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Reference Manual

VL-PSC

Power Supply
Card for the STD Bus



VL-PSC

Power Supply
Card for the STD 32 Bus



MPSC

**Model VL-PSC
Power Supply Card for the STD Bus**

REFERENCE MANUAL

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MPSC

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Overview

The VL-PSC (Power Supply Card) is a compact, high efficiency switching power supply for STD Bus systems drawing up to 3.5 amps at +5 volts.

It occupies the leftmost bus slot in any VersaLogic VX-series card cage or any other ¾" wide STD Bus slot (i.e., VL-G5 card cage). Power is delivered to the bus directly through the STD Bus card edge connector. The card supplies ±12, as well as +5 volts.

The VL-PSC card features a wide range of special functions including low voltage AC input (class II wiring), battery backup circuitry, power fail detection, and built-in front panel controls.

Installation

External Connections

The VL-PSC card can operate from a 24 VAC or 12 VDC power input. **DO NOT CONNECT IT TO 120 VAC POWER** as damage to the unit will result. The VL-PSC's low voltage power input provides both safety (no high voltage present in the STD Bus card cage) and convenience (low voltage circuits may use class II wiring; conduit and shielding are not required).

The power input connections are made to the card through the removable terminal block located near the card ejector.

Normally the card is powered by 24 VAC (at 1.25A max.). This can be from an existing 24 VAC (±15%) source, or from a 24 VAC transformer (such as the 30W class II plug-in unit available from VersaLogic). Connect the 24 VAC source to the "24 VAC" terminals. The "MAIN" LED indicator should light when the 24 VAC input circuit is energized.

Alternately, the VL-PSC can be powered from a 12 VDC source (±10% at 2.5A max.). However, the battery backup feature cannot be used when the card is powered from a 12 VDC source. Connect the 12 VDC source to the "VDC (BAT)" terminals, observing the correct polarity of the terminals as marked.

The "MAIN" LED indicator will NOT light when the 12 VDC input is energized, but the SYSTEM POWER LED should light when the SYSTEM POWER switch is turned on.

If a 24 VAC power source is used, a power backup battery can be connected to the "VDC (BAT)" terminals. See the Battery Backup section for details.

STD Bus Connection

The VL-PSC board should be inserted into an STD Bus card cage only when the SYSTEM POWER switch is off (the SYSTEM POWER indicator must be dark).

When inserting the board into the card cage, be certain that the card ejector (pin 1 edge of the card) is aligned in the same direction as other cards in the system (usually upward). The VL-PSC board has a key slot cut between pins 25 and 27. It is recommended that a matching key be installed in the STD Bus motherboard connector to prevent the card from being installed upside down.

Use caution when handling the board outside the card cage. Setting the board on a conductive surface can short-circuit the power input line, or the backup battery, if they are still connected to the board.

Front Panel Controls

The VL-PSC card includes the following controls and indicators built into a panel at the board edge.

- | | |
|---------------------|--|
| MAIN | An LED indicator that is lit whenever AC input power is present. |
| SYSTEM POWER | Allows power to the STD Bus to be turned on or off. The current state of power to the bus is indicated by the LED indicator. |
| RESET | Allows the system processor to be reset (via the PBRESET* signal on the bus). |

Battery Backup

The VL-PSC card includes provisions for operation with a backup battery. On-board circuitry automatically switches to battery power whenever the main AC power input fails. The input power switching is instantaneous, and is designed to deliver uninterrupted power to the system. Operation from the main AC power input resumes whenever the AC power is restored.

A charging circuit is also included to maintain the backup battery at full charge. The charging function can be defeated if desired (see the Jumper Option section for details).

Use of the battery backup functions requires connection of an external 12 volt storage type battery to the "VDC (BAT)" input terminals. Normally a 12 volt, 5 amp hour gel cell type battery should be used (Eagle-Picher #CF12V5L, Power Sonic #PS-1245, etc.). This type of battery will provide for full system operation for approximately one hour at full 3.5A load, 4 hours at 40% load, and 20 hours at 10% of rated load.

Other types of batteries may be used, as long as they are compatible with a "float" charge current of 35ma @ 2.3V/cell, and a 150ma typical recharge current.

Power Fail Detect

The VL-PSC card includes a power fail detect circuit that may be used to interrupt the system processor when the main AC power fails.

When the system has a backup battery, the signal can be used to notify the system operator that the unit has gone onto backup power.

When no backup battery is used, the signal provides approximately 4ms of warning before the +5 volt power begins to decay. This can allow for a safe shutdown of the system, such as closing all valves, turning off moving machinery, etc.

The power fail signal connects to the non-maskable interrupt request (NMIRQ*) line on the bus. The specific action taken when this interrupt occurs is the responsibility of the system programmer. The interrupt signal stays low at least 100ms and returns to a high state when AC power is restored. Note: The NMI input is edge sensitive on most processors. The only impact that the length of the interrupt signal has on interrupt operation is that it can reoccur every 100ms (if the AC power is turning on and off that fast).

To use the power fail detection circuit the "NMI" jumper must be in place. See the Jumper Options section for more information.

Jumper Options

The jumper options for the VL-PSC board are as follows.

- NMI** Connects the power-fail detection circuit to the NMIRQ* bus line. Causes a non-maskable interrupt signal to be sent to the system processor whenever the main AC power input to the VL-PSC card fails. The NMI jumper pads are located above R10 at the card edge connector end of the board.
- CHG** Allows the backup battery (connected to the "VDC (BAT)" terminals), to be charged whenever the main AC power is present. This jumper should be removed (left open) when 12 VDC power input is used and a backup battery is not connected to the card. It should also be removed (left open) if the backup battery is connected to its own charging circuitry, external to the VL-PSC card. The CHG jumper pads are located between D6 and C9.

Output Adjustments

The VL-PSC card includes voltage level adjustments for the +12 and -12 volt outputs. The trimmer pots for this purpose are located near the bottom edge of the VL-PSC card. The +12 and -12 volt outputs are calibrated and preset to the proper levels (12V \pm 10%) before delivery and readjustment of these controls should not be necessary unless repair or alterations are made to the card by the user.

The +5 volt output level is set by an internal reference and is not adjustable.

Specifications

Input: 24 VAC $\pm 15\%$ @ 1.25A (30W Class II)

12 VDC $\pm 10\%$ @ 2.5A

Removable screw type terminal strip for inputs

Output: +5.1 VDC $\pm 2.5\%$ @ 3.5A

+12 VDC $\pm 10\%$ @ .05A

-12 VDC $\pm 10\%$ @ .05A

Power delivered to STD Bus power pins

Line Regulation: 5V output, 50 mV typical for 12 VDC – 24 VAC

Load Regulation: 5V output, 50 mV typical for a 15–100% load change

Ripple and Noise:

5V output, ± 75 mV typical

± 12 V output, ± 100 mV typical

Over-Current Protection: All outputs current limited

Over-Voltage Protection: Fixed SCR crowbar on 5V output

Battery Backup Circuits:

Battery type: 12V, 5 Ah, gel cell type (Eagle-Picher CF12V5L, Power Sonic PS-1245, etc.)

“Float” charge current (2.3V/cell) 35 ma typical

Recharge current: 100 ma typical, 150 ma maximum

Recharge time: ≈ 24 hours (from fully discharged condition)

Backup time with fully charged battery:

1 hr @ full load (19W)

4 hrs @ 40% load (7.6W)

20 hrs @ 10% load (1.9W)

Battery charging is a jumper option

Power Fail Indicator:

Generates NMI (min. 100 ms) signal when AC input fails; jumper selectable.

If no battery backup, +5V is valid for approx. 4 ms.

Controls and Indicators:

“MAIN” LED — Indicates 24 VAC input power is present

“SYSTEM POWER” switch — Enables voltage outputs to bus

“SYSTEM POWER” LED — Indicates that +5V output is on

“RESET” push button — Resets system processor via the PBRESET* line

Power Consumption (Watts), AC Input: $P_{AC} = 2.4W + 1.32 \times P_{OUT}$

Power Consumption (Watts), Battery Input: $P_{BAT} = .6W + 1.45 \times P_{OUT}$

Operating Ambient Temperature:

Min. = -25° C

Max. = $+35^{\circ}$ C @ full load (19W)

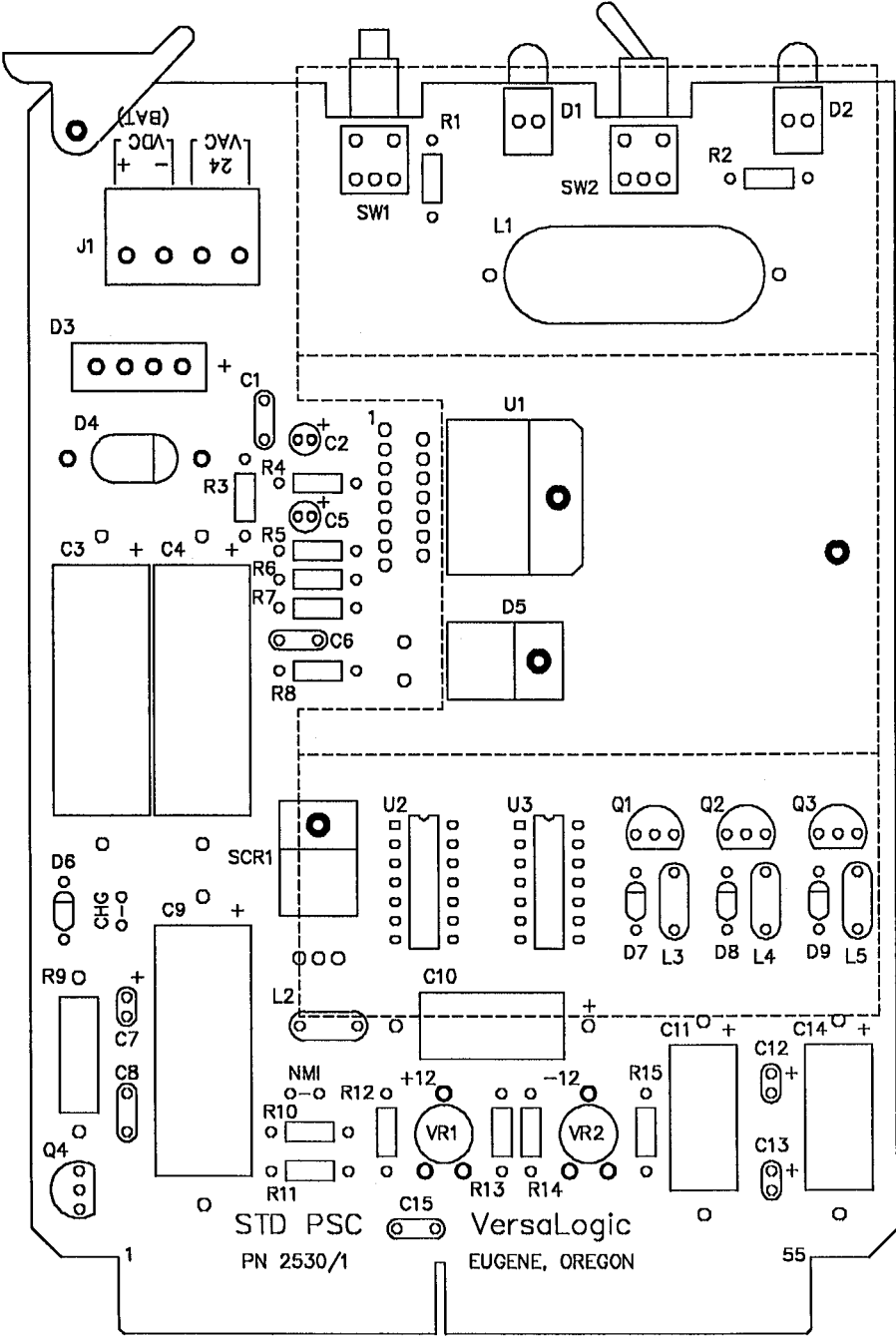
60° C @ 40% load (7.6W)

75° C @ 10% load (1.9W)

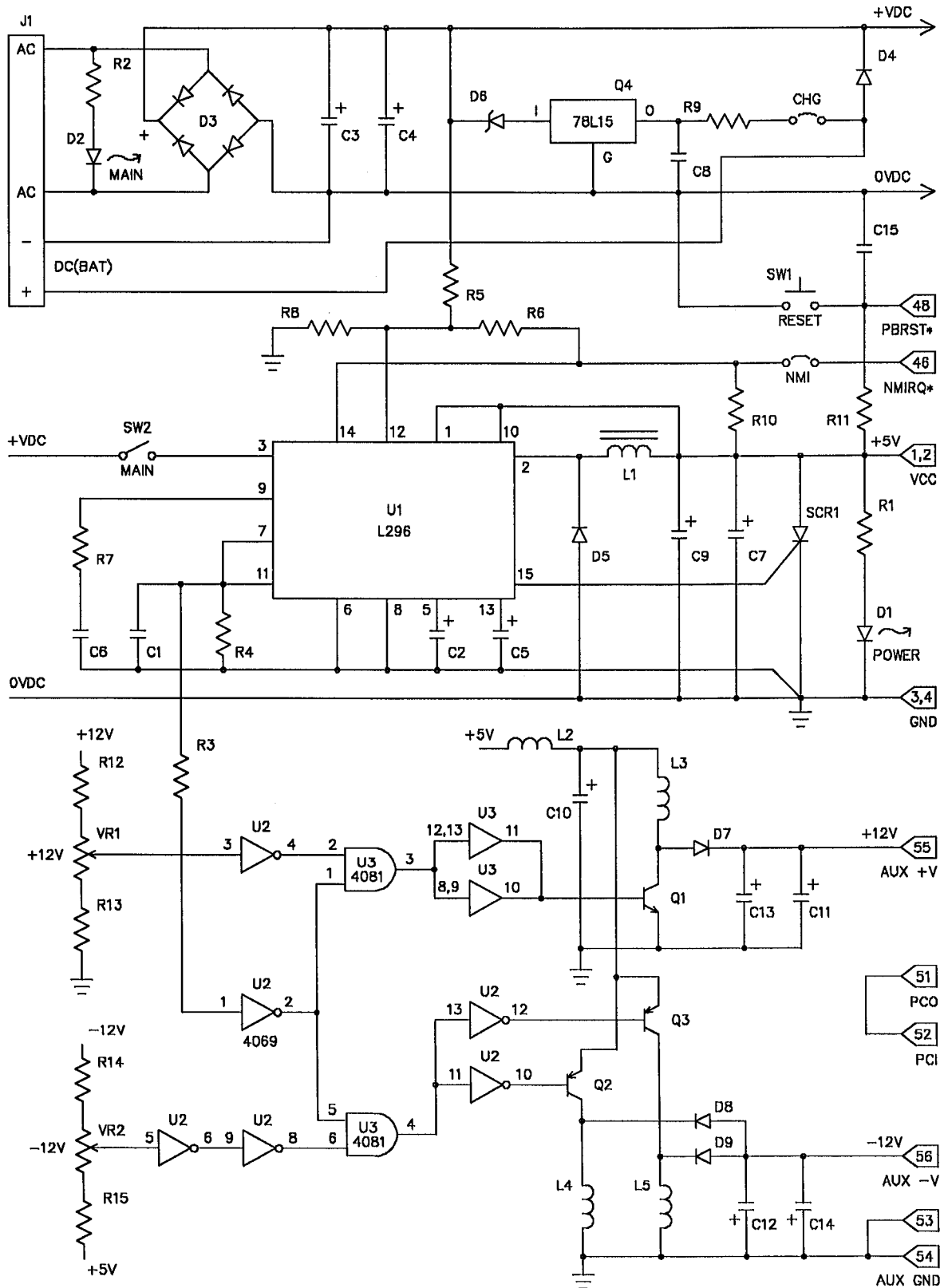
Cooling Required: Convection only

Size: STD card format, 4.5" x 6.5" x .75"

VL-PSC Parts Placement Diagram



VL-PSC Schematic



VL-PSC Parts List

Capacitors

C1	2200 pf 50V polyester
C2, C5	2.2 μ f 50V electrolytic
C3, C4, C9	470 μ f 50V electrolytic
C6	.033 μ f 50V polyester
C7, C12, C13	1 μ f 35V tantalum
C8, C15	.01 μ f ceramic disk
C10, C11, C14	220 μ f 16V electrolytic

Inductors

L1	100 μ H 3.5A
L2	10 μ H 250 ma
L3, L4, L5	100 μ H 150 ma

Integrated Circuits

U1	L296 switching regulator
U2	74HC04
U3	4081

Resistors

R1	180 Ω 5% 1/4W
R2	680 Ω 5% 1/4W
R3, R5, R6, R11	10K Ω 5% 1/4W
R4	8K2 Ω 5% 1/4W
R7	15K Ω 5% 1/4W
R8, R10	4K7 Ω 5% 1/4W
R9	33 Ω 5% 2W
R12	91K Ω 5% 1/4W
R13, R15	22K Ω 5% 1/4W
R14	150K Ω 5% 1/4W

Semiconductors

D1, D2	LED, R/A, green, with housing
D3	FWB 2A, 50 PIV
D4	IN5400, 3A, 50 PIV
D5	MBR745, Schottky, 7A
D6	IN4733
D7, D8, D9	IN4148
Q1	PN2222
Q2, Q3	PN2907
Q4	78L15
SCR1	SCR 50V, 8A

Miscellaneous

J1	4 position terminal
SW1	SPST pushbutton switch
SW2	SPDT toggle switch
VR1, VR2	10K Ω trimmer pot