

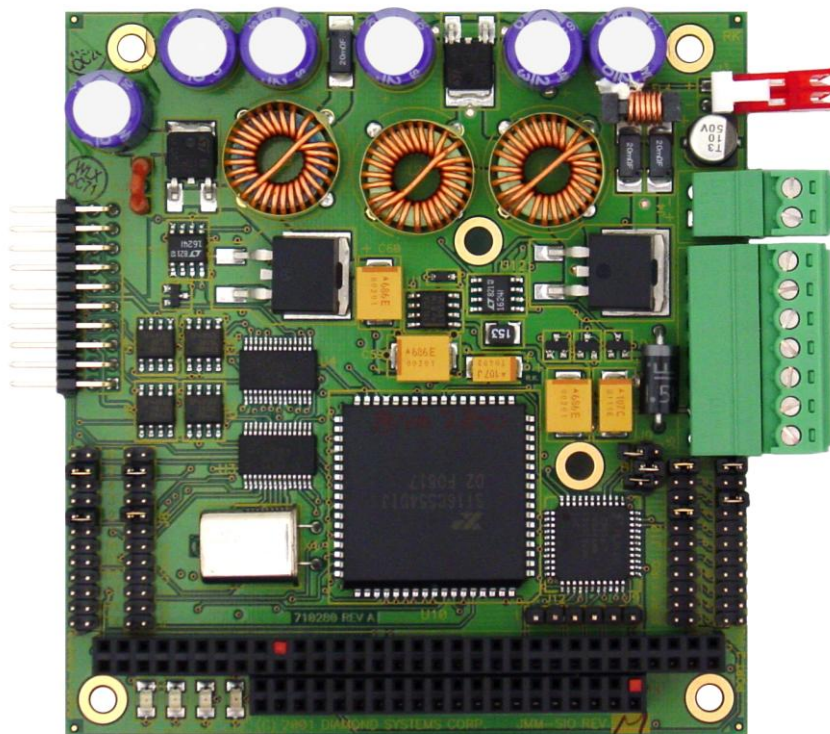


# JUPITER-MM-SIO / LP

*DC/DC Power Supply PC/104 Module*

*With 2 RS-232/422/485 Serial Ports*

User Manual V1.4



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## 1. DESCRIPTION

JUPITER-MM-SIO is a PC/104-format power supply module designed for mobile as well as stationary embedded applications. The JUPITER-MM-SIO design incorporates a high efficiency DC/DC converter circuit to provide power with minimum losses. Power supply performance and reliability have been optimized through the use of precision surface mount components. The Jupiter-MM-SIO series contains significant advances in mobile embedded power supply technology. The Jupiter-MM-LP is a low cost, depopulated and de-powered version of the Jupiter-MM-SIO. The Jupiter-MM-LP does not offer the dual serial ports and only provides 25W of power at +5VDC.

### ◆ **Surface Mount Components**

To the maximum extent possible, surface mount components have been used in the design, to lower the profile and improve ruggedness. An additional benefit to is the improved ability to use the PCB planes as a heat sink.

### ◆ **High Efficiency, High-Frequency Design**

Efficiency is as high as 92 percent, lowering input power requirements as well as heat generation. The 200KHz switching circuit allows the use of smaller inductors, reducing size and weight and allowing the board to fully fit within the PC/104 height requirements.

### ◆ **Advanced Design - No Heat Sink is required**

Eliminating the heatsink reduces total weight, a significant benefit for airborne applications.

### ◆ **Remote On/Off Control**

The supply can be turned on and off with an external contact closure through an auxiliary connector.

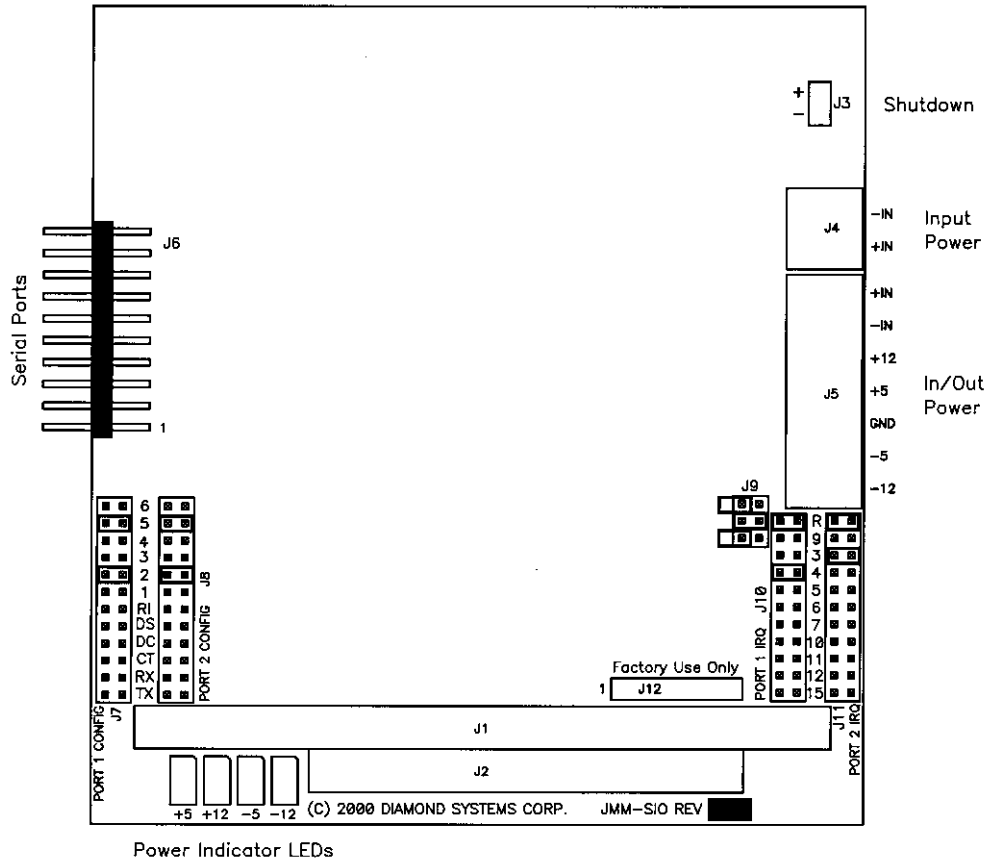
### ◆ **Dual Multiprotocol Serial Ports**

Two 16450-compatible serial ports offer RS-232, RS-422, and RS-485 protocol serial communications at speeds up to 115.2kbaud. In many applications this can reduce the need for an additional board, further reducing total system cost, size, and weight.

### ◆ **Extended Temperature Operation**

Extended temperature (-40°C to +85°C) operation is standard, enabling the supplies to be used in vehicle applications and other harsh environments.

## 2. BOARD DRAWING



J1	PC/104 8-bit bus header
J2	PC/104 16-bit bus header
J3	Shutdown control
J4	Main power input
J5	Power input/output connector
J6	Serial port connector
J7, J8	Serial port protocol configuration
J9	Serial port address configuration
J10, J11	Serial port interrupt level configuration
J12	Factory use only (for programming Xilinx PLD)

### 3. I/O HEADER PINOUTS

Jupiter-MM-SIO provides connections for input, input/output, remote on/off control, and PC/104 bus. All power I/O connectors except the PC/104 bus connectors are located along the right side of the board. The serial port connector is on the left side of the board.

#### PC/104 Bus Connectors for Power Lines

For simplicity, signal names are only shown for pins with power connections on board. All remaining pins are not shown.

#### View from Top of Board

**J2: PC/104 16-bit bus connector**

Ground	D0	C0	Ground
	D1	C1	
	D2	C2	
	D3	C3	
	D4	C4	
	D5	C5	
	D6	C6	
	D7	C7	
	D8	C8	
	D9	C9	
	D10	C10	
	D11	C11	
	D12	C12	
	D13	C13	
	D14	C14	
+5V	D15	C15	
	D16	C16	
	D17	C17	
Ground	D18	C18	
Ground	D19	C19	Key (pin cut)

**J1: PC/104 8-bit bus connector**

	A1	B1	Ground
	A2	B2	
	A3	B3	+5V
	A4	B4	
	A5	B5	-5V
	A6	B6	
	A7	B7	-12V
	A8	B8	
	A9	B9	+12V
	A10	B10	Key (pin cut)
	A11	B11	
	A12	B12	
	A13	B13	
	A14	B14	
	A15	B15	
	A16	B16	
	A17	B17	
	A18	B18	
	A19	B19	
	A20	B20	
	A21	B21	
	A22	B22	
	A23	B23	
	A24	B24	
	A25	B25	
	A26	B26	
	A27	B27	
	A28	B28	
	A29	B29	+5V
	A30	B30	
	A31	B31	Ground
Ground	A32	B32	Ground

## Main Input Power – J4

J4 consists of a 2-pin detachable screw terminal block. The screw terminals will accept wire sizes from 18-28 gauge. The input polarity is shown in markings on the board adjacent to the board-mounted connector.

1	Positive Input
2	Input Return

## Auxiliary Input/Output Power – J5

J5 consists of a 7-pin detachable screw terminal block. The screw terminals will accept wire sizes from 18-28 gauge. The input polarity is shown in markings on the board adjacent to the board-mounted connector.

1	Positive Input
2	Input Return
3	+12V Output
4	+5V Output
5	Ground
6	-5V Output
7	-12V Output

## Shutdown Control – J3

Shutdown may be implemented by shorting the two pins on J3 together (or driving a logic 0 into pin 1).

1	Shutdown input
2	Ground

## Mating Connectors for J3, J4, and J5

The part numbers for several compatible mating connectors are shown below.

Item	Description	Manufacturer	Mfr No.	Digi-Key No.
J3 board mount connector	2-pin friction lock	Amp	640457-2	A1926
J3 mating connector	26 AWG, Blue	Amp	640622-2	A19112
J3 mating connector	24 AWG, White	Amp	640621-2	A19091
J3 mating connector	22 AWG, Red	Amp	640620-2	A19070
J4 board mount connector	2 pins, 0.15", RA	Phoenix Contact	1803277	277-1206
J4 screw terminals	2 pins, 0.15"	Phoenix Contact	1803578	277-1161
J5 board mount connector	7 pins, 0.15", RA	Phoenix Contact	1803329	277-1211
J5 screw terminals	7 pins, 0.15"	Phoenix Contact	1803620	277-1166

Digi-Key is at [www.digikey.com](http://www.digikey.com) or (800) 344-4539 (800-Digikey).

## Serial Port Connector – J6

Jupiter-MM-SIO provides a 20-pin header labeled J6 on the left side of the board for the 2 serial ports. This connector is not available on the Jupiter-MM-LP.

The pinouts below show both serial ports with the same protocol for illustration purposes only. Each port can be configured independently.

See the following page for signal definitions.

### RS-232 Configuration:

#### J6

DCD 1	1	2	DSR 1
RXD 1	3	4	RTS 1
TXD 1	5	6	CTS 1
DTR 1	7	8	RI 1
GND	9	10	NC
DCD 2	11	12	DSR 2
RXD 2	13	14	RTS 2
TXD 2	15	16	CTS 2
DTR 2	17	18	RI 2
GND	19	20	NC

### RS-422 Configuration:

#### J6

NC	1	2	NC
TXD+ 1	3	4	TXD- 1
GND	5	6	RXD- 1
RXD+ 1	7	8	NC
GND	9	10	NC
NC	11	12	NC
TXD+ 2	13	14	TXD- 2
GND	15	16	RXD- 2
RXD+ 2	17	18	NC
GND	19	20	NC

### RS-485 Configuration:

#### J6

NC	1	2	NC
TXD/RXD+ 1	3	4	TXD/RXD- 1
GND	5	6	NC
NC	7	8	NC
GND	9	10	NC
NC	11	12	NC
TXD/RXD+ 2	13	14	TXD/RXD- 2
GND	15	16	NC
NC	17	18	NC
GND	19	20	NC

## Serial Port Signal Definitions:

<b>Signal Name</b>	<b>Definition</b>	<b>Direction</b>
<b>RS-232:</b>		
DCD	Data Carrier Detect	Input
DSR	Data Set Ready	Input
RXD	Receive Data	Input
RTS	Request To Send	Output
TXD	Transmit Data	Output
CTS	Clear To Send	Input
DTR	Data Terminal Ready	Output
RI	Ring Indicator	Input
<b>RS-422:</b>		
TXD+, TXD-	Differential Transmit Data	Output
RXD+, RXD-	Differential Receive Data	Input
<b>RS-485:</b>		
TXD/RXD+	Differential Transmit/Receive +	Bi-directional
TXD/RXD-	Differential Transmit/Receive -	Bi-directional
<b>Common to all protocols:</b>		
GND	Ground	--
NC	Not Connected	--



## 4. SERIAL PORT CONFIGURATION

Please refer to the drawing of Jupiter-MM-SIO on page 4 for locations of the configuration items mentioned here.

### Port and Interrupt Register Address Selection

Each peripheral board in the computer system must have a unique I/O address or block of addresses. The Jupiter-MM-SIO actually uses five I/O address blocks: one for each of the four serial ports and one for the interrupt status register. Each port's address block consists of 8 consecutive addresses, while the interrupt status register occupies a single address.

The I/O addresses are set with jumper block J9, located at the right edge of the board. Eight different I/O address combinations are selectable. The address shown below for each port is the base address of that port, i.e. the lowest address of the port's I/O address block.

#### J9: Serial Port Address Selection

A	B	C	Port 1	Port 2	Interrupt Status
In	In	In	3F8	2F8	220
Out	In	In	3E8	2E8	220
In	Out	In	380	388	224
Out	Out	In	240	248	224
In	In	Out	100	108	240
Out	In	Out	120	128	244
In	Out	Out	140	148	248
Out	Out	Out	160	168	24C

### Serial Protocol Selection

Different protocol configurations are possible for each serial port. Protocol selection is made by installing jumpers in the positions indicated below in the configuration headers J7 or J8, depending on the port.

J7:	Port 1 protocol configuration
J8:	Port 2 protocol configuration

Protocol	1	2	3	4	5	6
RS-232	Out	In	Out	Out	In	Out
RS-422	Int	Out	Int	Out	Out	Out
RS-485	In	Out	Out	In	Out	In

## Configuration for RS-422 and RS-485 Modes

When RS-422 or RS-485 modes are selected, not all signals are used by the line drivers and receivers. Depending on your software configuration, you may need to force some inputs true so that your software will operate correctly. Jumper blocks J7 and J8 provide a means to force the input signals true (connect them to ground, or logic 0) for ports 1 and 2, respectively. The signals that can be controlled in this fashion are CTS, DCD, DSR, and RI. To force an input signal true on a port, install a jumper next to that signal's name on the corresponding header for that port. Jumpers should not be installed in these locations for RS-232 operation.

**NOTE:** The positions TX and RX are not used for this purpose. Installing jumpers in these locations has an entirely different meaning. See Cable Endpoint Termination below.

## RS-422 / RS-485 Cable Endpoint Termination

In RS-422 or RS-485 networks, termination resistors are normally installed at the endpoints of the cables to minimize reflections on the lines. Jupiter-MM-SIO provides 120Ω resistors for this purpose. To enable resistor termination, install jumpers in the locations TX and RX of J7 or J8 for ports 1 or 2 respectively. Termination is only needed, and should only be used, at the cable endpoints. Installing termination resistors at additional points in the network may cause overloading and/or failure of the line drivers.

## Interrupt Levels

J10:	Port 1 interrupt configuration
J11:	Port 2 interrupt configuration

Each serial port requires an interrupt level as well as a base I/O address. Two jumper blocks, J10 and J11, are provided to select the interrupt level for each port from among levels 9, 3, 4, 5, 6, 7, 10, 11, 12, and 15. Install a jumper in the position corresponding to the desired interrupt level for each port. A second jumper is usually required in the R position as well; see “Interrupt Pulldown Resistor” below.

Note: Interrupt levels 3 – 7 and 9 are available on the standard 8-bit PC/104 bus header J1. If you are using an 8-bit bus, these are the only levels available to you. Interrupt levels 10, 11, 12, and 15 are available on the 16-bit PC/104 bus extension header J2. If you are using a 16-bit bus, then all 10 levels are available to you.

## Interrupt Sharing

On the PC/104 bus, a single interrupt level may be shared by multiple devices. A device requesting service drives the line to a logic high level, and when the device is serviced it tristates the line rather than driving it low. This technique avoids contention by two devices trying to drive the same line with opposing logic levels.

Jupiter-MM-SIO uses this technique for the two serial ports. To use the same interrupt level for both serial ports, install a jumper in the same number location for both ports and install a jumper in the R location for only one port.

## Interrupt Pulldown Resistor

In order to guarantee valid logic levels on the line when the device is not requesting service, each active interrupt level requires a 1KΩ pulldown resistor. Only one such resistor should be used on each active interrupt line. Each interrupt configuration header on Jupiter-MM-SIO has a position marked “R” for enabling the pulldown resistor. Install a jumper in this position to connect the resistor, and remove the jumper or install it over 2 pins in the left column in the header to disconnect the resistor. If two or more ports are sharing the same interrupt level, install the jumper in the R position for any one of the ports and leave it off the others.

## Interrupt Status Register

The interrupt status register indicates the status of each port's interrupt request line. It operates regardless of whether interrupt sharing is enabled (see below). If two or more ports are sharing the same interrupt level, the status register will still indicate the correct status of each port's interrupt request line.

Bit No.	7	6	5	4	3	2	1	0
Name	X	X	X	X	X	X	INT2	INT1

### Definitions:

- X Bit not used; generally reads back as a 1
- INT2-1 Status of interrupt request for each port:
  - 0 = no interrupt request active for this port
  - 1 = interrupt request active for this port

## Default Settings

The default settings for Jupiter-MM-SIO are as follows:

### Protocol settings:

Both ports set for RS-232 protocol (Jumpers 2 and 5 installed in locations J7 and J8)

### Address/Interrupt settings:

(J9 A B C = In In Out):

<u>Feature</u>	<u>Address</u>	<u>Interrupt level</u>
Port 1	100	3
Port 2	108	3 (shared)
Interrupt Status	240	

## RS-485 Transmitter Control

In an RS-485 network, the same pair of wires is used for both transmit and receive signals. Although any number of nodes can be listening simultaneously, only one can be transmitting or have its transmitter turned on in order for valid data to be transmitted across the network. On the Jupiter-MM-SIO, an RS-485 port's transmitter enable signal is controlled by that port's RTS signal. The RTS signal must be asserted (driven low) to enable the transmitter and de-asserted (driven high) to turn off the transmitter.

## 5. INSTALLATION

All Jupiter-MM-SIO power supplies are load tested prior to shipping. The supplies ship with all the external connectors required to start using your supply immediately. Any connector not needed can be removed.

1. Select the serial port base addresses using J9. Refer to page 9 for instructions.
2. Select the serial protocol for each serial port using J7 and J8.
3. Select the interrupt levels desired for each serial port using J10 and J11.
4. Connect a DC source to the Main power connector J4, or to the Auxiliary connector J5. The supply will operate with input voltages from 7 to 30VDC.

***CAUTION: VOLTAGES ABOVE 31V WILL BE SHUNTED TO GROUND THROUGH THE TRANSIENT VOLTAGE SUPPRESSOR (TVS). THE TVS IS RATED FOR 1,500 WATT SURGES, BUT IT MAY BE DAMAGED BY SUSTAINED VOLTAGES ABOVE 31V.***

5. Once the input voltage is in the valid range, verify that the power output indicator LEDs in the lower left corner are illuminated. This verifies your input power connections and the supply are fully functional. Note that only indicators corresponding to the voltages available on the supply will be lit. On the dual output version, the -5V and -12V LEDs may be present on the board but will not be lit.
6. Power down the supply. Plug the supply into your PC/104 stack. Your system is ready to use.

## 6. OUTPUT VOLTAGES AND CURRENTS

Jupiter-MM-SIO provides either 4 output voltages. The outputs appear on the PC/104 bus headers J1 / J2 as well as on the auxiliary I/O connector J5. The table below lists the maximum ratings for each output voltage.

Output	Jupiter-MM-SIO Max Current	Jupiter-MM-LP Max Current	Notes
+5V	10A	5A	Maximum rating achieved when only +5V output is used. Power drawn from additional outputs will reduce the available power on this line.
+12V	2A		
-5V	0.1A		
-12V	0.5A		

All outputs on the Jupiter-MM-SIO power supply are protected against overload on the outputs. The protection for each output circuit is slightly different:

+5V	Current limited to 10A. Above 10A the output voltage will drop to maintain maximum output of 50W. A short circuit will shut down the entire supply.
+12V	Current limited to 2A. Above 2A the voltage will drop to 5V and output current can increase to 10A (the 5V supply limit). Above 10A the output voltage will continue to drop. A short circuit will shut down the entire supply.
-5V	Current limited to 0.1A (100mA). A short circuit will shut down the output due to thermal protection in the output regulator IC.

Note the four LEDs in the bottom left corner of the board. These LEDs indicate the status of the four output voltages. During normal operation all four LEDs should be lit with equal intensity. If any LED is not lit or is only dimly lit, a problem exists with that particular circuit.

## 7. SPECIFICATIONS

### Input Power

Input voltage	7-30VDC
Input ripple	<100mV RMS
Transient protection	1500W transient voltage suppressor
Transient cutoff	31V

### Output Power

Output voltage/current	+5V 10A Jupiter-MM-SIO; 5A Jupiter-MM-LP +12V 2A (Jupiter-MM-SIO only) -5V 0.1A (Jupiter-MM-SIO only) -12V 0.5A (Jupiter-MM-SIO only)
Total output power	50 Watts Jupiter-MM-SIO; 25 Watts Jupiter-MM-LP
Output protection	+5V Current limited to 10A; short circuit shuts down supply +12V Current limited to 2A; short circuit shuts down supply -5V Current limited to 0.1A; thermally protected against short circuit
Output ripple	<50mV RMS (+5V output, 50% load)
Load regulation	±3% (+5V, -5V, +12V lines); ±8% (-12V line)
Efficiency	80% to 92%, based on load and input voltage

### Serial Ports (Jupiter-MM-SIO only)

No. of serial ports:	2
Protocol:	RS-232, RS-422, RS-485, Jumper selected
Maximum baud rate:	115kbps standard version
Parameters:	5, 6, 7, or 8 data bits; Even, odd, or no parity
Short circuit protection:	All outputs protected against continuous short circuit

#### RS-232 mode:

Input impedance:	3K $\Omega$ min
Input voltage swing:	±30V max
Output voltage swing:	±5V min, ±7V typical

#### RS-422, RS-485 modes:

Differential input threshold:	-0.2V min, +0.2V max
Input impedance:	12K $\Omega$ min
Input current:	+1.0mA max ( $V_{IN} = 12V$ ) -0.8mA max ( $V_{IN} = -7V$ )
Differential output voltage:	2.0V min ( $R_L = 50\Omega$ )
High/low states differential output voltage symmetry:	0.2V max

### Mechanical

Size	3.55" x 3.775"
PC/104 bus	J1 (64 pins) and J2 (40 pins) stackthrough connectors installed

### Environmental

Operating temperature	-40 to +85°C
Operating humidity	5 to 95% non-condensing