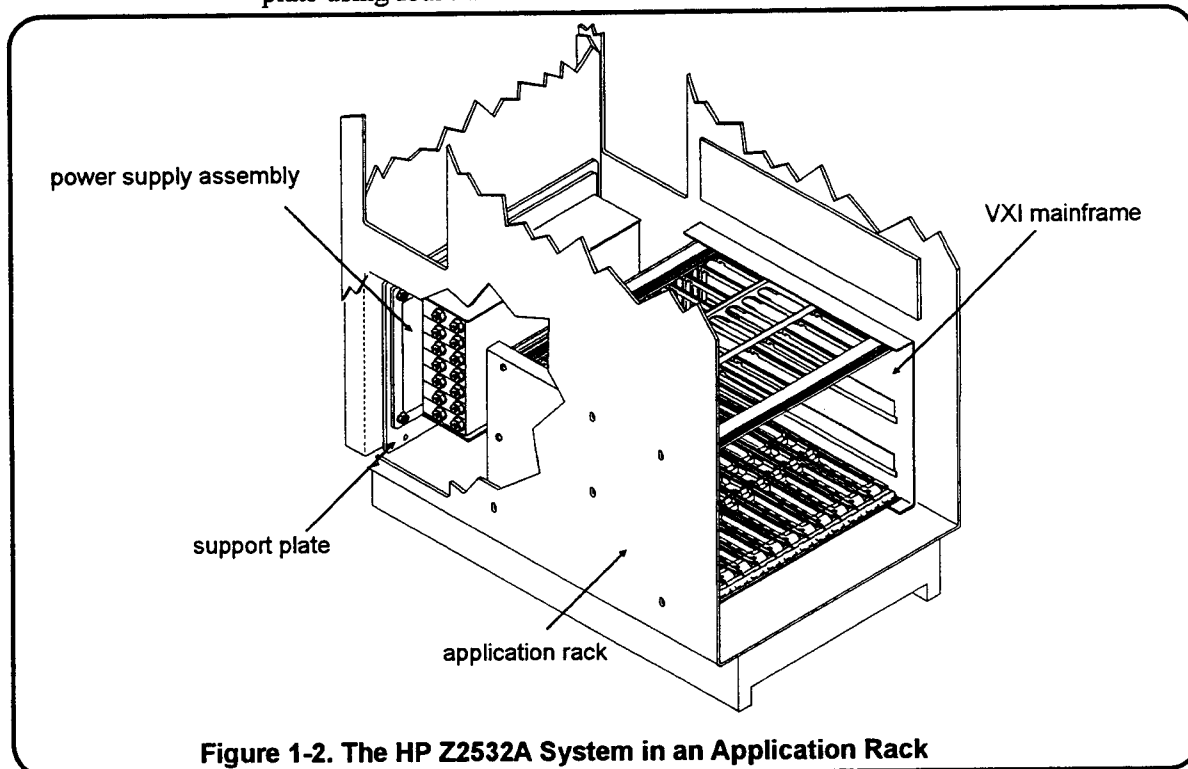


Figure 1-2. The HP Z2532A System in an Application Rack

Caution Static sensitive components are exposed on the VXI mainframe backplane. Do not touch the backplane when handling the HP Z2532A system. Install the system at a static-controlled workstation that includes personnel grounding provisions.

Caution There are four capacitors on the mainframe backplane which extend beyond the mainframe chassis. Use care when positioning the mainframe relative to the power supply to avoid damaging the capacitors.

3. Slide the VXI mainframe into the rack until the mainframe mounting holes (four per side) line up with the rack mounting holes. Insert eight bolts (not included with the system) and tighten to secure the mainframe to the rack.

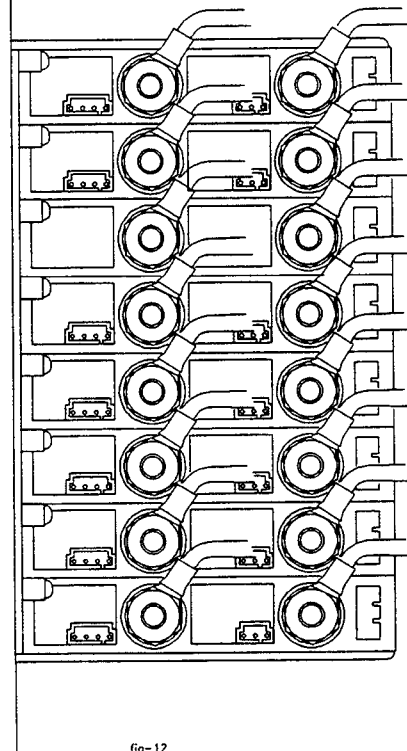
4. Using the label on the power supply assembly, the labels on the individual cables, and Figure 1-3, connect the backplane cables to the supply terminals.

A. To easily access all terminals and ports, connect the backplane cables to the power supply in the sequence shown in Table 1-1.

B. Connect the remote sense cable status connector to the power supply interface port J10 (Figure 1-4).

Warning

Do not apply power to the HP Z2532A system until all power supply terminals have been connected to the mainframe backplane, and the system is installed in the application rack. Arcing can result between the power supply and external wiring if the system is not properly installed before power is applied.



HEWLETT PACKARD		Z2532PS POWER SUPPLY	
Status		Voltage Sense	
	+12V GND		+12V
	+5V GND		+5V
	+5V Booster GND		+5V Booster
	-12V GND		-12V
	-2V GND		-2V
	-5.2V GND		-5.2V
	-24V GND		-24V
	+24V GND		+24V

Fig-9

Figure 1-3. Connecting the VXI Backplane to the Power

Table 1-1. VXI Backplane and Power Supply Wiring Sequence

Step	Cable Assembly	Cable	Step	Cable Assembly	Cable
1	Z2532-61602	+24V	13	Z2532-61602	-5.2V
2	Z2532-61602	-24VGND	14	Z2532-61603	-5.2V sense
3	Z2532-61602	-5.2VGND	15	Z2532-61601	-2V
4	Z2532-61601	-2VGND	16	Z2532-61603	-2V sense
5	Z2532-61600	-12VGND	17	Z2532-61600	-12V
6	Z2532-61601	+5 Booster	18	Z2532-61603	-12V sense
7	Z2532-61600	+5V	19	Z2532-61601	+5V Booster GND
8	Z2532-61600	+12V	20	Z2532-61601	+5VGND
9	Z2532-61602	+24VGND	21	Z2532-61603	+5V sense
10	Z2532-61603	+24V sense	22	Z2532-61601	+12VGND
11	Z2532-61602	-24V	23	Z2532-61603	+12V sense
12	Z2532-61603	-24V sense			

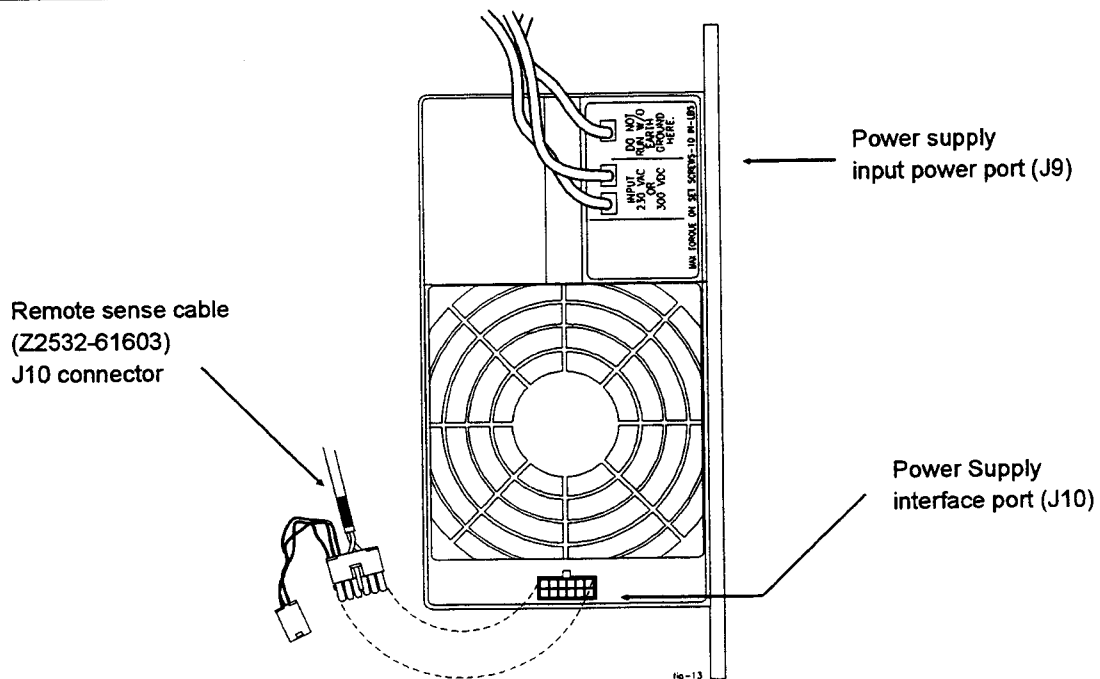


Figure 1-4. Connecting the Remote Sense Cable to the Power Supply

VXI Instrument Installation

As mentioned on Page 9, the VXI mainframe in the HP Z2532A system is in full compliance with the VXIbus specifications (Rev. 1.4) and VMEbus system specifications (Rev. C.1).

The mainframe has 11 slots labeled A1 - A11. Note, however, that these slots function as slots 0 through 10 based on the VXIbus specification. Thus, there are restrictions on the VXI instrument that can be installed in slot 0.

Note

The VXI-specific information in this manual is limited to installation of VXI instruments in the mainframe. Detailed VXI configuration information is included with the various VXI instruments.

Installing C-Size Instruments

C-Size Modules can be installed in any slot except slot 0, and need not be installed in adjacent slots. However, when installing multiple modules which make a virtual instrument, the modules should be installed in adjacent slots. This allows cables to be easily connected between the modules.

Figure 1-5 shows the installation of C-Size instruments.

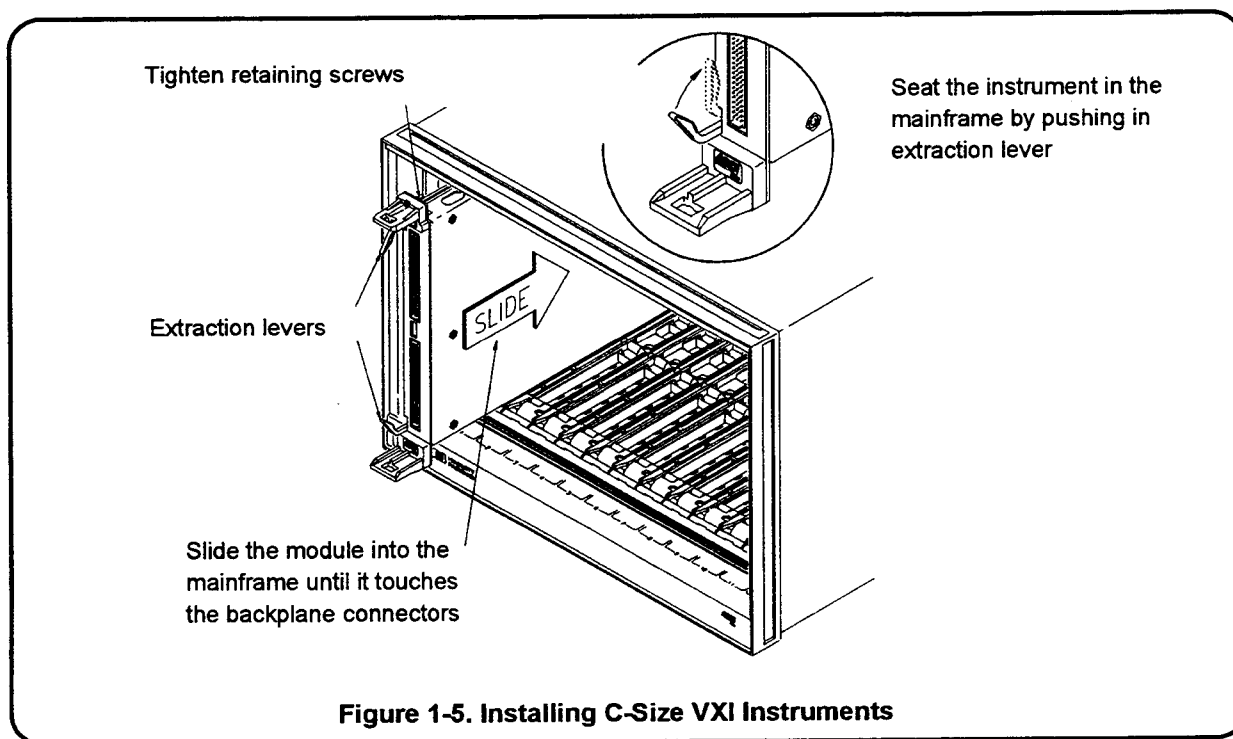


Figure 1-5. Installing C-Size VXI Instruments

1. To prevent damage to the VXI instruments, install the instruments when power is not applied to the mainframe.

2. Insert the instrument into the mainframe by aligning the instrument with the card guides inside the mainframe. Slowly push the instrument into the slot until it seats in the backplane connectors. The front panel of the instrument should be even with the front edges of the mainframe.

3. Tighten the retaining screws on the top and bottom of the module.

Warning

All instruments within the VXI mainframe are grounded through the mainframe chassis. During installation, tighten the instrument's retaining screws to secure the instrument to the mainframe and to make the ground connection.

NOTE

If the module fails to insert properly, make sure you are lined up in the card guides and make sure the tabs are turned towards the center of the card.

Installing A- and B-Size Instruments

If you are installing A-size, B-size, and C-size instruments in the same mainframe, we recommend you install the A- and B-Size instruments *first*. (You will generally need more working room to install the smaller instruments.) Figure 1-6 shows the installation of A- and B-size instruments.

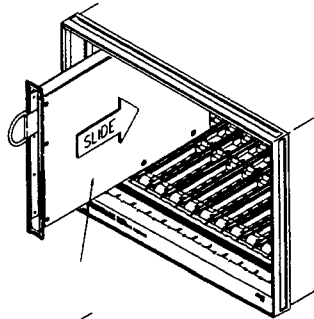
1. To prevent damage to the VXI instruments, install the instruments when power is not applied to the mainframe.

2. Install the HP E1403 A/B-size Module Carrier or the HP E1407 A/B-size Module Carrier into the mainframe. This is done by aligning the top and bottom of the carrier with the card guides and slowly pushing the carrier into the mainframe. The front of the carrier should be even with the front edges of the mainframe.

3. Slide the A- or B-Size instrument into the carrier until it connects.

4. Tighten the retaining screws on the top and bottom of the instrument.

Slide adapter module into the mainframe until it plugs into the backplane connector



Slide the A- or B-size instrument into the adapter until it plugs into the adapter

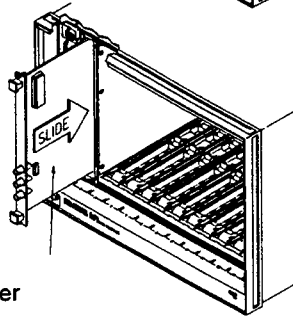


Figure 1-6. Installing A- and B-Size VXI Instruments

Warning

All instruments within the VXI mainframe are grounded through the mainframe chassis. During installation, tighten the instrument's retaining screws to secure the instrument to the mainframe and to make the ground connection.

Installation manuals are shipped with each carrier described.

- **HP E1403B A/B-size Module Carrier** extends the P1 connector on the VXIbus backplane and mounts the (A/B-size) modules flush with other C-size modules. This carrier is recommended for all Hewlett-Packard B-size modules which have only the P1 connector.
- **HP E1407A A/B Module Carrier** extends the P1 and P2 connectors on the VXIbus backplane. This carrier is recommended for B-Size modules which have the P1/P2 connectors.

Caution

When installing the mainframe in your system, ensure that the air inlets and outlets are not obstructed. Blocked inlets and outlets can cause damage to the mainframe and plug-in modules due to overheating.

Chapter 2

Operating Considerations

Introduction

This chapter contains general operating information and explains parameters which must be considered prior to, and during, HP Z2532A system operation. The sections in this chapter include:

- Before Applying Power
- Verifying the Backplane Voltage
- Applying a +5V Standby Signal
- Auxiliary Vcc and Output Shut Down
- Monitoring the Power Supply Outputs

Before Applying Power

The following parameters are the responsibility of the system integrator or end user. To avoid possible injury and equipment damage, these parameters must be addressed **before** power is applied to the HP Z2532A system.

Verifying Power Supply and Mainframe Cabling

Visually inspect the system to ensure the mainframe cables are connected to their corresponding power supply terminals. The label on each cable must match the terminal label on the power supply assembly. The terminal label is shown in Figure 1-3.

Notice that the $\pm 24\text{V}$ and $\pm 12\text{V}$ terminals use the smaller diameter (12 gauge) wire and the +5V, -5.2V, and -2V terminals use the larger diameter (10 gauge) wire.

Remote Sense Cable

Verify that the remote sense cable (Figure 1-4) is firmly connected to the mainframe backplane, to power supply input port J10, and to the J2 sense port on each supply output. The cable's sense leads are also labeled and must be connected to the corresponding 'Voltage Sense' port.

Power Supply Terminal Grounding

Using an ohmmeter, check all supply grounds ($\pm 24\text{V}$, $\pm 12\text{V}$, +5V, -5.2V, -2V). When wired correctly, all grounds will be shorted together. Also verify that the +5V and +5V booster supplies are shorted together.

Caution

Each power supply output has a corresponding (mainframe) backplane signal line. Connecting a supply voltage (e.g. +24V) to a signal line intended for a lower voltage (e.g. +5V) can damage the backplane.

Once all cabling has been verified and the other parameters have been addressed, proceed to "Verifying the Backplane Voltage" in the next section.

Fusing the Power Supply Input

There is no input fault protection for the HP Z2532A system power supply. The supply manufacturer strongly recommends that a fault clearing device such as a fuse (10A slow blow) or circuit breaker rated for the input voltage be used at the supply input. See the VICOR power supply manual in Appendix A for additional information.

Notice that it is the responsibility of the system integrator or end user to provide input fault protection.

VXI Instrument Cooling

In HP Z2532A systems, the system integrator or end user is responsible for supplying adequate cooling to VXI instruments installed in the mainframe. Hewlett-Packard is not responsible for damage due to overheating.

VXI Mainframe and Instrument Grounding

All signals within the VXI mainframe are referenced to the mainframe chassis. The chassis is grounded to the CASS rack through the eight side plate mounting bolts. Do not operate the HP Z2532A system without grounding the mainframe and power supply.

All instruments within the VXI mainframe are grounded through the mainframe chassis. During instrument installation, tighten the instrument's retaining screws to ensure the ground connection.

Verifying the Backplane Voltage

Once power is applied to the HP Z2532A system, you should verify that the correct voltages are present on the backplane before VXI instruments are installed. Figure 2-1 shows a slot's J1 and J2 connectors and signal locations. Only one slot and one location for each voltage need be checked.

Voltage	Connector	Pin	Row
+24V	J2	31	C
-24V	J2	32	C
+12V	J1	31	C
-12V	J1	31	A
+5V	J1 J2	32	A,B,C
		1	B
		13	B
		25	A
-5.2V	J2	32	B
		4	C
		7	A
		13	A
-2V	J2	19	A,C
		2	A
		13	C

J2 connector

J1 connector

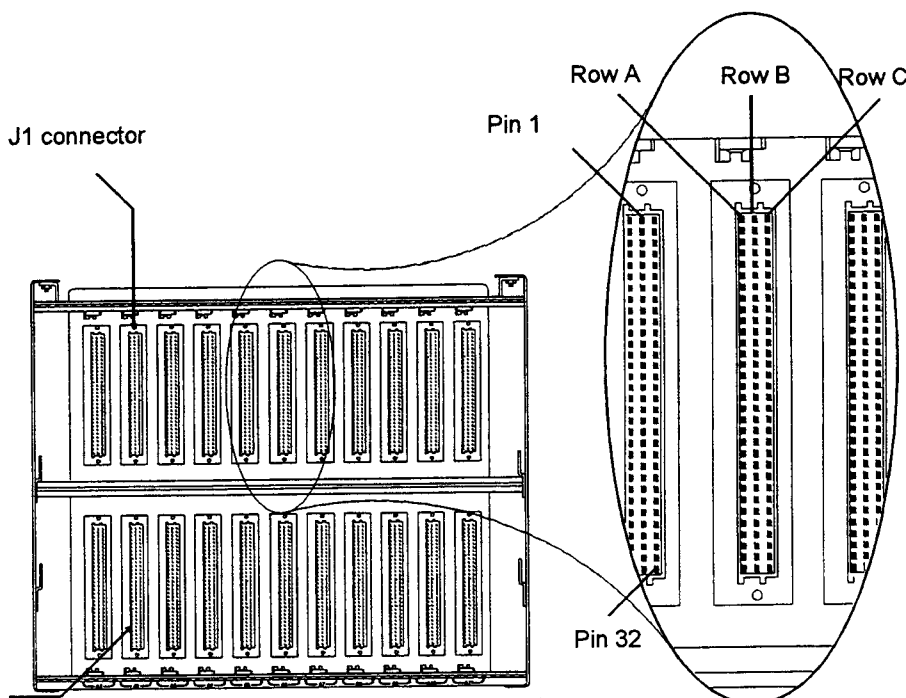


Figure 2-1. Verifying the Backplane Voltages

Caution

If voltages greater than +5V, -5.2V, or -2V are detected on these signal lines, damage to the backplane can occur. Remove power from the system and re-check the cabling between the power supply and the backplane.

Before reapplying power, refer to Chapter 3, "Troubleshooting and Repair" to determine if damage to the backplane has occurred.

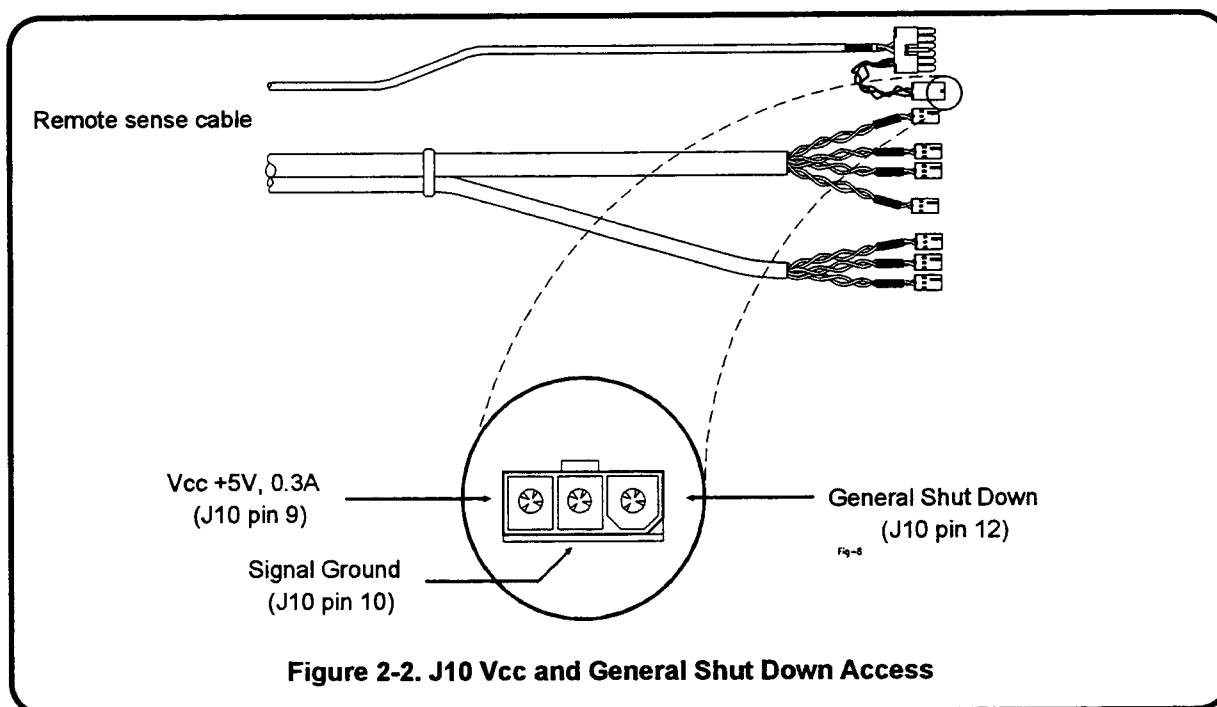
If a voltage other than a supply voltage is measured on any signal line, re-check the Voltage Sense (J2) port connections on the remote sense cable.

Applying a +5V Standby Signal

A +5V (1A maximum) standby signal can be applied to each mainframe slot from the +5V - STDBY terminal on the rear side of the backplane.

Auxiliary Vcc and Output Shut Down

The three terminal plug housing extending from the remote sense cable J10 connector provides access to the auxiliary Vcc +5V signal (J10 pin 9). The housing and cable are shown in Figure 2-2. The auxiliary +5V can be applied to output port J3 (pin 1) which is used to indicate the status of a particular supply.



The plug housing also enables you to shut down the individual supplies which essentially turns off the system. This is done by shorting the 'General Shut Down' pin to the 'Signal Ground' pin. Notice that these pins correspond to J10 pin 12 and pin 10 respectively.

The power supply J10 and J3 ports and associated connectors are described in the VICOR manual in Appendix A.

Note

The 'Signal Ground' pin (J10 pin 10) accessed through the three terminal plug housing is chassis ground. Be aware of ground loops when connecting this ground to another ground reference through the housing.

Monitoring the Power Supply Outputs

The power supply provides $\pm 24V$, $\pm 12V$, $-5.2V$, $+5V$, and $-2V$. The failure of one supply does not affect the others. Each supply can be monitored individually using the 'Status' (J3) port of the particular supply (Figure 2-3).

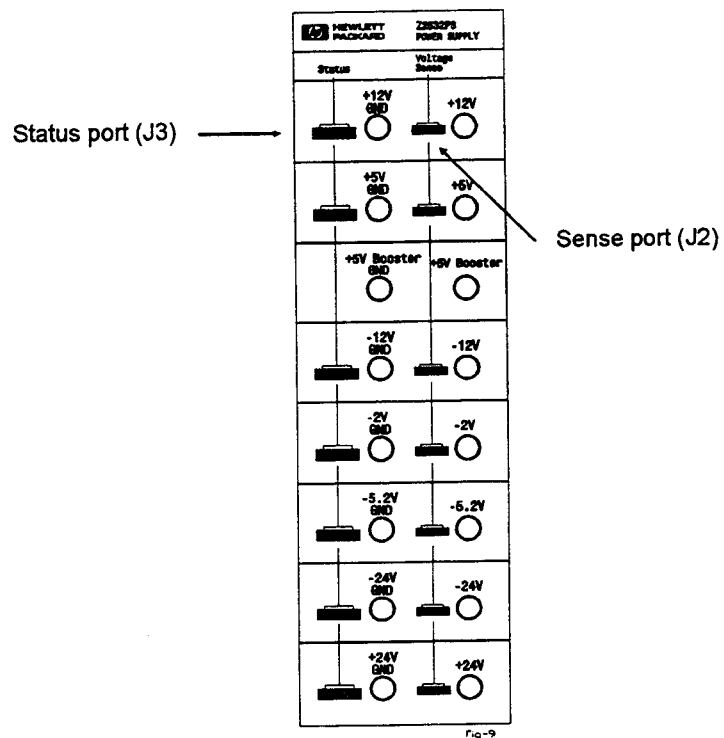


Figure 2-3. HP Z2532A Power Supply Status and Sense Ports

It is the responsibility of the end user to monitor the supply voltages. See the VICOR power supply manual in Appendix A for additional information.

Chapter 3

Troubleshooting and Repair

Introduction

There are no servicable parts in the HP Z2532A VXI mainframe and power supply system. Repair is limited to replacing the mainframe, power supply, or cable assembly.

Checking For Backplane Damage

If power is applied to an incorrectly wired HP Z2532A system, damage to the VXI mainframe backplane can occur. Specifically, if $\pm 24\text{V}$ or $\pm 12\text{V}$ was connected to the $+5\text{V}$ backplane lines, then the backplane's power monitor circuitry must be checked. If $\pm 24\text{V}$ or $\pm 12\text{V}$ is connected to the -5.2V or -2V backplane lines, then the mainframe's 10 MHz clock circuitry must be checked.

Power Monitor Circuitry

Operation of the power monitor circuitry is verified by checking the backplane's ACFAIL and SYSRESET signals. The relationship of these signals is shown in Figure 3-1. The signals are accessible on the backplane J1 connector (Figure 3-2). Using an oscilloscope, verify the signals at power on and at power down (Figure 3-1). If either signal is not present or the phase relationship is not as shown, contact the Hewlett-Packard Atlanta Sales and Service Office for return/replacement procedures.

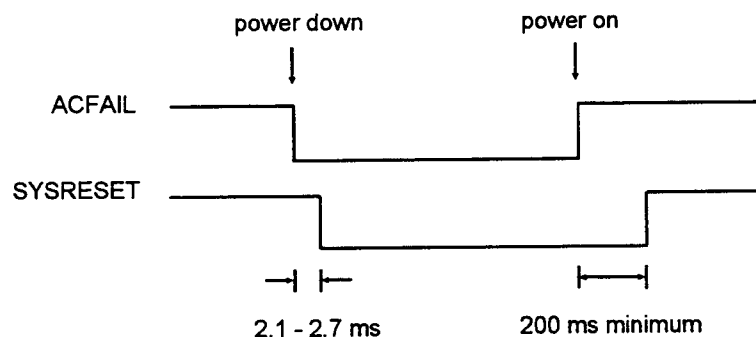
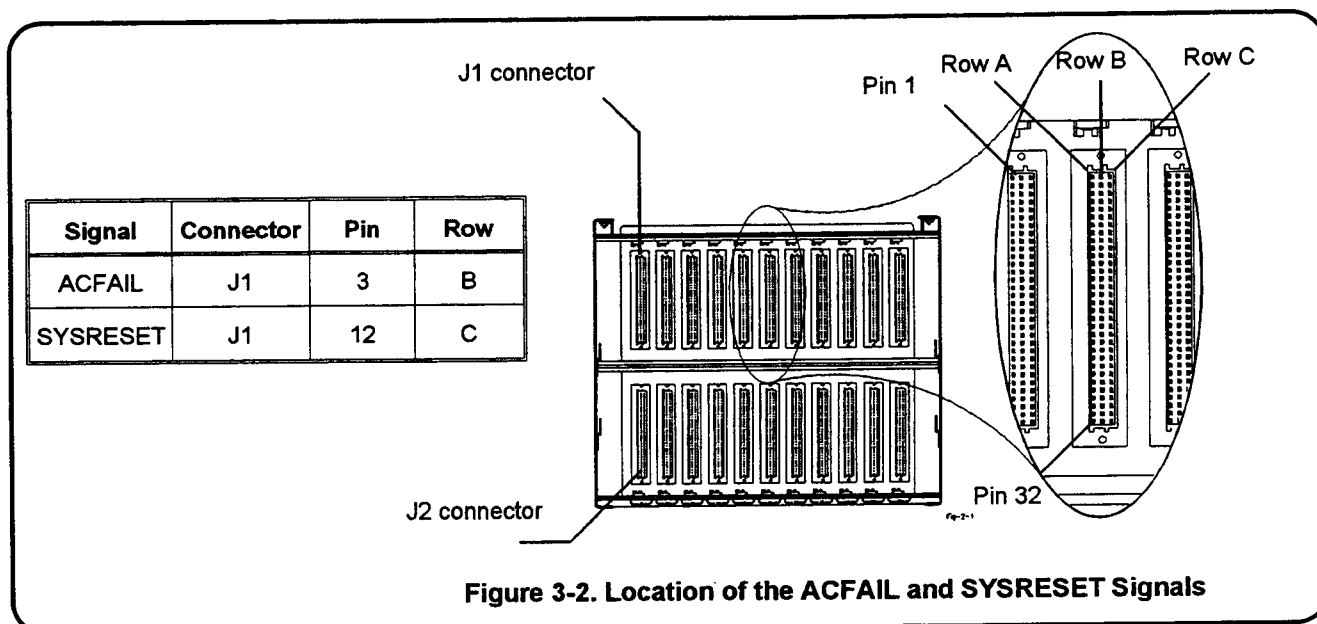


Figure 3-1. VXI Backplane ACFAIL and SYSRESET Signals



Checking the 10 MHz System Clock

As previously mentioned, if $\pm 24V$ or $\pm 12V$ is connected to the $-5.2V$ or $-2V$ backplane lines, then the mainframe's 10 MHz clock circuitry must be checked. The 10 MHz clock is sourced from VXI slot 0 to VXI slots 1 -10. (Notice that these slots are labeled A1 - A11 on the mainframe.) The clock is checked by installing a slot 0 VXI instrument such as the HP E1406 Command Module in slot 0, and a VXI instrument such as the HP E1420B Universal Counter to measure the frequency.

If the 10 MHz clock is not functioning, contact the Hewlett-Packard Atlanta Sales and Service Office for return/replacement procedures.

System Failures

If the VXI mainframe and power supply are wired correctly but the correct supply voltages are not present on the backplane, then you need to isolate the problem to the mainframe, the power supply, or to the cables assemblies.

1. Verify that voltages are present on the backplane using the "Verifying the Backplane Voltages" procedure found in Chapter 2.
2. If one or more supply voltages do not appear on the backplane, measure the voltages directly on the power supply terminals. If these voltages are not correct, then the power supply may need to be replaced. Contact the Hewlett-Packard Atlanta Sales and Service Office for return/replacement procedures.

Warning

When measuring voltage directly on the power supply terminals, ensure that the HP Z2532A system remains installed. This ensures that the +5V and +5V booster supplies remain connected, and that the 'voltage sense' (J2) ports continue to regulate the output.

3. If the voltages on the power supply terminals are correct and the voltages on the backplane are incorrect, then one or more cable assemblies may need to be replaced. These assemblies are available from the Hewlett-Packard Atlanta Sales and Service Office.

Component Replacement

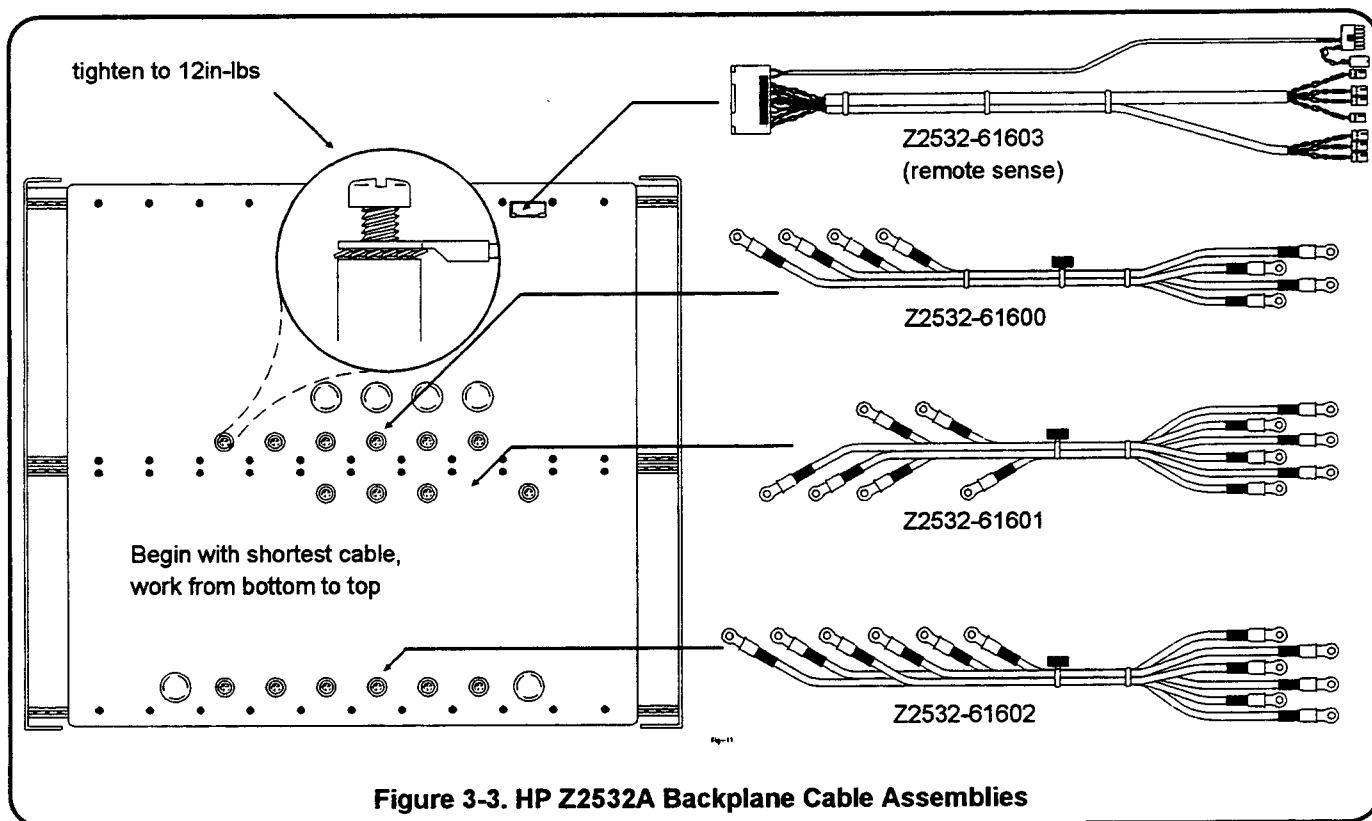
The Z2532A system components available for replacement are listed below.

Mainframe	Z2532-64401
Power Supply	Z2532-60001
Cable Assembly*	Z2532-60000
* Includes all four backplane cable assemblies.	

Note

The components listed above are only available from the Hewlett-Packard Atlanta, Georgia Sales and Service Office.

Figure 3-3 identifies the cable assemblies and their locations on the backplane. Notice that each backplane screw terminal label matches a corresponding cable.

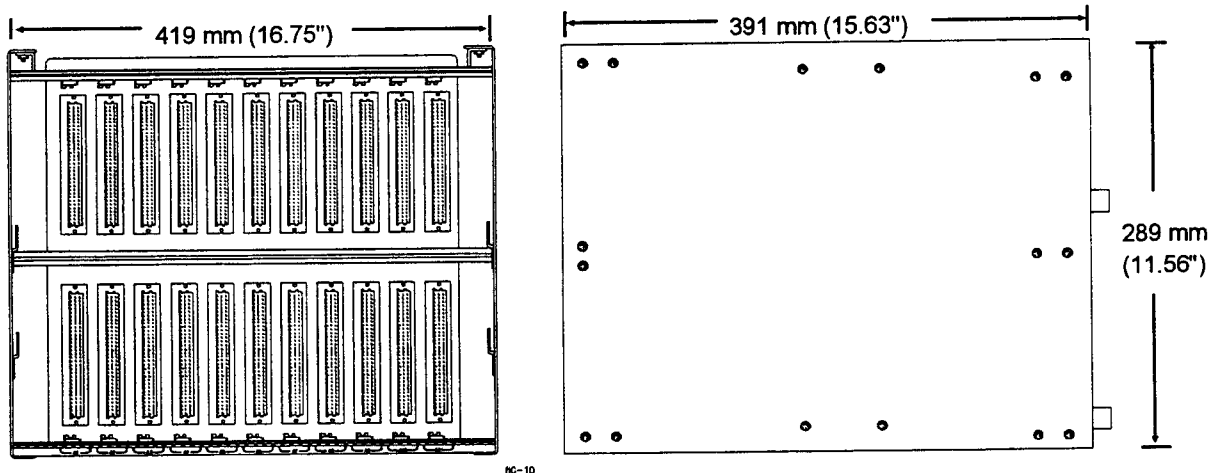


Chapter 4

Specifications

The HP Z2532A mainframe is 100% compatible with VXIbus specification revision 1.4.

Overall Mainframe Size



Product Weight HP Z2532A: 11.3 Kg (25.0 lbs) with no modules installed.

Module Size Eleven (11) C-Size slots. The mainframes also accept A- or B- Size modules using the optional HP E1403B or HP E1407A Module Carriers.

Power Supply Outputs

DC Output Voltage	Peak DC Output Current (IMP*) 55 °C	P-P Dynamic Current (IMD**)
+5V	80A	8.0A
+12V	16.7A	0.8A
-12V	16.7A	0.8A
+24V	8.3A	2.5A
-24V	8.3A	2.5A
-5.2V	38.5A	4.0A
-2V	40A	4.0A

* IMP = Rated mainframe peak DC output current as defined by the VXIbus Specification.

** IMD = Rated mainframe peak-to-peak dynamic current as defined in the VXIbus Specification by a current vs. frequency curve.

VXI Ripple/Noise*

DC Output Voltage	Allowed Variation	Max. DC Load Ripple/Noise	Max. Induced Ripple/Noise
+5V	+0.25/-0.125	50 mV	50 mV
+12V	+0.06/-0.36	50 mV	50 mV
-12V	-0.60/+0.36	50 mV	50 mV
+24V	+1.2/-0.72	150 mV	150 mV
-24V	-1.2/+0.72	150 mV	150 mV
-5.2V	-0.26/+0.156	50 mV	50 mV
-2V	-0.10/+0.10	50 mV	50 mV

* Per VXI Specification rev. 1.4

Humidity 35% to 95% relative humidity from 0 to 40 °C

Temperature Range Non-operating: -40 °C to +75 °C
Operating: 0°C to 55 °C

Vibration Operating, Functional:
Random: 0.0001 g²/Hz, 5-500 Hz, ~0.21 Grms, 10 min/axis.
Variable Frequency:
0.1G at 5 Hz to 2.0G at 15 Hz
2.0G from 15 Hz to 25 Hz
2.0G at 25 Hz to 1.0G at 30 Hz
1.0G from 30 Hz to 50 Hz
Survival:
Swept Sine: 5-500 Hz resonant search, 1 Octave/min sweep rate, 5 min dwell at resonance.
Random: 0.015 g²/Hz, 5-500 Hz, ~2.09 Grms, 10 min/axis.

Shock End use, Handling:
Less than 45.5 kg: Half sine waveform, <3ms duration, velocity change depending on weight.
Greater than 45.5 kg: 10.2 cm free fall tilt drop.
Transportation:
Trapezoidal waveform, velocity change dependent on weight, minimum acceleration 30 g.

EMC Testing None. EMC shielding must be provided by the system integrator or end user.

Module Weight Maximum 3.5 Kg (7.7 lbs) per slot to comply with vibration and shock specifications. Heavier modules may be installed if vibration and shock environment is less severe.

Chassis Finish Clear chromate per MIL-C-5541.

VICOR MegaPACTM DC Power Supply

Appendix A

Appendix A contains detailed information on the family of power supplies available from VICOR Corporation. The power supply used in the HP Z2532A system is the 'Autoranging MegaPAC'. Disregard the information pertaining to the other power supply models.

This information has been reprinted with permission from the VICOR Corporation.

The MegaPAC™ Family

AC-DC, DC-DC Switching Power Supplies

Overview

The MegaPAC family is a line of field configurable switching power supplies that leverage Vicor's DC/DC converters to provide maximum flexibility. Developing a custom power supply is as easy as selecting a MegaPAC chassis and sliding in the appropriate output assemblies, called ConverterPACs. With five different chassis, five different ConverterPAC styles and thousands of voltage and power combinations, there is a MegaPAC to fit almost any need.

Designing a customized power supply begins with selecting a chassis from the MegaPAC family; the PFC MegaPAC, Autoranging MegaPAC, Mini MegaPAC, Three Phase MegaPAC or DC MegaPAC. One or more can accept input voltages from 85 to 264 VAC, 208/240 three phase, or 10 to 380 VDC. Maximum output power ranges from 1000 to 2000 watts, and all five are fan cooled. Standard features include output sequencing, general shutdown, AC OK and overcurrent protection.

Customized design continues by selecting the ConverterPACs that meet your requirements. Each ConverterPAC can be configured to provide one or two separate output voltages and up to 200 watts of power. Multiple ConverterPACs can be connected in parallel to achieve higher power levels. Best of all, ConverterPACs can be added or replaced with the turn of just one screw.

MegaPAC Family Products

Power Factor Corrected (PFC) MegaPAC	
Technical Description	20-2
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Output Power Derating	20-5
Autoranging/Mini MegaPAC	
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Three Phase MegaPAC	
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DC MegaPAC	
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Input Voltage Range and Vin OK Limits	20-16
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MegaPAC Mechanical Considerations	20-20
MegaPAC Do's and Dont's	20-20
Mini StakPAC	20-20
ConverterPAC Derating Curves	20-21

PFC MegaPAC Technical Description

The PFC MegaPAC chassis consists of an off-line single phase, power factor corrected front end, EMI filter, cooling fan, customer interface and associated housekeeping circuits.

Input AC mains voltage (L1, L2/N and GND) is applied to a terminal block. The input current is passed through an EMI filter designed to meet conducted noise limit "B" specifications of FCC Part 15 and VDE 0871 and EN55022 level "B". At start-up, inrush current is limited by a PTC thermistor prior to being passed to the power rectifiers. The PTC is shunted out shortly after initial power-up by a DC bus voltage sense circuit driving a relay. After rectification, the input voltage is put through a boost converter that keeps the AC input current sinusoidal and synchronized with the input AC voltage (in compliance with EN61000 at nominal line voltages). The boost converter delivers an unregulated 370 VDC to the hold-up capacitors and a high voltage backplane. The backplane supplies power to a variety of ConverterPAC assemblies that provide the desired low voltage, regulated outputs.

At initial power-up, the PFC MegaPAC outputs are disabled to limit the inrush current and to allow the DC bus potential to settle out to the correct operating level. A low-power flyback converter operating with PWM current-mode control converts the high voltage DC bus into regulated low voltage to power the internal housekeeping circuits and DC cooling fan. The internal housekeeping Vcc comes up within 1 s after the application of input power. Once the high voltage bus is within its limits, the AC Power OK signal asserts to a TTL "1" indicating that the input power is OK, and allows the power outputs to come up within 15-30 ms. An auxiliary Vcc output of 5 VDC sourcing up to 0.3A is provided for peripheral use on interface connector J10-9.

An output Enable/Disable function is provided by using an optocoupler to control the Gate In pins of the ConverterPAC assemblies. If the Enable/Disable control pin is pulled low, the optocoupler turns on, pulling the Gate In pin low and disabling the ConverterPAC output. The nominal delay associated for an output to come up when measured from release of the Enable/Disable pin is 5-10 ms. The General Shutdown function controls all outputs simultaneously, and works in a similar manner.

The ride-through (holdup) time is the amount of time the load can be supported before loss of output regulation after the loss of input power. Detecting the loss of input power takes a finite time period after which the AC Power OK signal goes from a TTL "1" to "0". This signal is available for use within 1.2 seconds after initial power-up and may be used to indicate an impending loss of power. Approximately 3 ms of warning time is obtained. Following the loss of input power, the outputs are disabled after AC Power OK goes low.

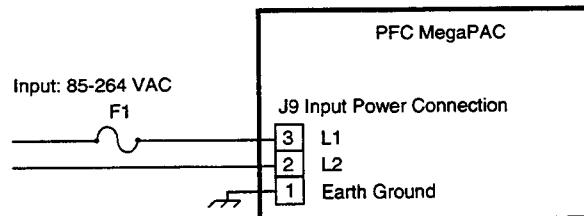
PFC MegaPAC Interface Connections

Chassis Input Power Terminals (J9)

Input AC power is applied to terminal block J9, using a pressure screw terminal that accepts a maximum wire size of 12 AWG. The maximum torque recommended is 10 in-lbs. J9-1 (GND) is Earth Ground for safety; J9-2 (L2) is the Hot connection; J9-3 (L1/N) is the other Hot or input Neutral connection.

A fault clearing device such as a fuse or circuit breaker at the power supply input is required per safety agency conditions of acceptability. It should be sized to handle the start-up inrush current.

Figure 1.
Input Connector J9

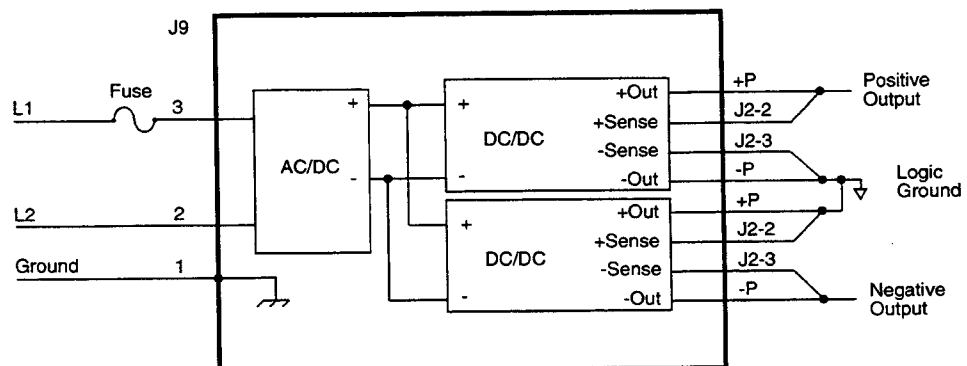


Chassis Output Power Terminals (P8/J1)

Depending on the ConverterPAC used, there are two types of output power terminals available in the PFC MegaPAC. For single output assemblies (ModuPAC/RAMPAC/BatPAC), these terminals are two 1/4-20 plated steel bolts. The positive polarity of the output is the upper bolt. For DualPACs there is a 6-pin Molex connector for each output (J1A, J1B). For both connectors pins 1 & 4 are the +Output, and pins 2 & 5 are the -Output. Pins 3 & 6 are duplicates of the remote sense pins present on J2A and J2B. The top connector, J1B, provides the first voltage listed on the DualPAC, while the bottom connector, J1A, provides the second voltage. Each power output is isolated; thus outputs of positive or negative polarity may be configured by the user through proper selection of an output reference terminal.

In order to minimize parasitic cable inductance and reduce EMI, the output power cables should be routed in close proximity to one another, and large current loops should be avoided. To avoid excessive voltage drop, do not undersize power cables, especially for high current outputs. Excessive cable inductance coupled with large capacitive loading can introduce instability in switching power supplies. This problem can be avoided with proper system design. Consult Vicor's Applications Engineering Department for assistance with applications that use long cable lengths and excessive load capacitance.

Figure 2.
Output Power Connections



PFC Interface Connections (cont)

Signal Ground

Signal Ground on J10-10 is an isolated secondary ground reference for all J10 interfacing signals, and for ModuPAC output status signals such as Power Good. This is not the same as Earth Ground on input power connector J9.

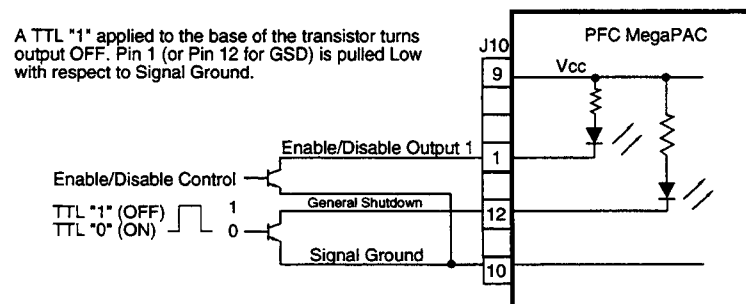
Enable/Disable

The Enable/Disable control pins allow ConverterPAC outputs to be sequenced either on or off. J10-1 through J10-8 are the control pins for output positions 1 through 8 respectively. For DualPACs, both outputs are sequenced. In parallel arrays, only the driver ModuPAC need be controlled. The Enable/Disable pins should be pulled low to less than 0.7V with respect to Signal Ground to disable the outputs. They will source 10mA maximum. These pins should be open circuited or allowed to exceed 4.5V when enabled. Do not apply more than 5V to these inputs at any time.

General Shutdown GSD

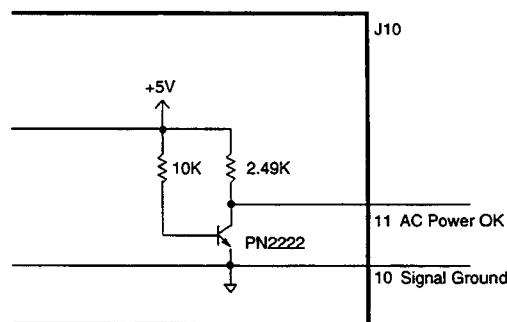
The GSD control pin on J10-12 allows simultaneous shutdown of all ConverterPAC outputs. This pin must be pulled down to less than 0.7V, and will source 13 mA maximum to shut down all outputs. The GSD pin should be open circuited or allowed to exceed 4.5V when not in use, or when the outputs are to be enabled. Do not apply more than 5V to this input at any time. Normal open circuit voltage is 1.5 to 3V with respect to Signal Ground.

Figure 3.
Enable/Disable
and General
Shutdown

**AC Power OK**

This is an active high TTL compatible signal, and provides a status indication of the AC input power. It is capable of sinking 20 mA maximum. This signal switches to a TTL "1" when the high voltage bus exceeds low-line condition during turn-on, and switches to a TTL "0" 3 ms (typical) before loss of output regulation due to the loss of input AC power. This signal may be used to warn external control circuits of an impending loss of power.

Figure 4.
AC Power OK



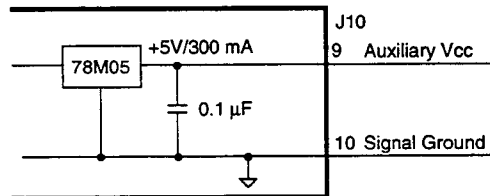
PFC Interface Connections (cont)

Auxiliary Vcc +5V/0.3A

The Vcc on J10-9 is an auxiliary 5V regulated power source. It is +5 VDC $\pm 5\%$ with respect to Signal Ground, and can supply 300 mA maximum. It is short circuit proof, but if shorted all outputs will shut down through the Enable/Disable circuitry.

The Auxiliary Vcc is typically used with the Power Good circuitry to provide a pull-up reference for the outputs of the DC Power Good circuit on a ModuPAC (Figure 5, below). If used for this purpose, then the Signal Ground on J10-10 must also be connected to the J3-4 Signal Ground pin of the ModuPAC.

Figure 5.
Auxiliary Vcc



PFC MegaPAC Output Power Derating

Figure 6.
Maximum
Output Power vs.
AC Input Voltage

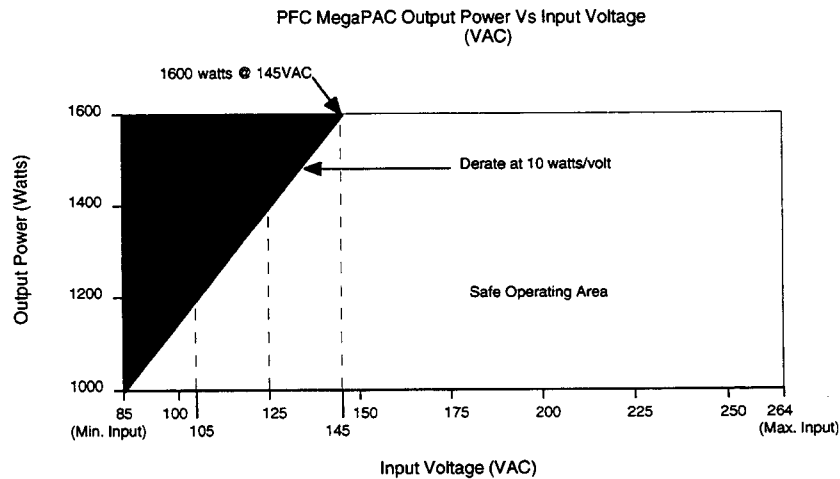
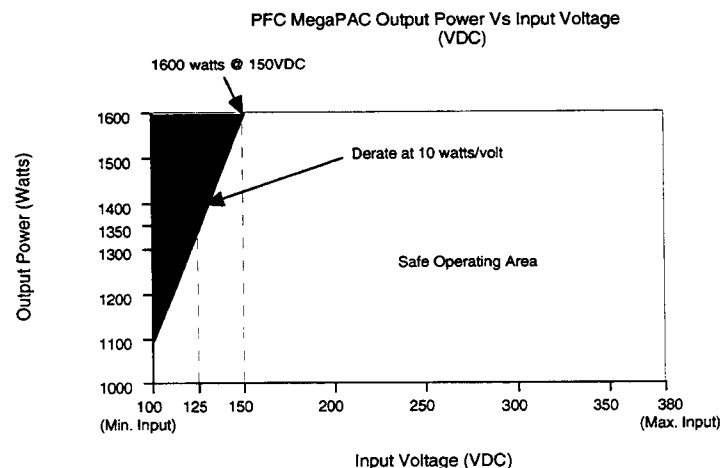


Figure 7.
Maximum
Output Power vs.
DC Input Voltage

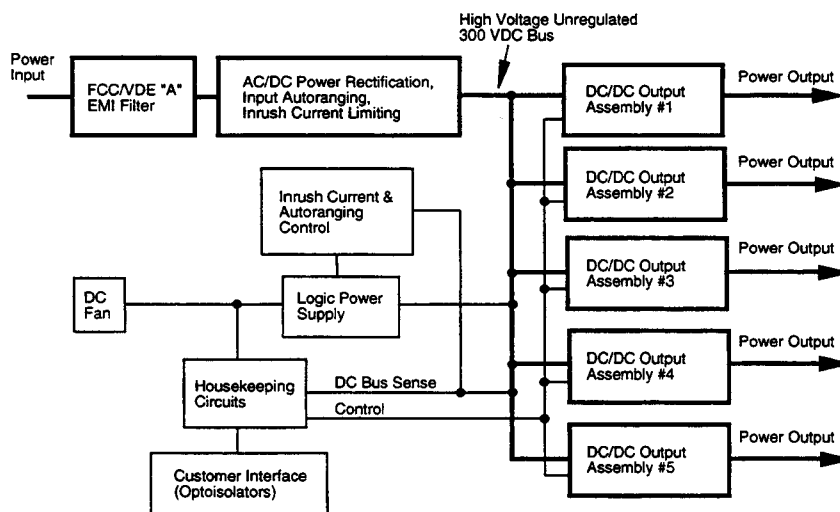


Autoranging MegaPAC/Mini MegaPAC Technical Description

The MegaPAC and Mini MegaPAC chassis consist of an off-line single phase AC front end, EMI filter, cooling fan, customer interface and associated housekeeping circuits.

Input AC mains voltage (L1, L2/N and GND) is applied to a terminal block. The input current is passed through an EMI filter designed to meet conducted noise limit "A" specifications of FCC Part 15 and VDE 0871. At start-up, inrush current is limited by an NTC thermistor prior to being passed to the power rectifiers. The NTC is shunted out shortly after initial power-up by a relay driven by a DC bus voltage sense circuit. The sense circuit also controls the input autoranging selection relay on the autoranging MegaPAC. The power rectifiers and filter capacitors are arranged in a conventional full wave bridge rectifier/voltage doubler configuration. This operates as a full wave bridge rectifier on 230 VAC, and voltage doubler on 115 VAC, delivering unregulated 300 VDC to a high voltage backplane. The backplane supplies power to a variety of ConverterPAC assemblies that provide the desired low voltage, regulated outputs.

Figure 8.
MegaPAC and
Mini MegaPAC
Architecture



At initial power-up, the MegaPAC outputs are disabled to limit the inrush current, reduce peak currents in the autoranging relay contacts, and to allow the DC bus potential to settle out to the correct operating level. A low-power flyback converter operating with PWM current-mode control converts the high voltage DC bus into regulated low voltage to power the internal housekeeping circuits and DC cooling fan. When operating on 115 VAC, the internal housekeeping Vcc comes up within 1000 ms after the application of input power.

On 230 VAC, it comes up within 500 ms. The input range selection circuit in the Autoranging MegaPAC may take up to 200 ms to select the range if 115 VAC is applied. When 230 VAC is applied, the circuit immediately selects for operation on 230 VAC. Once the input range selection has taken place, the AC Power OK signal asserts to a TTL "1" indicating that the input power is OK, and allows the power outputs to come up within 15-30 ms later. An auxiliary Vcc output of 5 VDC sourcing up to 0.3A is provided for peripheral use on interface connector J10-9.

Autoranging MegaPAC/Mini MegaPAC Interface Connections

An output Enable/Disable function is provided by using an optocoupler to control the Gate In pins of the ModuPAC assemblies. If the Enable/Disable control pin is pulled low, the optocoupler turns on, pulling the Gate In pin low and disabling the ModuPAC output. The nominal delay associated for an output to come up when measured from release of the Enable/Disable pin is 5-10 ms. The General Shutdown function controls all outputs simultaneously, and works in a similar manner.

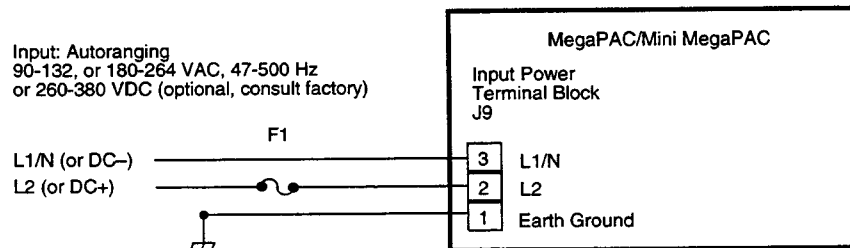
The ride-through (holdup) time is the amount of time the load can be supported before loss of output regulation after the loss of input power. Detecting the loss of input power takes a finite time period after which the AC Power OK signal goes from a TTL "1" to "0". This signal is available for use within 1.2 seconds after initial power-up and may be used to indicate an impending loss of power. Approximately 3 ms of warning time is obtained. Following the loss of input power, the outputs are disabled after AC Power OK goes low.

Chassis Input Power Terminals (J9)

Input AC power is applied to terminal block J9, using a pressure screw terminal that accepts a maximum wire size of 10 AWG. The maximum torque recommended is 10 in-lbs. J9-1 (GND) is Earth Ground for safety; J9-2 (L2) is the Hot connection; J9-3 (L1/N) is the other Hot or input Neutral connection.

A fault clearing device such as a fuse or circuit breaker at the power supply input is required per safety agency conditions of acceptability. It should be sized to handle the start-up inrush current. For an output of 1200W with operation on 115 VAC, a 30A slow-blow fuse is recommended (25A for 1600W operation on 230 VAC).

Figure 9.
Input Power
Connections



Note: An input fault clearing device, such as fuse F1 or a circuit breaker is recommended.

Signal Ground

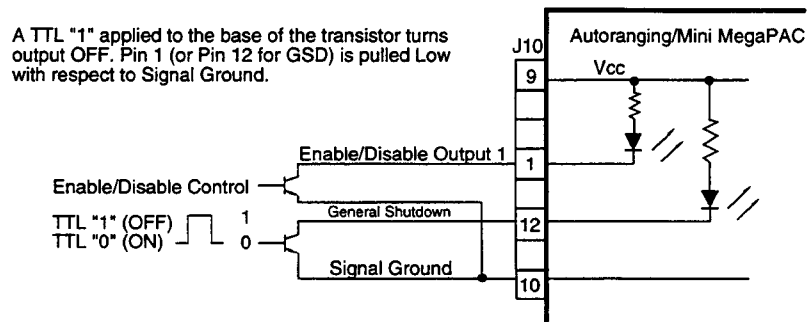
Signal Ground on J10-10 is an isolated secondary ground reference for all J10 interfacing signals, and for ModuPAC output status signals such as Power Good. This is not the same as Earth Ground on input power connector J9.

Enable/Disable

The Enable/Disable control pins allow ConverterPAC outputs to be sequenced either on or off. For the MegaPAC, J10-1 through J10-8 are the control pins for output positions 1 through 8 respectively. For the Mini MegaPAC, J10-1 through J10-5 control the outputs for position 1 through 5. For DualPACs, either one output (selectable via jumper) or both can be sequenced. In parallel arrays, only the driver ModuPAC need be controlled. The Enable/Disable pins should be pulled low to less than 0.7V with respect to Signal Ground to disable the outputs. They will source 10 mA maximum. These pins should be open circuited or allowed to exceed 4.5V when enabled. Do not apply more than 8V to these inputs at any time.

Autoranging MegaPAC/Mini MegaPAC Interface Connections (cont)

Figure 10.
Enable/Disable
General Shutdown



General Shutdown GSD

The GSD control pin on J10-12 allows simultaneous shutdown of all ModuPAC outputs. This pin must be pulled down to less than 0.7V, and will source 13 mA maximum to shut down all outputs. The GSD pin should be open circuited or allowed to exceed 4.5V when not in use, or when the outputs are to be enabled. Do not apply more than 8V to this input at any time. Normal open circuit voltage is 1.5 to 3V with respect to Signal Ground.

AC Power OK

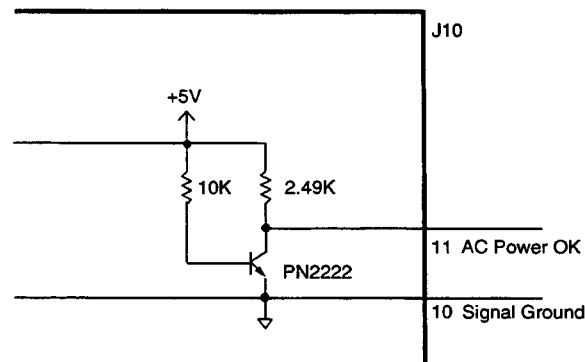
This is an active high TTL compatible signal, and provides a status indication of the AC input power. It is capable of sinking 20 mA maximum. This signal switches to a TTL "1" when the high voltage bus exceeds low-line condition during turn-on, and switches to a TTL "0" 3 ms (typical) before loss of output regulation due to the loss of input AC power. This signal may be used to warn external control circuits of an impending loss of power.

Auxiliary Vcc +5V/0.3A

The Vcc on J10-9 is an auxiliary 5V regulated power source. It is +5 VDC $\pm 5\%$ with respect to Signal Ground, and can supply 300 mA maximum. It is short circuit proof, but if shorted all outputs will shut down through the Enable/Disable circuitry.

The Auxiliary Vcc is typically used with the Power Good circuitry to provide a pull-up reference for the outputs of the DC Power Good circuit on a ModuPAC (Figure 11, below). If used for this purpose, then the Signal Ground on J10-10 must also be connected to the J3-4 Signal Ground pin of the ModuPAC.

Figure 11.
AC Power OK



Autoranging MegaPAC/Mini MegaPAC Interface Connections (cont)

Vcc

The Vcc on J3-1 is an input that requires +5V either from the Auxiliary Vcc on J10-9, or from another source. Input current to this pin is limited by an internal resistor to 3 mA. If the Auxiliary Vcc on J10-9 is connected to Vcc on J3-1, then Signal Ground J10-10 must also be connected to Signal Ground on J3-4.

Three Phase MegaPAC Technical Description

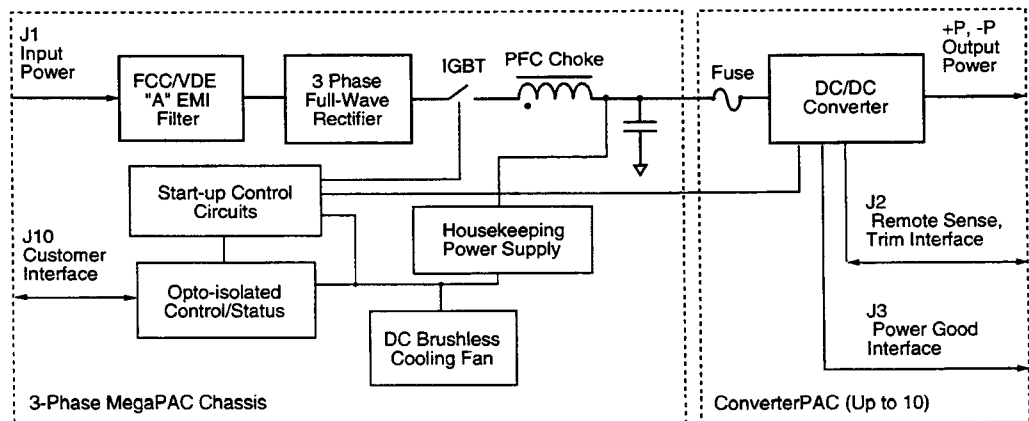
A Three Phase MegaPAC is configured by installing DC/DC ConverterPAC assemblies into a three phase front-end chassis. The chassis takes three phase AC input power and performs filtering and rectification functions. The ConverterPACs plug into a high-voltage backplane and provide low-noise, independently regulated and fully isolated outputs.

Three Phase MegaPAC Chassis

Input AC mains voltage (L1, L2, L3 and GND) is applied to an agency-approved mating plug. The input current is passed through an EMI filter designed to meet conducted noise limit "A" specifications of FCC Part 15 and VDE 0871, before it is passed to a three-phase full-wave bridge rectifier. The rectifier charges-up storage capacitors and delivers unregulated 300 VDC to a backplane after passing through a large choke that improves input power factor. The power factor typically exceeds 0.9 depending upon load, line voltage, frequency and line balance. Inrush current is actively controlled with an IGBT and never exceeds 30A peak regardless of hot or cold starts. The backplane supplies power to a variety of ConverterPAC assemblies that provide the desired low-voltage, regulated outputs.

A housekeeping supply, isolated from the AC input, powers the brushless DC cooling fan and other input monitoring circuits, in addition to providing an auxiliary +5V power source for the user. Excessive input currents caused by loss of a phase, or excessive output loading in single phase operation, will safely shut down the unit and provide a phase fail indication until input power is recycled. This occurs when the peak input current reaches 30A. Analog and digital temperature monitors are provided, as well as overtemperature shutdown. An active-high TTL compatible, Enable control is included for each ConverterPAC assembly, as well as an active-low General Shutdown control; the polarities, active-high or active-low, are factory set. Three Phase MegaPACs can be safely paralleled with accurate current sharing for high power systems. All interface signals are safety-isolated using a common floating return.

Figure 12.
3-Phase MegaPAC
Architecture



Three Phase MegaPAC Technical Description (cont)

Upon power-up, all outputs are first disabled to limit the inrush current, and to allow the unregulated 300 VDC to reach correct operating levels for ConverterPAC assemblies. The internal housekeeping supply comes up within 500 mS after input power is applied, at which time the AC Power OK signal asserts to a TTL "1," indicating that the input power is OK. The low-voltage power outputs come up within 10-20 mS after the AC Power OK asserts to a TTL "1." Output ramp-up time from Enable or General Shutdown is 10-20 mS. Output fall time from Disable is dependent on load, but typically a few hundred microseconds.

Three Phase MegaPAC Interface Connections

Input Power Connections (J1)

Input AC power is applied to a plug-in connector, J1, that accepts soldered terminals with a maximum wire size of 10 AWG. For operation on high voltage DC input, input power may be connected to any two input lines. A fault-clearing device, such as a fuse, at the power supply input is required per safety agency conditions of acceptability. A user-accessible input fuse is not present within the unit. For an output of 2000W with operation on 208 VAC, 3Ø input, a 10A slow-blow fuse in each input line is acceptable. Input power cables should be shielded to minimize radiated noise effects.

The Three Phase MegaPAC can also operate from a single phase 230 VAC input; however, the output power must be limited to 1200 watts.

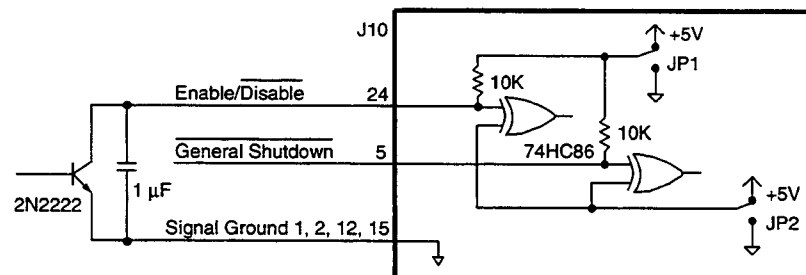
Signal Ground

Signal Ground on J10 pins 1, 2, 12, and 15 is an isolated secondary ground reference for all J10 interface signals. This is not the same as Earth Ground on input power connector J1.

Enable/Disable and General Shutdown (GSD)

The Enable/Disable control lines allow individual ConverterPAC outputs to be sequenced either on or off via TTL compatible HCMOS control inputs. For DualPACs, both outputs are sequenced together. In parallel arrays, only the driver ModuPAC needs to be sequenced. The GSD control line on J10-5 allows simultaneous shutdown of all ConverterPAC outputs. An internal jumper, JP2, selects polarity, either active-high or active-low. A jumper, JP1, selects a pull-up or pull-down source for the HCMOS control inputs.

Figure 13.
Enable/Disable and
General Shutdown



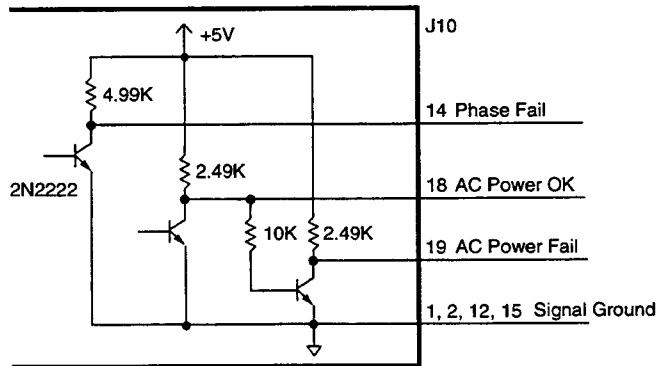
Three Phase MegaPAC Interface Connections (cont)

For standard Three Phase MegaPACs, the Enable/Disable controls are configured as active-high with internal pull-up; outputs are enabled when these pins are open-circuited or allowed to exceed 4.5V with respect to Signal Ground. Outputs are disabled when the Enable/Disable control lines are pulled low to less than 0.7V. The GSD control line is configured to be active-low with internal pull-up; all outputs are simultaneously inhibited when the GSD control line is pulled low to less than 0.7V. All outputs are enabled when GSD is open circuited or allowed to exceed 4.5V. Do not apply more than 5V to these inputs at any time. If driven from an electro-mechanical switch or relay, a small capacitor should be connected between the control line and Signal Ground to eliminate latch-up due to the effects of switch bounce (1 μ F, typical).

AC Power OK

This signal on J10-18 provides a status of the AC input power. It is active high, TTL compatible and capable of sinking 10 mA maximum. This signal switches to a TTL "1" when the high voltage bus exceeds low-line condition during turn-on, and switches to a TTL "0" 3 mS (typical) before loss of output regulation due to the loss of input AC power. This signal may be used to warn external control circuits of an impending loss of power.

Figure 14.
AC Power OK,
AC Power Fail and
Phase Fail



AC Power Fail

J10-19 is the inverse of AC Power OK, and goes to a TTL "1" when the input AC power is not OK. It is capable of sinking 10 mA maximum. The fan out is 20.

Phase Fail (Input Overcurrent)

J10-14 is a TTL level active-high signal, that is asserted when the peak input current reaches 30A due to the loss of an input phase, or severe line imbalance. This occurs when one input phase is lost with approximately 1400W output loading. Maximum current that can be sourced is 10 mA.

Analog Temperature

J10-4 provides an analog DC voltage between 0V and 10V, representing an inlet air temperature of 0°C to 100°C respectively. The temperature is monitored close to the fan.

Overtemperature Warning

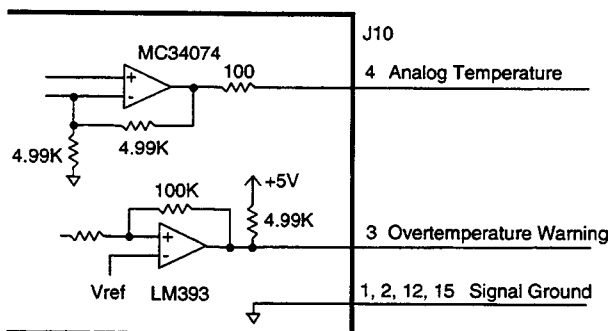
J10-3 asserts a TTL level "1" if the inlet air temperature exceeds the following factory set levels. For standard units, the warning trip point is between 65°C to 76°C. The recovery point is 1°C lower than the actual trip point.

Three Phase MegaPAC Interface Connections (cont)

Overtemperature Shutdown

If the inlet ambient air temperature exceeds the following factory set levels, then all outputs are disabled. For standard units the shutdown trip point is between 70°C to 81°C. The recovery point is 10°C lower than the actual trip point.

Figure 15.
Analog Temperature
and Overtemperature
Warning

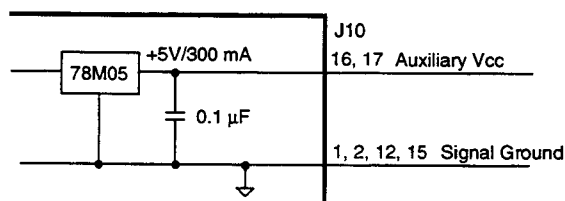


Auxiliary Vcc

J10 pins 16 and 17 provide an auxiliary regulated power source. It is +5 VDC $\pm 5\%$ with respect to Signal Ground, and can supply 300 mA maximum. It is short circuit proof, but if shorted, all outputs will shut down.

The Auxiliary Vcc can be used to provide a pull-up reference for the Power Good circuit on ConverterPACs. In this case, Signal Ground on J10 must also be connected to Signal Ground on J3-4 of the ConverterPAC Power Good connector.

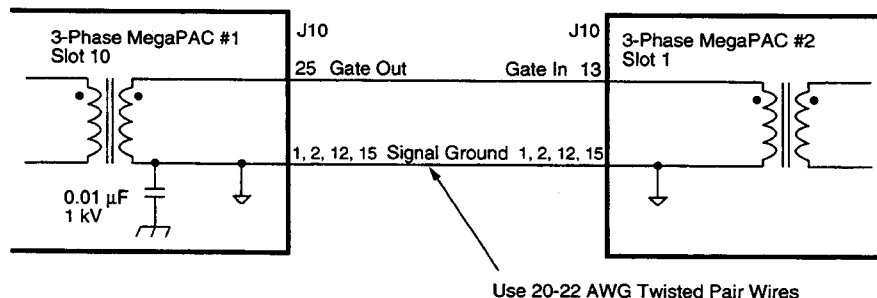
Figure 16.
Auxiliary Vcc



Gate-Out, Gate-In

Gate-In and Gate-Out signals are used for paralleling Three Phase MegaPACs for high power systems using a proprietary driver/booster technique that provides accurate current sharing between units. One channel may be paralleled, i.e., one output voltage from unit #1 may be connected to unit #2. The Three Phase MegaPAC #1 provides a signal from output slot #10 at J10-25, to slot #1 in the 3-Phase MegaPAC #2 at J10-13. These signals are referenced to Signal Ground on J10. Use twisted pair 20-22 AWG wires. Do not separate the units by more than six feet.

Figure 17.
Gate-In and Gate-Out

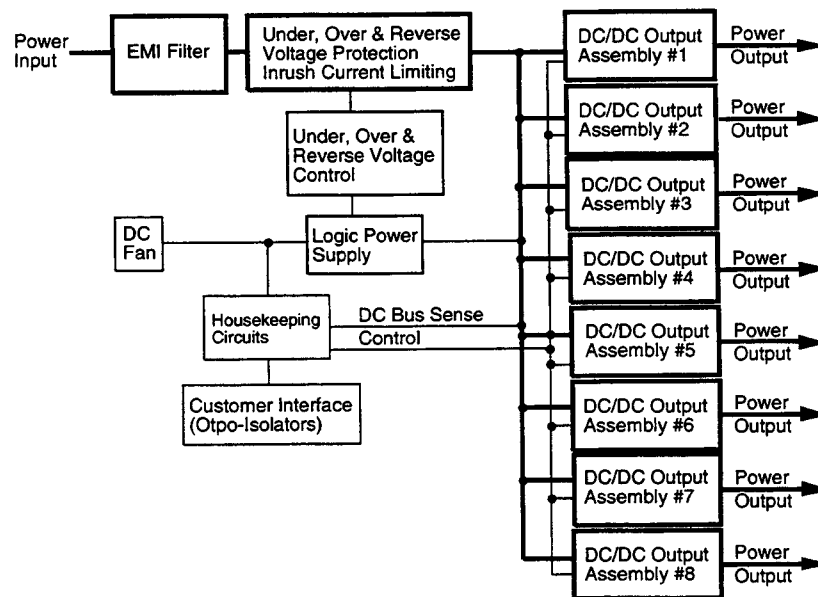


DC MegaPAC Technical Description

The DC MegaPAC chassis consists of an EMI filter, cooling fan, customer interface and associated housekeeping circuits.

Input DC voltage (+VIN, -VIN and GND) is applied to the input connectors. The input current is passed through an EMI filter designed to meet British Telecom specifications. At start-up, inrush current is limited by a thermistor. The thermistor is shunted out shortly after initial power-up by a relay driven by a DC bus voltage sense circuit. The DC voltage is then fed to the backplane. The backplane supplies power to a variety of ConverterPAC assemblies that provide the desired voltage, regulated outputs.

Figure 18.



At initial power-up, the DC MegaPAC outputs are disabled to limit the inrush current and to allow the DC bus potential to charge to the operating level. A low-power flyback converter operating with PWM current-mode control converts the voltage DC bus into regulated low voltage to power the internal housekeeping circuits and DC cooling fan. The internal housekeeping Vcc comes up within three seconds after the application of input power. Once the input range is within specification, the Vin OK signal asserts to a TTL "1" indicating that the input voltage is OK, and allows the power outputs to be enabled. The power outputs will be in regulation 500 ms after the Vin OK signal asserts to a TTL "1". An auxiliary Vcc output of 5 VDC sourcing up to 0.3A is provided for peripheral use on interface connector J10-16 and J10-17.

DC MegaPAC Interface Connections

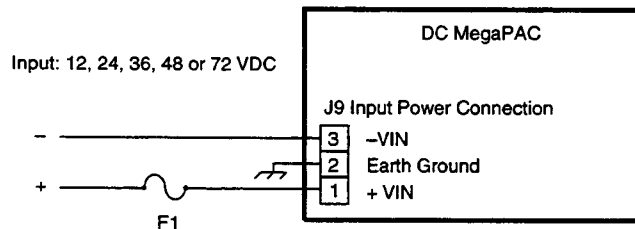
Chassis Input Power Terminals (J9)

Input DC power is applied to solderless lugs J9, using a wire size of 2 AWG. J9-1 is the +DC Voltage IN connection and J9-3 is the -DC Voltage IN connection. The Earth Ground is accessed via J9-2, a size 10-32 self-locking PEM nut. Max. torque recommended is 25 in-lbs. A fault clearing device such as a fuse or circuit breaker at the power supply input is strongly recommended. For an output of 1600 watts with operation on 48 VDC (and low line operation

DC MegaPAC Interface Connections (cont)

of 42 volts), a fast-blow fuse of 50 amps is recommended. Start-up inrush current is limited by a 10Ω thermistor and in most cases will be less than nominal line current during operation. Start-up inrush current can be calculated by $I = \text{Max Vin}/10$ (where Max Vin is the maximum operating voltage, see Table 1, page 20-16). Example, for a nominal 48V input, the maximum operating voltage is 60V, therefore, $I = 60\text{V}/10 = 6$ amps.

Figure 19.



NOTE: An input fault clearing device such as fuse F1, or a circuit breaker is required per safety agency conditions of acceptability.

Signal Ground

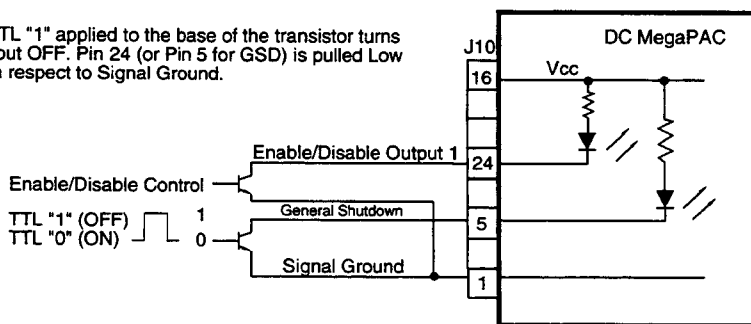
Signal Ground on J10-1, 2, 12 and 15 are isolated secondary ground references for all J10 interfacing signals. This is not the same as Earth Ground on input power connector J9.

Enable/Disable

The Enable/Disable control pins allow ConverterPAC outputs to be sequenced either on or off, see outline drawing for locations. For DualPACs, both outputs are sequenced together. In parallel arrays, only the driver ConverterPAC need be controlled. The Enable/Disable pins should be pulled low to less than 0.7V with respect to Signal Ground to disable the outputs. They will source 8 mA maximum. These pins should be open circuited or allowed to exceed 4.5V when enabled. Do not apply more than 8V to these inputs at any time. If driven from an electro-mechanical switch or relay, a capacitor should be connected to eliminate the effects of switch bounce.

Figure 20.

A TTL "1" applied to the base of the transistor turns output OFF. Pin 24 (or Pin 5 for GSD) is pulled Low with respect to Signal Ground.



General Shutdown (GSD)

The GSD control pin on J10-5 allows simultaneous shutdown of all ConverterPAC outputs. This pin must be pulled low to less than 0.7V, and will source 8 mA maximum to shut down all outputs. The GSD pin should be open circuited or allowed to exceed 4.5V when not in use, or when the outputs are to be enabled. Do not apply more than 8V to this input at any time. Normal open circuit voltage is 1.5 to 3V with respect to Signal Ground. If driven from an electromechanical switch or relay, a capacitor should be connected to eliminate the effects of switch bounce.

DC MegaPAC Interface Connections (cont)

Input Power OK

This is an active high TTL compatible signal on pin J10-18, and provides a status indication of the DC input power. It is capable of sinking 20 mA maximum. This signal switches to a TTL "1" when VIN voltage is within specification. See Table 1, page 20-16 for specifications.

Input Power Fail

The Input Power Fail signal on pin J10-19 is the inverse of the Input Power OK signal on J10-18, and goes to a TTL "0" when the input DC power is OK. It is capable of sinking 20 mA maximum.

Analog Temperature

This signal on J10-4, referenced to Signal Ground, provides an analog DC voltage output between 0V and 10V that represents the air temperature of 0°C to 100°C respectively inside the power supply. The inlet air temperature is monitored close to the fan.

Overtemperature Warning

J10-3 is a signal that asserts a TTL level "1" if the air temperature exceeds the following factory set levels. The warning trip point is 65°C to 76°C typically and the recovery point is 1°C lower than the actual trip point.

Overtemperature Shutdown

If the inlet ambient air temperature exceeds the following factory set levels, then the outputs are disabled. The shutdown trip point is 70°C to 81°C typically and the recovery point is 10°C lower than the actual trip point.

Gate In/Gate Out

The Gate In and Gate Out signals are used for paralleling DC MegaPACs for power expansion. The Gate Out signal, J10-25, of the driver DC MegaPAC should be connected to the Gate In, J10-13, of the Booster DC MegaPAC; J10 signal ground of the driver DC MegaPAC also needs to be connected to J10 signal ground of the booster DC MegaPAC.

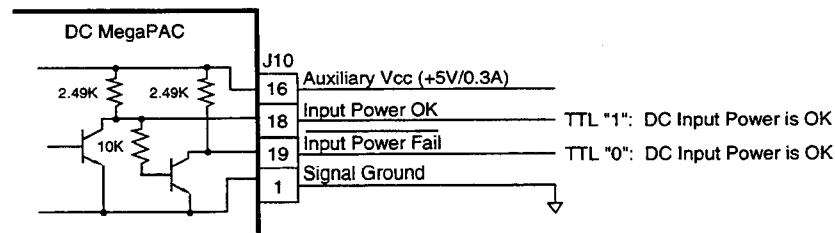
The driver DC MegaPAC (ModuPAC, slot #8) generates the Gate Out signal and sends it to the booster DC MegaPAC (ModuPAC, slot #1). Vicor's zero-current-switching Booster technology provides for accurate, dynamic power sharing within arrays, without the need for trimming, module "matching" or external components.

Auxiliary Vcc +5V/0.3A

The Vcc on J10-16, 17 is an auxiliary 5V regulated power source. It is +5 VDC $\pm$ 5% with respect to Signal Ground, and can supply 300 mA maximum. It is short circuit protected, but if shorted all outputs will shut down through the Enable/Disable circuitry.

The Auxiliary Vcc can be used with the Power Good circuitry to provide a pull-up reference for the outputs of the DC Power Good circuit on a ConverterPAC. If used for this purpose, then the Signal Ground on J10-1, 2, 12 or 15 must also be connected to the J3-4 Signal Ground pin of the ConverterPAC.

Figure 21.
Input Power OK,
Input Power Fail



Input Voltage Range and Vin OK Limits

Table 1.

Code	Operating Range			Vin OK Trigger	
	Nominal VDC	Low Line	High Line	Low Line Cut off	High Line Cut off
0	12 volts	10 volts	20 volts	6V to 10V	20V to 23V
1	24 volts	21 volts	32 volts	16V to 21V	32V to 36V
W	24W volts	18 volts	36 volts	12V to 18V	36V to 41V
2	36 volts	21 volts	56 volts	11V to 21V	56V to 63V
3	48 volts	42 volts	60 volts	34V to 42V	60V to 68V
N	48W volts	36 volts	76 volts	23V to 36V	76V to 86V
4	72 volts	55 volts	100 volts	40V to 55V	100V to 112V*

*Do not apply greater than 100 volts to the input of the DC MegaPAC.

ConverterPAC Functional Descriptions

A brief description of the standard output assemblies and the power and interface connections is provided. Please refer to the MegaPAC Family data sheet for technical specifications and mechanical details.

ModuPAC

The ModuPAC output assembly consists of a VI-200 DC to DC converter that converts the unregulated high voltage bus to the desired regulated output voltage. The converter is fused with a PC-Tron 3A fast-acting fuse in the positive input terminal. The output of the converter contains a passive LC filter to reduce output ripple/noise down to 1% (typ.), and 2% (max.) when measured peak to peak up to a 20 MHz bandwidth from 10% to 100% of rated load of the converter. To meet VXI noise level standards the "V" option can be selected for outputs up to 15 VDC, and the "V1" option can be selected for 24 VDC outputs. Option "V" limits output ripple/noise to 50 mV peak to peak and option "V1" limits output ripple/noise to 150 mV peak to peak. An optional DC Power Good signal and/or output voltage adjustment potentiometer may be specified.

The ModuPAC contains output overvoltage protection (OVP), overcurrent protection (OCP), and overtemperature protection (OTP). The OCP has automatic recovery when the overcurrent condition is removed. The OVP and OTP are latching functions, and require recycling of the AC input power to restart.

JuniorPAC

The JuniorPAC consists of one VI-J00 DC to DC converter that converts the unregulated input voltage to the desired regulated output voltage. The assembly is fused with a single PC-Tron fast-acting fuse. The output contains a passive LC filter to reduce output ripple/noise to 1% (typ.), and 2% (max.) when measured peak to peak up to a 20 MHz bandwidth from 10% to 100% of rated load of the converters. To meet VXI noise level standards the "V" option can be selected for outputs up to 15 VDC, and the "V1" option can be selected for 24 VDC outputs.

Option "V" limits output ripple/noise to 50 mV peak to peak and option "V1" limits output ripple/noise to 150 mV peak to peak. An optional DC Power Good signal and/or output voltage adjustment potentiometer may be specified.

ConverterPAC Functional Descriptions (cont)

The JuniorPAC contains output overcurrent protection which recovers automatically when the overcurrent condition is removed. Overvoltage and overtemperature protection are not available.

DualPAC

This output assembly consists of two VI-J00 DC to DC converters that convert the unregulated high voltage bus to the desired regulated output voltages. The assembly is fused with a single PC-Tron 3A fast-acting fuse. The output of each converter contains a passive LC filter to reduce output ripple/noise to 1% (typ.), and 2% (max.) when measured peak to peak up to a 20 MHz bandwidth from 10% to 100% of rated load of the ConverterPACs. To meet VXI noise level standards the "V" option can be selected for outputs up to 15 VDC, and the "V1" option can be selected for 24 VDC outputs. Option "V" limits output ripple/noise to 50 mV peak to peak and option "V1" limits output ripple/noise to 150 mV peak to peak. An optional output voltage adjustment potentiometer may be specified. DC Power Good signal is not available.

The DualPAC contains output overcurrent protection which recovers automatically when the overcurrent condition is removed. Overvoltage and overtemperature protection are not available.

RAMPAC

This output assembly consists of a VI-J00 DC to DC converter with a Ripple Attenuator Module (RAM) and is often used in applications requiring low output ripple/noise. The RAMPAC attenuates the ripple/noise down to 10 mV when measured peak to peak over a 20 MHz bandwidth from 10% to 100% of rated load of the converter. The converter is also fused at the input with a PC-Tron 3A fast-acting fuse. An optional DC Power Good signal, or output voltage adjustment potentiometer may be specified.

The RAMPAC contains output overcurrent protection which recovers automatically when the overcurrent condition is removed. Overvoltage and overtemperature protection are not available.

BatPAC

The BatPAC output assembly consists of a VI-200 BatMod current source that converts the unregulated input voltage to the desired regulated output current or voltage. The converter is fused with a PC-Tron fast-acting fuse in the positive input terminal. This is a programmable current source that may be configured as a battery charger. Overvoltage and overtemperature protection are not available. Maximum current and voltage settings are made using potentiometers that come as a standard feature. An option to control these maximum settings externally is also available.

Table 2.
Summary of
ConverterPAC
Features

ConverterPAC	OVP	OCP	OTP	RS	LS	PG	TrimPot
ModuPAC	Std.	Std.	Std.	Std.	Opt.	Opt.	Opt.
DualPAC	N/A	Std.	N/A	Std.	Opt.	N/A	Opt.
JuniorPAC	N/A	Std.	N/A	Std.	Opt.	Opt.	Opt.
RAMPAC	N/A	Std.	N/A	Std.	Opt.	Opt.	Opt.
BatPAC	N/A	Std.	N/A	N/A	Std.	N/A	Opt.

OVP: Overvoltage Protection

OCP: Overcurrent Protection

OTP: Overtemperature Protection

RS: Remote Sense

LS: Local Sense

PG: Power Good

ConverterPAC Functional Descriptions (cont)

ModuPAC Power Good (J3)

Power Good

The optional Power Good signal on J3-2 is referenced to Signal Ground on J3-4, and indicates the status of the output voltage. It is capable of sinking 20 mA maximum when 5V is used as Vcc. This signal is asserted a TTL "1" when the output voltage is above 95% of nominal. It is a TTL "0" when the output voltage is below 85% of nominal.

Power Good Inverted

This is the inverse of the Power Good signal on J3-2, referenced to Signal Ground on J3-4.

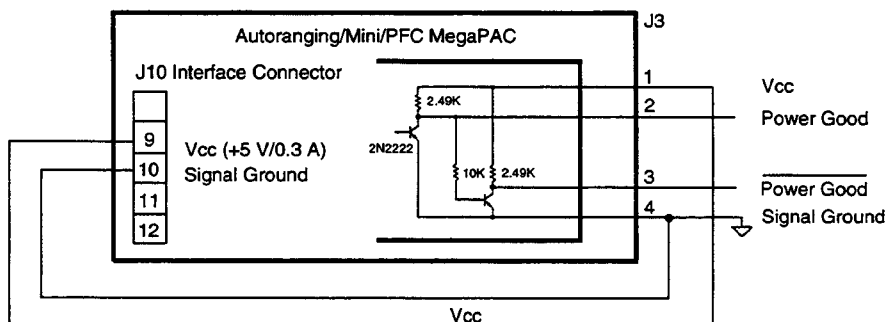
Signal Ground

Signal Ground on J3-4 is an isolated secondary ground reference for all J3 status signals. It is used to provide a reference point for the Power Good circuitry, and is not the same as Earth Ground on input power connector J9.

Vcc

The Vcc on J3-1 is an input that requires +5V either from the Auxiliary Vcc on J10-9, or from another source. Input current to this pin is limited by an internal resistor to 3 mA. If the Auxiliary Vcc on J10-9 is connected to Vcc on J3-1, then Signal Ground J10-10 must also be connected to Signal Ground on J3-4.

Figure 22.
Power Good and
Vcc



ConverterPAC Remote Sense and Trim Interface

(J2 for Single Outputs or J2A and J2B for Dual Outputs)

+Sense/-Sense

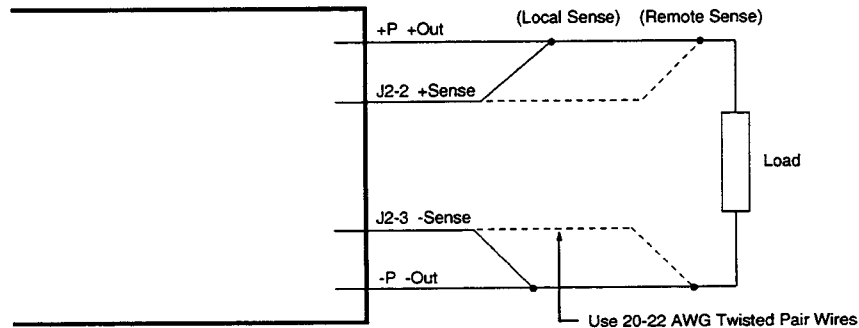
The +Sense on J2-2 should be connected to the +Power Out, and the -Sense on J2-3 to the -Power Out terminal. Do not leave the Sense pins open.

These pins may be terminated locally at the output of the power supply, in which case the power supply will provide regulation at the output terminals. The voltage appearing at the load may drop slightly due to voltage drop in the power cables. If it is necessary to compensate for voltage drop along the output power cables, this termination should be made close to the output load. Compensation of up to 0.5V can be obtained. Use twisted pair 20-22 AWG wire for this purpose.

For DualPACs, the +Sense pins are available on connectors designated as J2A-2 and J2B-2 for outputs A and B respectively. -Sense pins are on J2A-3 and J2B-3 respectively. These pins are also duplicated on power connectors J1A and J1B.

ConverterPAC Functional Descriptions (cont)

Figure 23.
Sense Leads

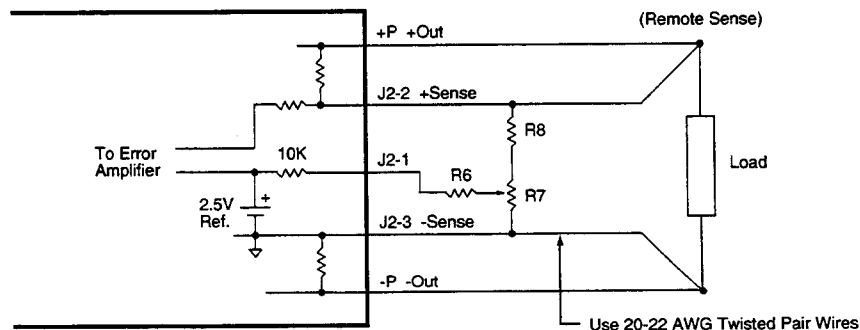


Trim

The Trim pin on J2-1 may be used to control the output voltage. It is referenced to the -Sense pin on J2-3. For DualPACs, the Trim pins are available on connectors designated as J2A-1 and J2B-1 for outputs A and B respectively.

Trimming is accomplished by using the techniques shown earlier in Section 5, *Output Voltage Trimming*. These techniques show how a potentiometer placed external to the power supply may be used to adjust the output voltage (Figure 24, below). Alternatively, a digital-to-analog converter (DAC) may be used to program the output voltage from 50 to 110% of nominal as the DAC output is controlled from 1.25 to 2.75 VDC.

Figure 24.
External Trim



MegaPAC Mechanical Considerations

The MegaPAC may be mounted on any of four surfaces using standard 8-32/M4 size screws. The chassis comes with four mounting points on each surface; maximum allowable torque is 20 in. lbs. The maximum penetration is 0.15 in (3.7 mm).

When selecting a mounting location and orientation, the unit should be positioned so that air flow is not restricted. Maintain a 1.8" minimum clearance at both ends of the MegaPAC and route all cables so that airflow is not obstructed. The standard unit draws air in at the fan side and exhausts air out the load side. If airflow ducting is used, pay attention as sharp turns could present back pressure to the MegaPAC. The fan moves approximately 30 CFM of air.

MegaPAC Mechanical Considerations (cont)

Avoid excessive bending of output power cables after they are connected to the MegaPAC. For high-current outputs, use cable-ties to support heavy cables to minimize mechanical stress on output studs. Be careful to not short-out to neighboring output studs. The MegaPAC is supplied with serrated, flanged hex-nuts on all output studs, therefore, Loc-tite® or lock washers are not required. The maximum torque recommended on flanged nuts is 45 in.-lbs.

Avoid applications in which the unit is exposed to excessive shock or vibration levels. In such applications, a shock absorption mounting design is required.

MegaPAC Do's and Don'ts

- Do not leave ConverterPAC output sense lines open. Always terminate them locally or at the load. Use twisted pair 20-22 AWG wire.
- For power expansion use booster ConverterPACs. Viewing the unit from the output terminal side, always insert boosters to the right side of the driver.
- Run the output (+/-) power cables next to each other to minimize inductance.
- Do not restrict airflow to the unit. The cooling fan draws air into the unit and forces it out at the output power terminals.
- Do not plug or unplug ConverterPACs while input power is applied. They are not designed for hot-plug applications.
- Wait five minutes after shutting off power before inserting or removing ConverterPACs
- Do not attempt to repair or modify the power supply yourself.
- Insert proper fault protection at power supply input terminals (i.e., a fuse).
- Use proper size wires to avoid overheating.

Mini StakPAC

Detailed information on the installation and operation of the Mini StakPAC is available from Vicor's Applications Engineering Department at (800) 735-6200.

ConverterPAC Derating Curves

Figure 25.

AR/Mini/DC/3-Phase MegaPAC Thermal Derating Curve
(5 volt ConverterPACs)

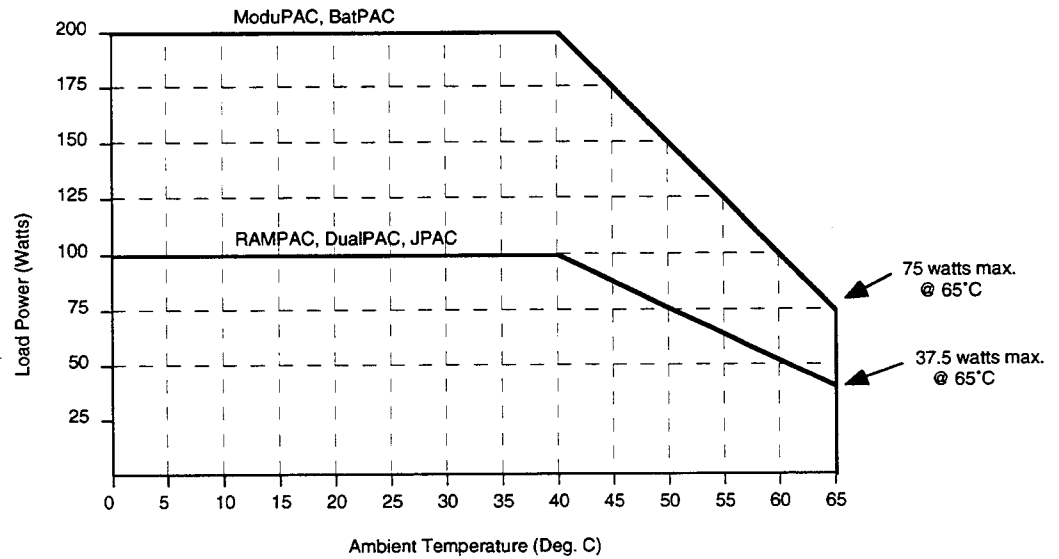
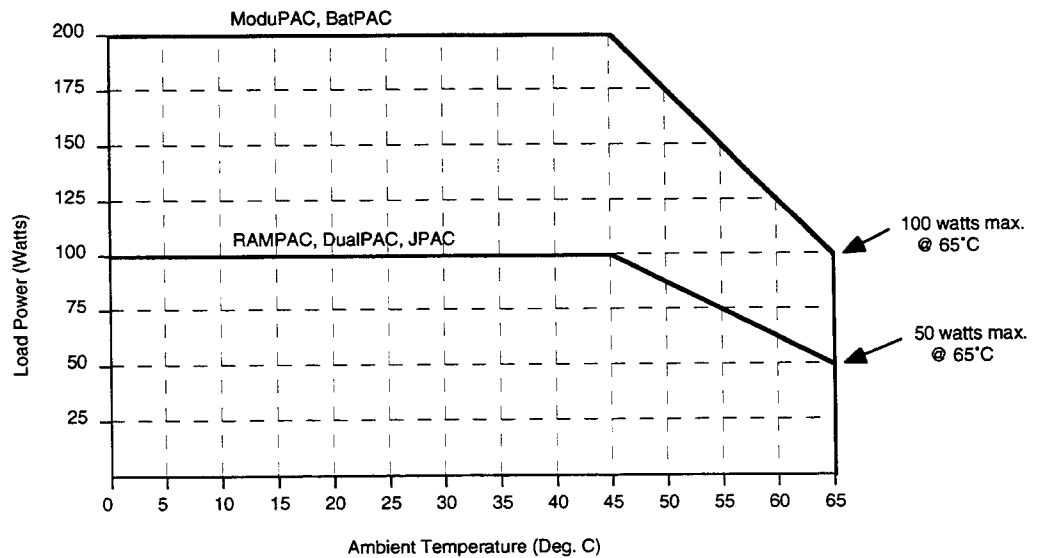


Figure 26.

AR/Mini/DC/3-Phase MegaPAC Thermal Derating Curve
(12-95 volt ConverterPACs)



ConverterPAC Derating Curves (cont)

Figure 27.

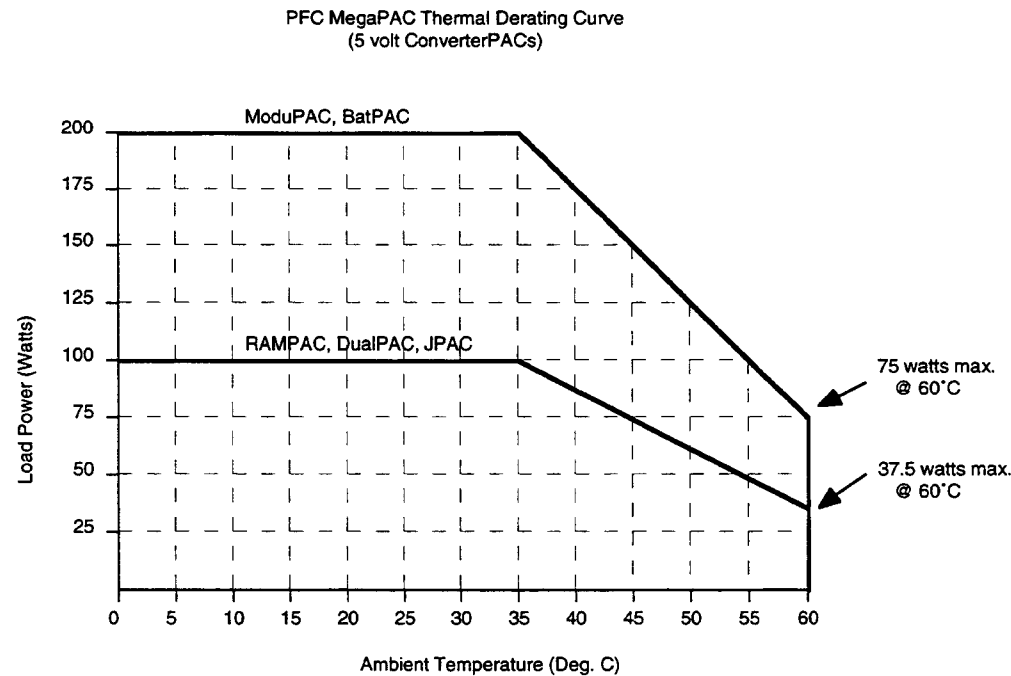
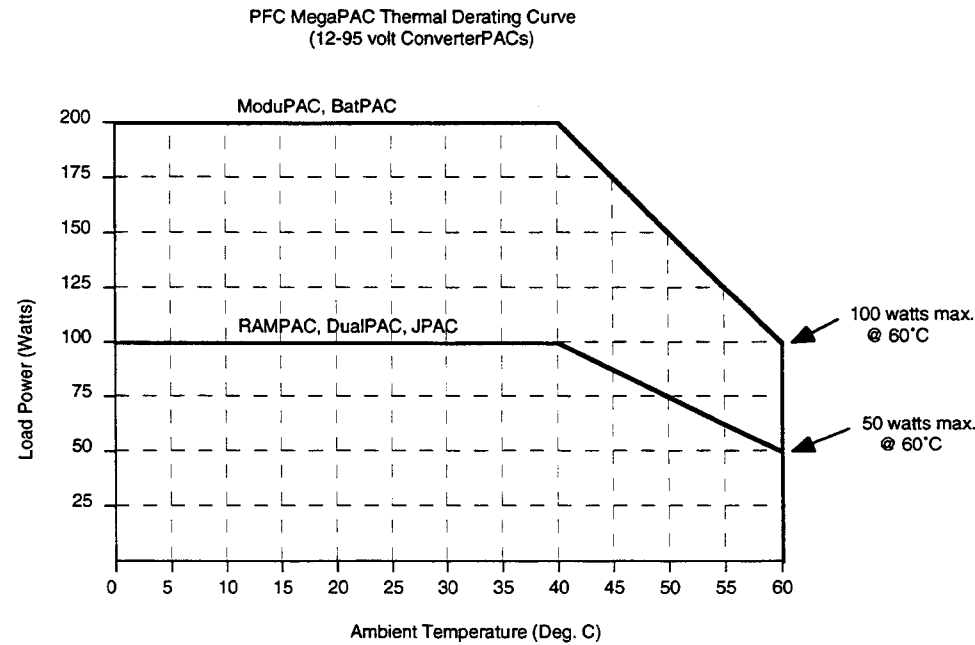
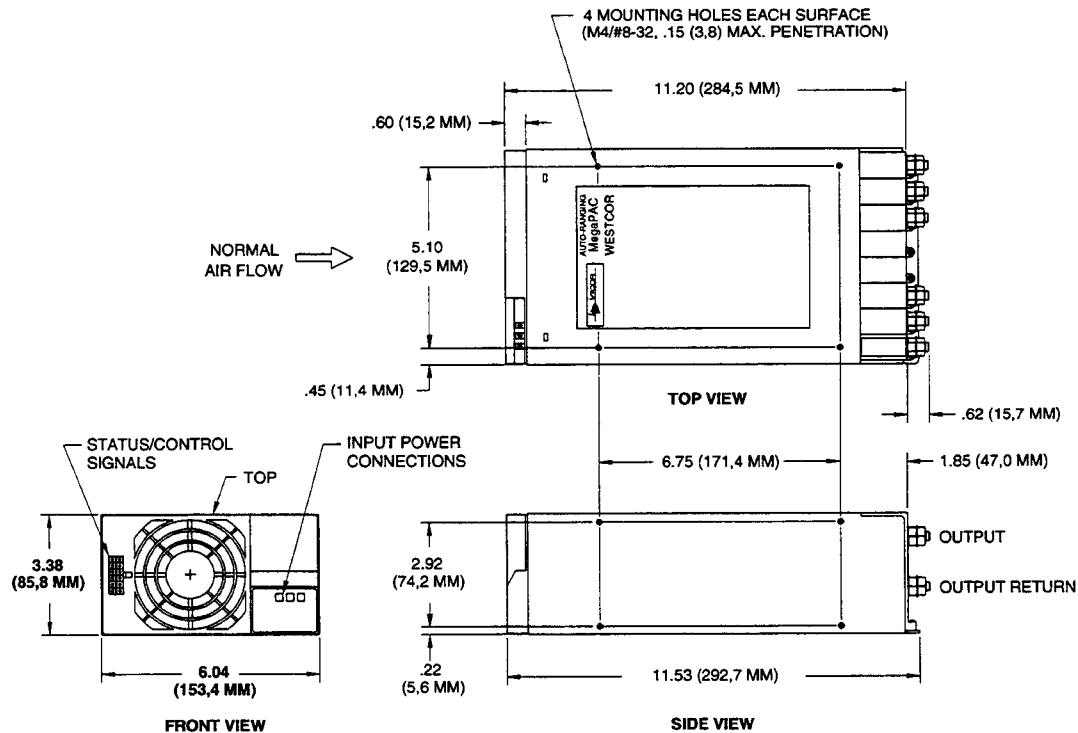


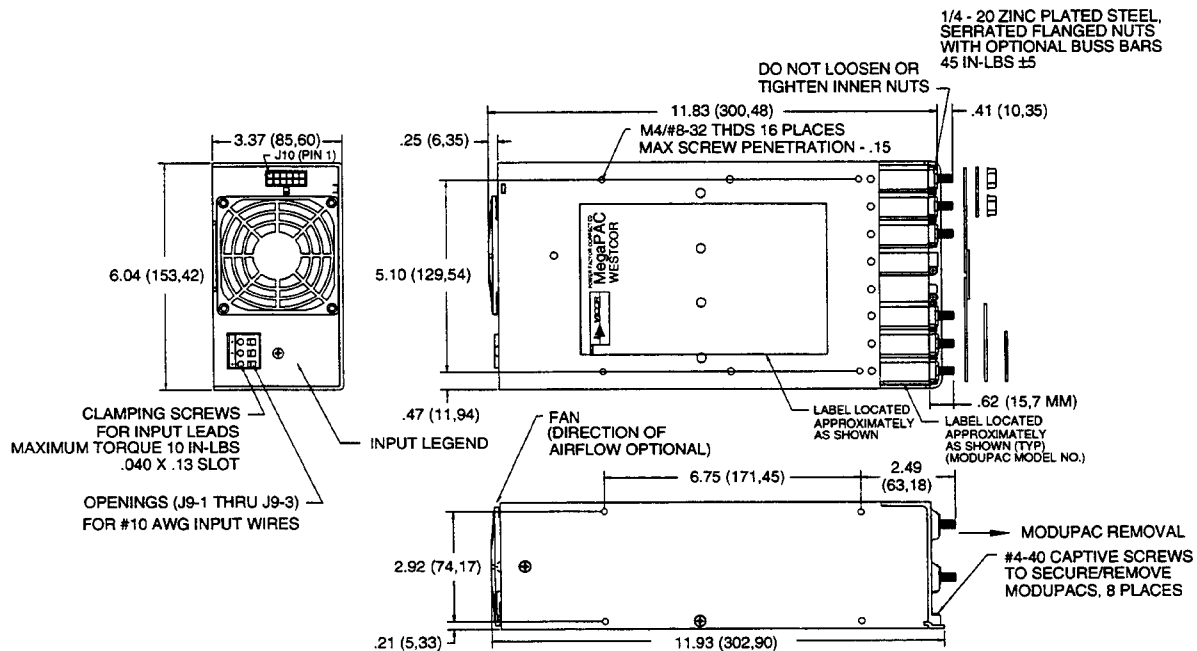
Figure 28.



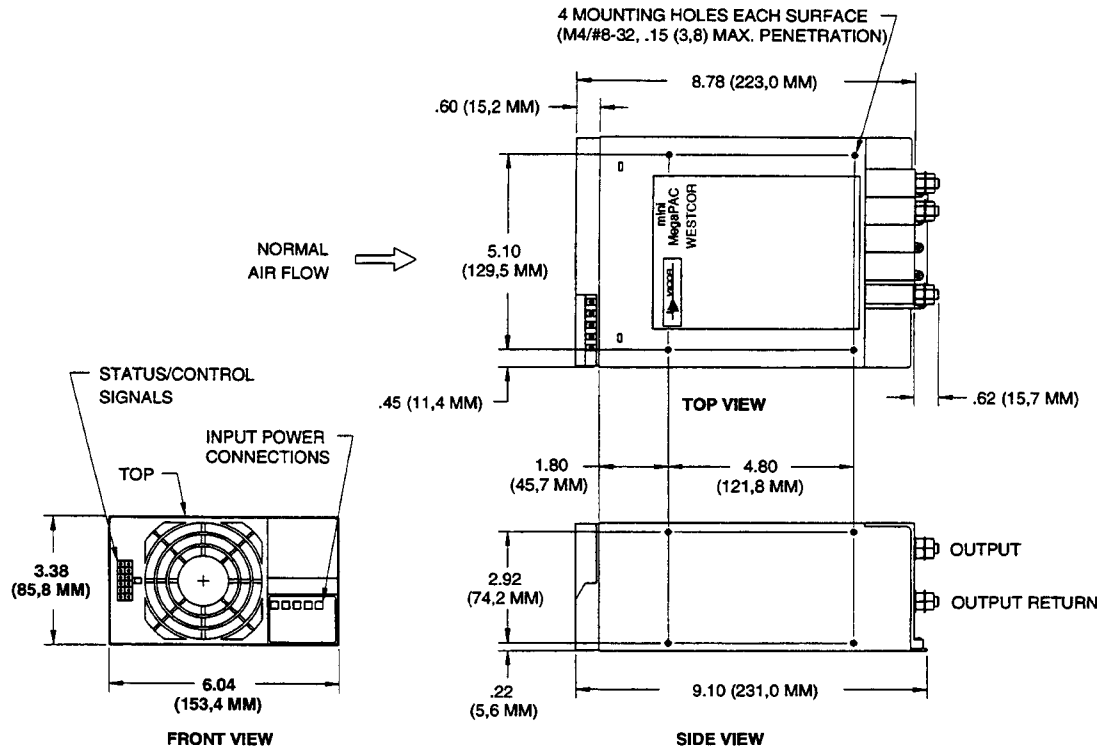
Autorangeing MegaPAC



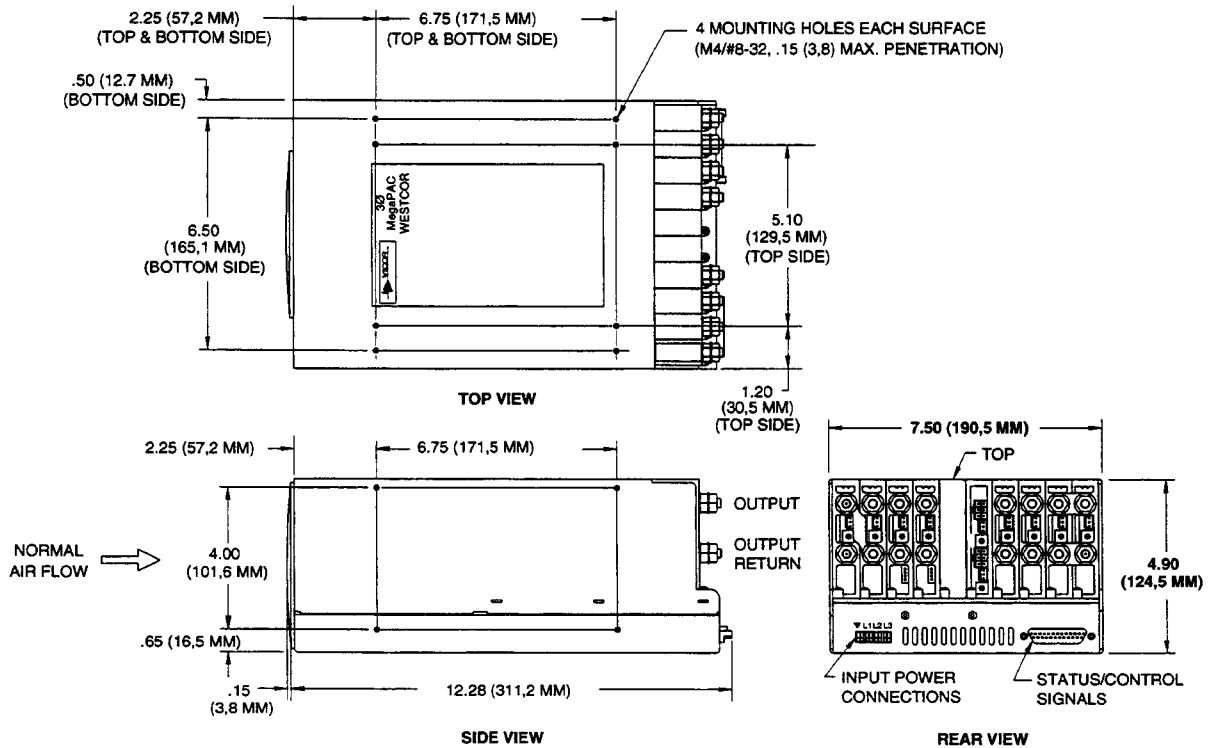
PFC MegaPAC



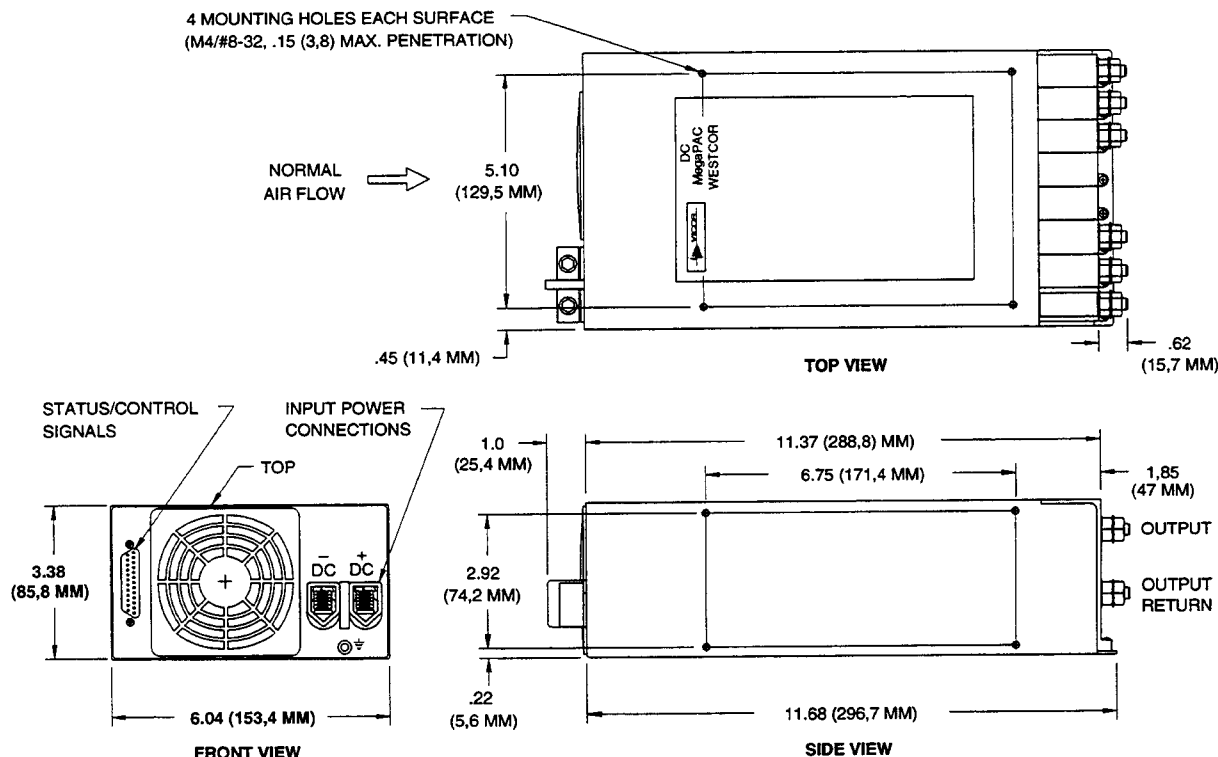
Mini MegaPAC



3Ø MegaPAC

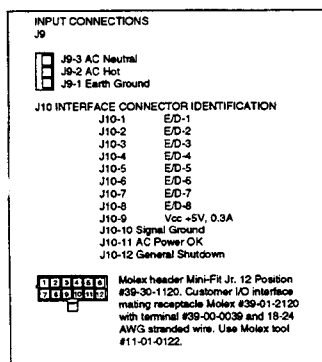


DC MegaPAC

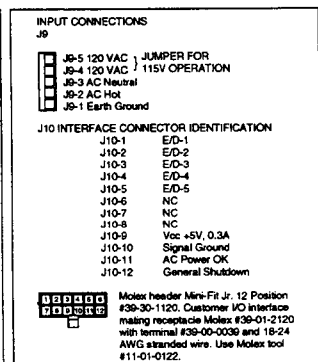


Connection Diagrams, Input

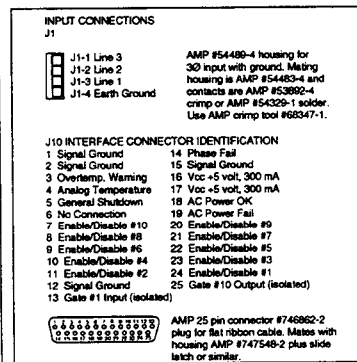
Autoranging/PFC MegaPAC



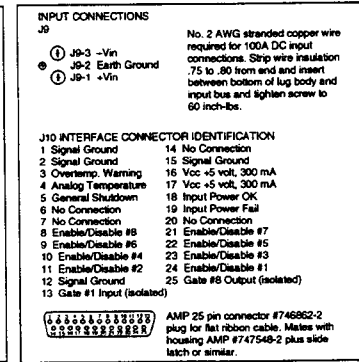
Mini MegaPAC



3Ø MegaPAC

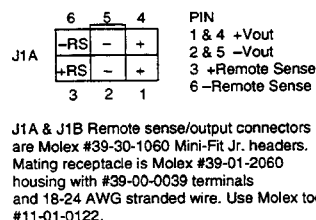


DC MegaPAC

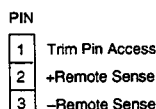


Connection Diagrams, Output (All Models)

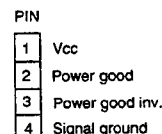
DUAL MODUPAC



J2 "Remote sense" and "Trim pin access" connector
Molex #705-53-0002 to mate with #50-57-9403 housing, using #16-02-0103 terminals and 22-24 AWG stranded wire. Use Molex tool #11-01-0118.



J3 "Power good" connector when "power good" option is specified.
Molex #39-27-0042 to mate with housing #39-01-0043 using #39-00-0031 terminals and 22-24 AWG stranded wire. Use Molex tool #57005-5000.



R4 "Trim pot" present when adjustable output option is specified.

