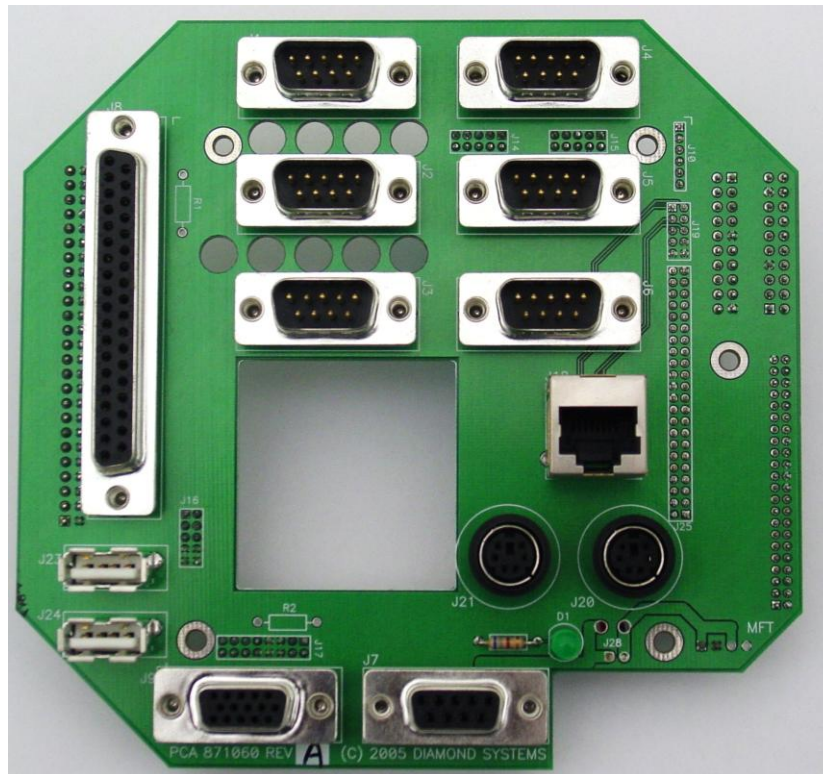




RHODEUS PANEL I/O BOARD

User Manual

Revision A April 2011



Revision	Date	Comment
A	4/11/11	Initial Release

**FOR TECHNICAL SUPPORT
PLEASE CONTACT:**

support@diamondsystems.com

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Diamond Systems Corporation
555 Ellis Street
Mountain View, CA 94043 USA
Tel 1-650-810-2500
Fax 1-650-810-2525
www.diamondsystems.com

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IMPORTANT SAFE-HANDLING INFORMATION



WARNING: ESD-Sensitive Electronic Equipment!

Observe ESD-safe handling procedures when working with this product.

Always use this product in a properly grounded work area and wear appropriate ESD-preventive clothing and/or accessories.

Always store this product in ESD-protective packaging when not in use.

Safe Handling Precautions

Aurora contains numerous I/O connectors that connect to sensitive electronic components. This creates many opportunities for accidental damage during handling, installation and connection to other equipment. The list here describes common causes of failure found on boards returned to Diamond Systems for repair. This information is provided as a source of advice to help you prevent damaging your Diamond (or any vendor's) embedded computer boards.

ESD damage – This type of damage is almost impossible to detect, because there is no visual sign of failure or damage. The symptom is that the board simply stops working, because some component becomes defective. Usually the failure can be identified and the chip can be replaced.

To prevent ESD damage, always follow proper ESD-prevention practices when handling computer boards.

Damage during handling or storage – On some boards we have noticed physical damage from mishandling. A common observation is that a screwdriver slipped while installing the board, causing a gouge in the PCB surface and cutting signal traces or damaging components.

Another common observation is damaged board corners, indicating the board was dropped. This may or may not cause damage to the circuitry, depending on what is near the corner. Most of our boards are designed with at least 25 mils clearance between the board edge and any component pad, and ground / power planes are at least 20 mils from the edge to avoid possible shorting from this type of damage. However these design rules are not sufficient to prevent damage in all situations.

A third cause of failure is when a metal screwdriver tip slips, or a screw drops onto the board while it is powered on, causing a short between a power pin and a signal pin on a component. This can cause overvoltage / power supply problems described below. To avoid this type of failure, only perform assembly operations when the system is powered off.

Sometimes boards are stored in racks with slots that grip the edge of the board. This is a common practice for board manufacturers. However our boards are generally very dense, and if the board has components very close to the board edge, they can be damaged or even knocked off the board when the board tilts back in the rack. Diamond recommends that all our boards be stored only in individual ESD-safe packaging. If multiple boards are stored together, they should be contained in bins with dividers between boards. Do not pile boards on top of each other or cram too many boards into a small location. This can cause damage to connector pins or fragile components.

Power supply wired backwards – Our power supplies and boards are not designed to withstand a reverse power supply connection. This will destroy each IC that is connected to the power supply. In this case the board will most likely will be unrepairable and must be replaced. A chip destroyed by reverse power or by excessive power will often have a visible hole on the top or show some deformation on the top surface due to vaporization inside the package. **Check twice before applying power!**

Bent connector pins – This type of problem is often only a cosmetic issue and is easily fixed by bending the pins back to their proper shape one at a time with needle-nose pliers. This situation can occur when pulling a ribbon cable off of a pin header. Note: If the pins are bent too severely, bending them back can cause them to weaken unacceptably or even break, and the connector must be replaced.

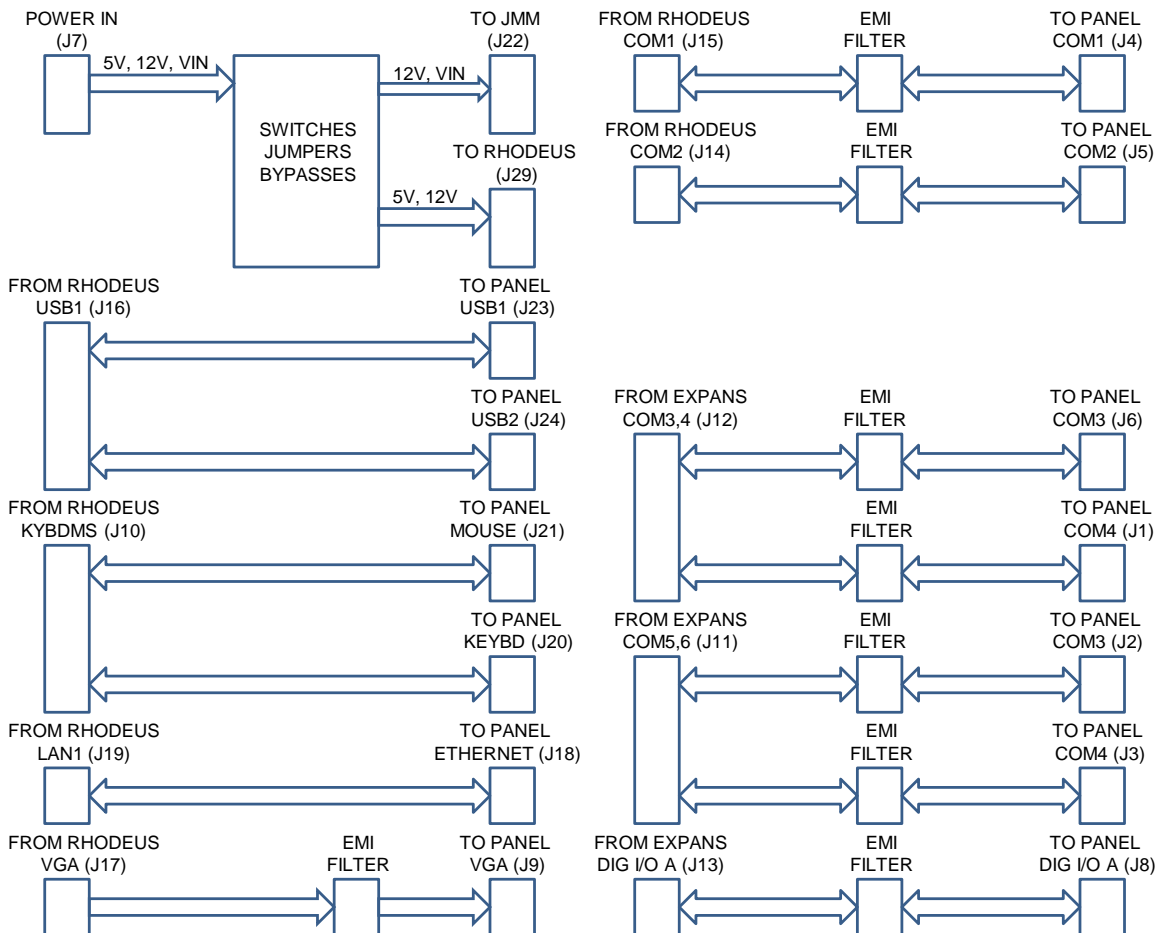
1. DESCRIPTION

The Rhodeus panel I/O board plugs directly onto Diamond's Rhodeus PC/104™ single board computer (SBC) and provides industry-type I/O connectors for all I/O features of the SBC. The Rhodeus with panel I/O board assembly mounts in Diamond's compact, rugged PC/104 Pandora enclosure to provide a cable-free mounting system for Rhodeus.

Key panel I/O board features include:

- ◆ Plugs onto the Rhodeus SBC and provides all I/O without cables
- ◆ Brings additional I/O to the front panel I/O for 2 add-on PC/104 boards
- ◆ Mounts within the Pandora enclosure
- ◆ Provides connection for power switch
- ◆ Provides power paths for +5V and variable voltage input

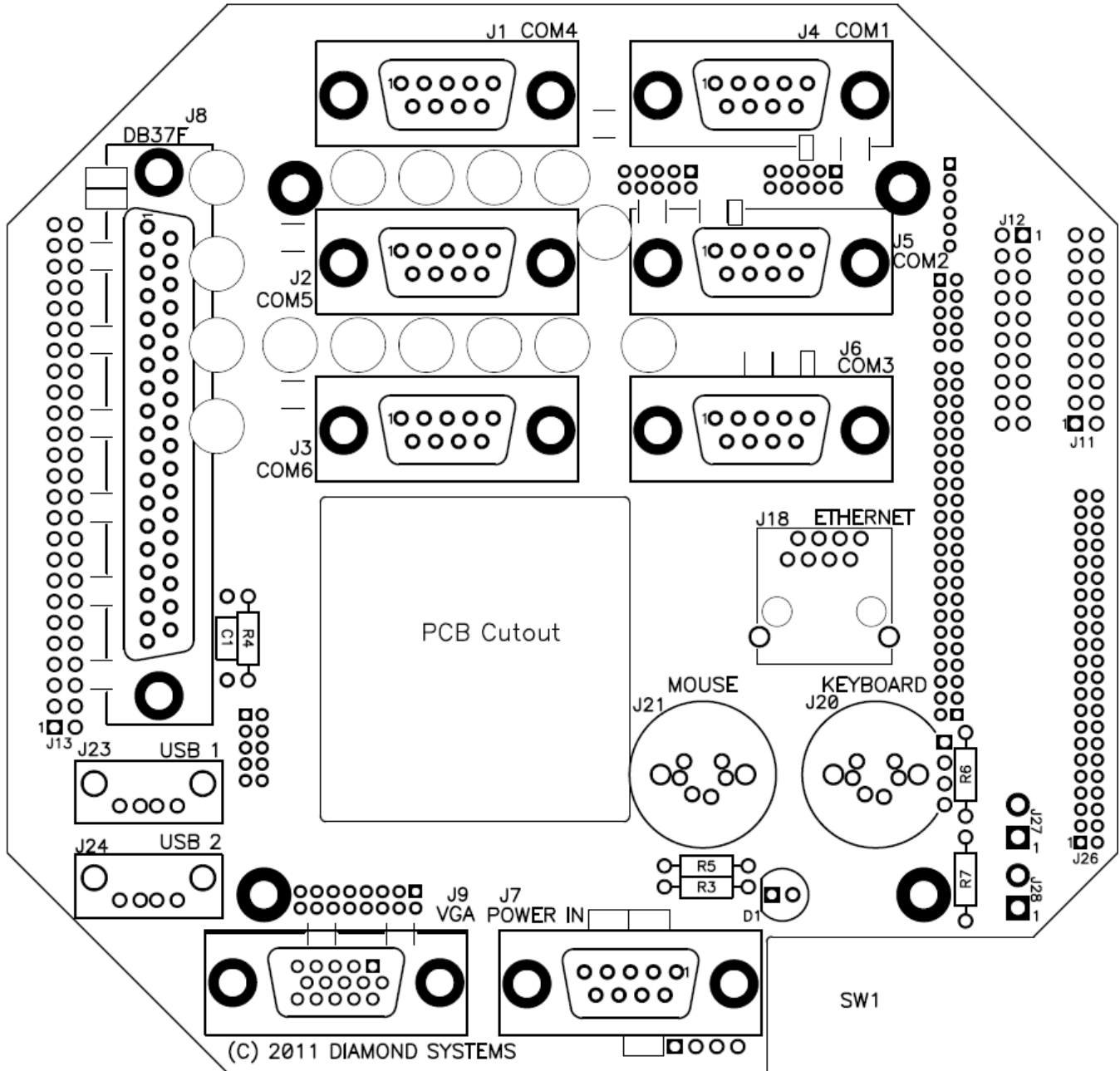
2. BLOCK DIAGRAM



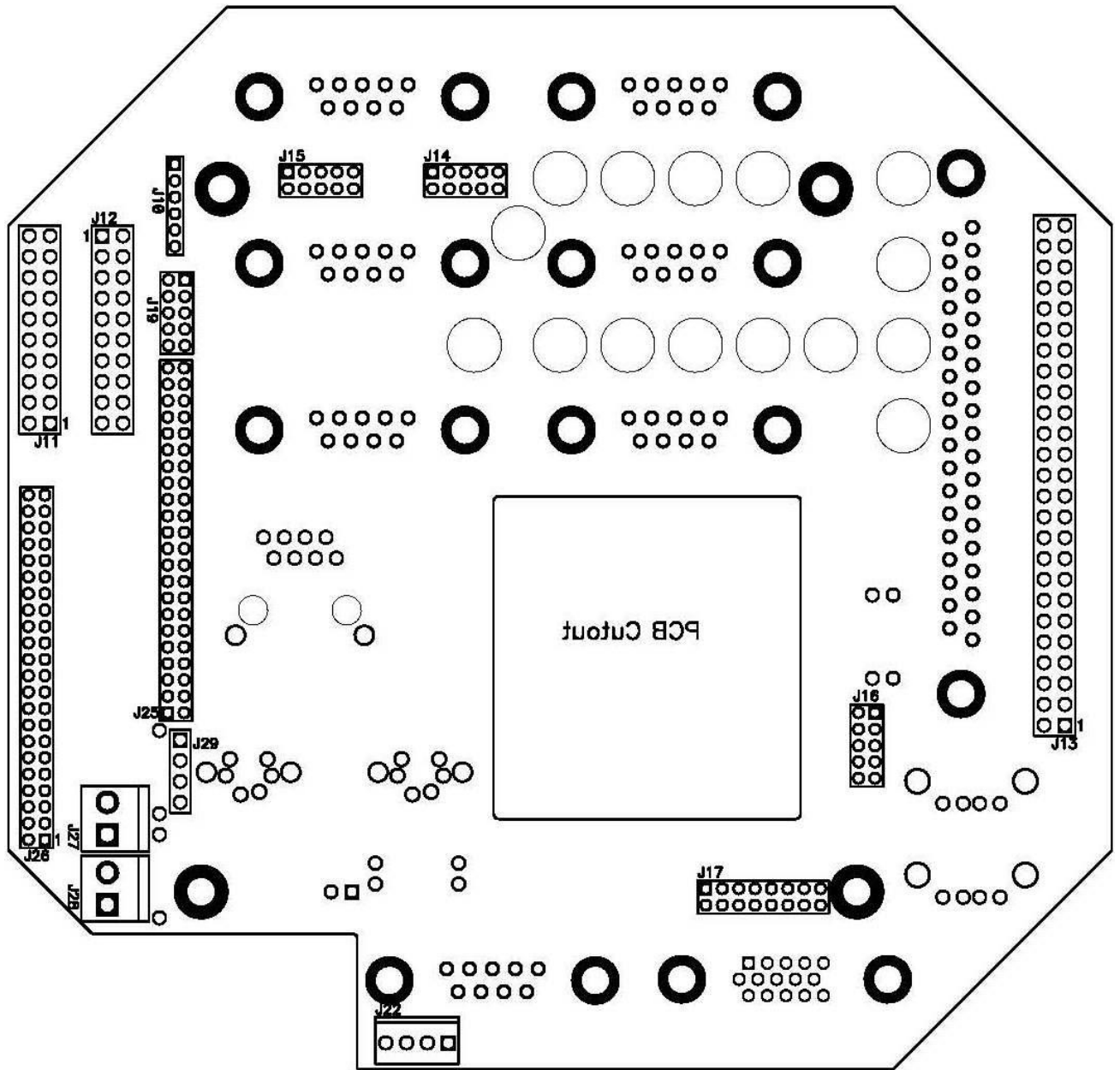
3. MECHANICAL DRAWINGS

Mechanical drawings of the Rhodeus panel I/O board connector layout are provided below. The first drawing shows the top side of the panel I/O board with the relative connector locations. The second drawing shows the bottom side of the panel I/O board and the connectors that mate to the Rhodeus SBC.

All I/O connectors are located on the board so that there is sufficient room to install all connectors without interference with any other connector or mounting hole.



Panel I/O Board Top Side



Panel I/O Board Bottom Side

4. FUNCTIONAL DESCRIPTION

The panel I/O board contains three major sections: SBC I/O section, Expansion I/O section, and Power section.

4.1 SBC I/O Section

The SBC I/O section brings out all the SBC I/O to the front panel connectors. The top side of the panel I/O board has industry standard I/O connectors, and the bottom side provides dual row 2mm pin sockets to mate with the corresponding 2mm pin headers on the Rhodeus SBC.

4.2 Expansion I/O Section

The Expansion I/O section contains additional connectors for bringing out the I/O from PC/104 modules installed below the SBC within the enclosure.

The first expansion connector provides I/O for a generic PC/104 I/O board. It includes a 40-pin 2x20 .1" pitch pin header for mating with a standard ribbon cable that connects to the I/O connector of the installed PC/104 board. This pin header is on the bottom right side of the panel I/O board in a spot convenient for mating with the standard PC/104 board I/O connector location. On the top side of the panel I/O board, a DB37 connector is provided for external access to this I/O.

The second expansion connector provides I/O for a Diamond Emerald (EMM-XT or EMM-4M-XT) serial I/O board. It provides two 2x10 .1" pitch pin headers in the upper right corner for connection to the Emerald board. On the top side of the panel I/O board are three DB9M connectors in the top left center and 1 DB9M connector in the right center for external connection.

4.3 Power Section

The Power section provides two paths for input power coming from either a +5V, +12V or variable input voltage source. The power input connector consists of a DB9 female with 3pins each of +5V, +12V and ground.

The +5V source is routed through a 1x2 .156" pitch friction lock connector to a front panel switch, and then to a pin socket on the bottom side of the panel I/O board that mates with the Rhodeus SBC. The switch connector can be bypassed with a jumper if desired.

The +12V or variable input voltage source is routed through another 1x2 .156" pitch friction lock connector to the front panel switch, and then to a separate 1x2 .156" pitch friction lock connector for connection to a DC/DC power supply mounted inside the enclosure. The +5VDC output of this DC/DC power supply has two paths to the Rhodeus SBC:

- (1) Connect directly to the PC/104 bus of the system, if the power supply is mounted on the bus
- (2) Route back to the panel I/O board with another connector and then to the Rhodeus SBC through the panel I/O board's pin socket connection

The panel I/O board also provides a path for optional +12VDC output from the power supply to the Rhodeus SBC through the pin socket.

The panel I/O board features a green LED which is connected to the +5VDC signal to indicate power status.

5. SBC I/O SECTION – BOTTOM SIDE

All these connectors are on the bottom side of the panel I/O board. Their locations and pinouts match exactly the corresponding connectors on the Rhodeus SBC. The pin numbering of these connectors, when facing the connector, is reversed from the pin numbering on the male pin headers.

5.1 Ethernet

TX+	1	2	TX-
RX+	3	4	NC
NC	5	6	RX-
NC	7	8	Ground
GND	9	10	KEY

5.2 Input Power

+5V	1
GND	3
GND	5
+12V	7

The power signals on this connector come from either the front panel input power connector via jumpers or external switch.

5.3 PS/2 Keyboard / Mouse

This connector provides the standard PS/2 keyboard and mouse signals.

KB Data	1
GND	2
MS Data	3
KB CLK	4
5V VCC	5
MS CLK	6

5.4 Serial Ports

This connector provides access to the two serial ports from the Rhodeus SBC and four serial ports from an optional Emerald series serial port PC/104 expansion board. Port 1 and Port 2 are provided by the Rhodeus SBC. Port 1 is RS-232 only and Port 2 is jumper-configurable for RS-232, RS-422, or RS-485 protocols. Ports 3 to 6 may be provided by an optional Emerald PC/104 serial port expansion module. Port 3 is jumper-configurable for RS-232, RS-422, or RS-485 protocols, and ports 4 through 6 are fixed RS-485 only.

RS-232 Configuration				RS-422 Configuration				RS-485 configuration				
Port 1	DCD 1	1	2	DSR 1	NC	1	2	NC	NC	1	2	NC
	RXD 1	3	4	RTS 1	TXD+ 1	3	4	TXD- 1	TXD/RXD+ 1	3	4	TXD/RXD- 1
	TXD 1	5	6	CTS 1	GND	5	6	RXD- 1	GND	5	6	NC
	DTR 1	7	8	RI 1	RXD+ 1	7	8	NC	NC	7	8	NC
	GND	9	10	NC	GND	9	10	NC	GND	9	10	NC
	-----				-----				-----			
Port 2	DCD 2	11	12	DSR 2	NC	11	12	NC	NC	11	12	NC
	RXD 2	13	14	RTS 2	TXD+ 2	13	14	TXD- 2	TXD/RXD+ 2	13	14	TXD/RXD- 2
	TXD 2	15	16	CTS 2	GND	15	16	RXD- 2	GND	15	16	NC
	DTR 2	17	18	RI 2	RXD+ 2	17	18	NC	NC	17	18	NC
	GND	19	20	NC	GND	19	20	NC	GND	19	20	NC
	-----				-----				-----			

5.5 USB 0/1 Connector

This connector provides access to the 2 USB 2.0 ports. The shield pin is tied to system ground. The key positions are missing to match the key position in the cable to prevent misconnection.

NC	1	2	Shield / Ground
USB1 Pwr-	3	4	USB0 Pwr-
USB1 Data+	5	6	USB0 Data+
USB1 Data-	7	8	USB0 Data-
USB1 Pwr+	9	10	USB0 Pwr+

5.6 VGA Connector

This connector provides a connection for VGA monitors. Note that while the DDC serial detection pins are present, there is no +5V supply provided, nor are the legacy "Monitor ID" pins used.

RED	1	2	GRN
BLU	3	4	NC
GND	5	6	GND
GND	7	8	GND
NC	9	10	GND
NC	11	12	DDC-Data
HSYNC	13	14	VSYNC
DDC-Clock	14	16	NC

5.7 IDE Connector

This connector provides IDE signals from the SBC. It connects to a 2x22 2mm connector on the panel I/O board for connection to an IDE device inside the enclosure. It is a 2x22 2mm pitch female pin socket connector.

IDE Reset	1	2	GND
Data07	3	4	Data08
Data06	5	6	Data09
Data05	7	8	Data10
Data04	9	10	Data11
Data03	11	12	Data12
Data02	13	14	Data13
Data01	15	16	Data14
Data00	17	18	Data15
GND	19	20	KEY
REQ	21	22	GND
IOWR	23	24	GND
IORD	25	26	GND
IORDY	27	28	IDESEL
DACK	29	30	GND
IRQ	31	32	NC
ADDR1	33	34	DIAG
ADDR0	35	36	ADDR2
CS2	37	38	CS3
IDEACTP	39	40	GND
+5V	41	42	+5V
GND	43	44	GND

6. SBC I/O SECTION – TOP SIDE

These SBC I/O connectors are on the top side of the panel I/O board. They face out through the enclosure front panel.

6.1 Input Power

The input power connector is DB9 male connector. The input power may be supplied either by +5VDC and/or +12V / +Vin. The +5V can be connected via jumper or switched to the Rhodeus SBC board power connector via an external power switch. If there is +12V available with the +5V, optionally a jumper may be used to jumper the +12V to the +12V bus on the Rhodeus SBC power connector.

The +12V / +Vin can also be connected via jumper, or switched via an external power switch to an auxiliary connector on the back side of the board which is used to connect to a DC/DC power supply. The output of the DC/DC power supply is then fed either to the PC/104 bus power pins (if the power supply is on the PC/104 bus), or back to the panel I/O board, and then to the Rhodeus SBC, through the +5V pins on the SBC mating power input connector.

1	+5V
2	+5V
3	GND
4	+12V / Var
5	+12V / Var
6	+5V
7	GND
8	GND
9	+12V / Var

6.2 Ethernet

The Ethernet connector is a vertical metal-shielded RJ-45 jack with industry standard pinout for 10/100Mbps Ethernet. The connector includes the LEDs for link and speed. The signals come from the SBC mating Ethernet connector.

6.3 VGA

The VGA connector is a standard vertical DD15 female connector with industry standard VGA pinout. It has 4-40 thread inserts and hex screwlocks. The signals come from the SBC mating VGA connector.

6.4 USB

The USB connectors are 2 vertical metal shrouded type A connectors with industry standard pinout for USB. The signals come from the two SBC mating USB connectors.

6.5 PS/2 Keyboard and Mouse

The PS/2 connectors are 2 vertical Mini-DIN-6 connectors with industry standard pinout for PS/2 keyboard and mouse. The signals come from the SBC mating PS/2 connector.

6.6 Serial Ports

The serial port connectors are six vertical DB9 male connectors. They have 4-40 thread inserts and hex screwlocks. Port 1 and Port 2 signals come from 2 2x5 pin SBC serial port connectors and use the pinout shown below. Signals for Ports 3 – 6 come from 2 2x10 pin expansion connectors. Their pinout is given in section 7.1. Ports 4 – 6 are RS-485 only.

Panel Connector	Panel Pin	Signal Name	Serial Port Connector		Signal Name	Panel Pin
COM1	1	DCD 1	1	2	DSR 1	6
	2	RXD 1	3	4	RTS 1	7
	3	TXD 1	5	6	CTS 1	8
	4	DTR 1	7	8	RI 1	9
	5	GND	9	10	NC	
COM2	1	DCD 2	1	2	DSR 2	6
	2	RXD 2	3	4	RTS 2	7
	3	TXD 2	5	6	CTS 2	8
	4	DTR 2	7	8	RI 2	9
	5	GND	9	10	NC	
COM3	1	DCD 3	1	2	DSR 3	6
	2	RXD 3	3	4	RTS 3	7
	3	TXD 3	5	6	CTS 3	8
	4	DTR 3	7	8	RI 3	9
	5	GND	9	10	NC	
COM4		NC	11	12	NC	
	2	RXD 4	13	14	RTS 4	7
		NC	15	16	NC	
		NC	17	18	NC	
	5	GND	19	20	NC	
COM5		NC	1	2	NC	
	2	RXD 4	3	4	RTS 4	7
		NC	5	6	NC	
		NC	7	8	NC	
	5	GND	9	10	NC	
COM6		NC	11	12	NC	
	2	RXD 4	13	14	RTS 4	7
		NC	15	16	NC	
		NC	17	18	NC	
	5	GND	19	20	NC	

7. EXPANSION I/O SECTION

These connectors are on the bottom side of the panel I/O board, outside the PC/104 outline. They do not connect to the Rhodeus SBC. They are used for other internal connections and functions. Both connectors are 0.1" pitch male pin headers.

7.1 Serial Port Expansion

The serial port expansion connectors are two 2x10 pin 0.1" pitch male pin headers. Their signals are brought out to four DB9 male connectors for serial ports 3-6 on the top side of the panel I/O board. The signal routing is described below. COM4, COM5 and COM6 are RS-485 only.

Panel Connector	Panel Pin	Signal Name	Expansion Connector		Signal Name	Panel Pin
COM3	1	DCD 5	1	2	DSR 5	6
	2	RXD 5	3	4	RTS 5	7
	3	TXD 5	5	6	CTS 5	8
	4	DTR 5	7	8	RI 5	9
	5	GND	9	10	NC	

COM4		NC	11	12	NC	
	2	RXD 4	13	14	RTS4	7
		NC	15	16	NC	
		NC	17	18	NC	
	5	GND	19	20	NC	

COM5		NC	1	2	NC	
	2	RXD 5	3	4	RTS 5	7
		NC	5	6	NC	
		NC	7	8	NC	
	5	GND	9	10	NC	

COM6		NC	11	12	NC	
	2	RXD 6	13	14	RTS 6	7
		NC	15	16	NC	
		NC	17	18	NC	
	5	GND	19	20	NC	

7.2 Digital I/O

The data I/O connector is a DB37 female connector that connects the digital I/O signals from an expansion digital I/O board to the outside world.

VCC	1	20	GND
B7	2	21	B6
GND	3	22	B5
B4	4	23	GND
B3	5	24	B2
GND	6	25	B1
B0	7	26	GND
C7	8	27	C6
GND	9	28	C5
C4	10	29	GND
C3	11	30	C2
GND	12	31	C1
C0	13	32	GND
A7	14	33	A6
GND	15	34	A5
A4	16	35	GND
A3	17	36	A2
GND	18	37	A1
A0	19	XX	

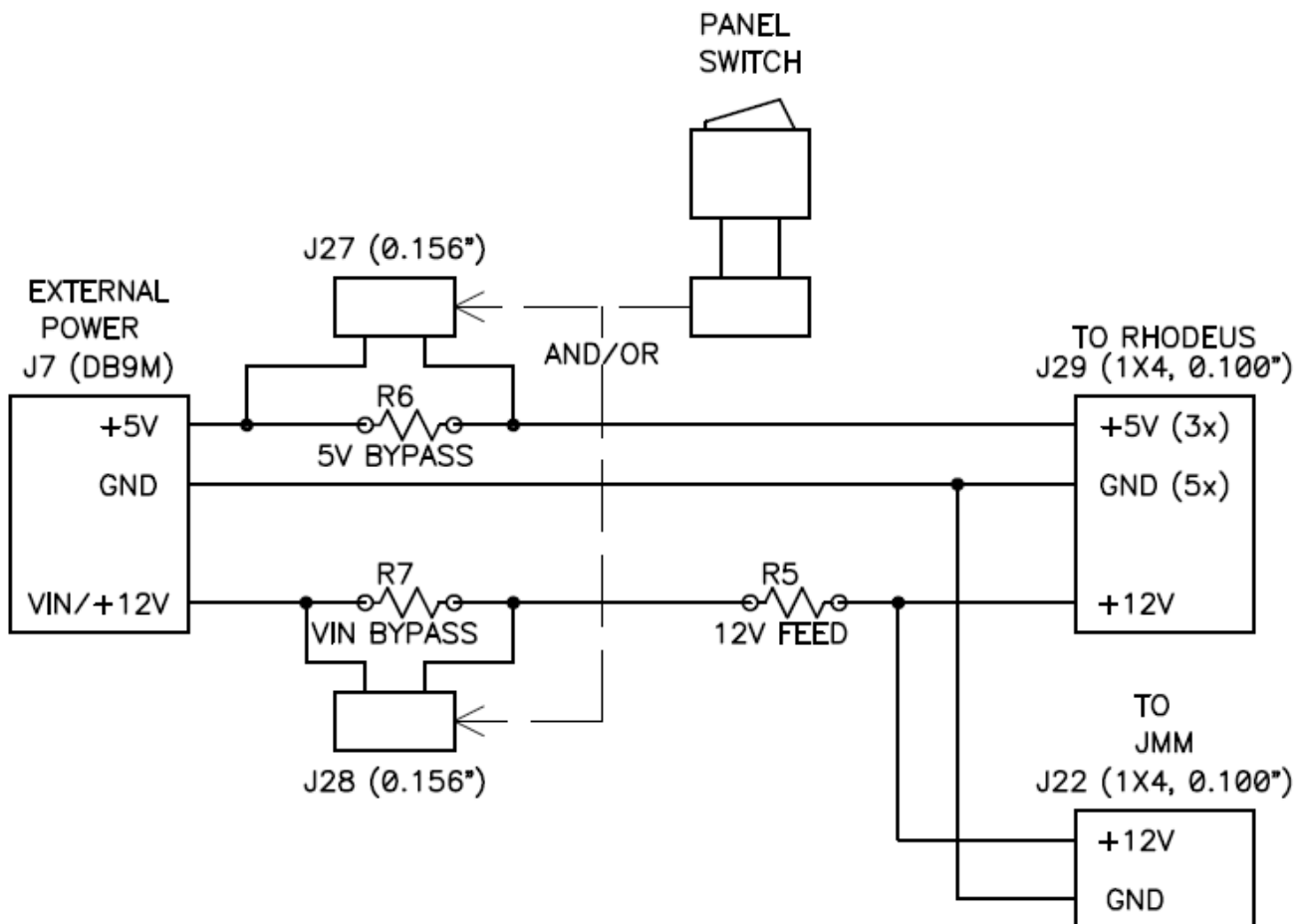
8. POWER SECTION

The power I/O section provides the means to bring power to the system. The schematic below indicates the power routing between the input power connector and the Rhodeus SBC through the panel I/O board. Power may be provided in several methods:

1. +5VDC in from the input power connector directly to the panel I/O board, using either the front panel switch or a direct connection, and then to the Rhodeus SBC through the SBC input connector.
2. Vin (+8 to 30VDC) from the input power connector to a connector leading to an internal DC/DC power supply, whose output is driven directly onto the PC/104 bus using the PC/104 bus connectors on the DC/DC power supply. The Vin may be routed to the power supply connector either through the front panel switch or through a direct connection.
3. Same as #2 above, except the +5VDC and optional +12VDC outputs of the DC/DC power supply are routed back to the panel I/O board, and then connected to the Rhodeus SBC through the SBC power input connector.

The switch bypass jumpers are 0-ohm ¼ watt T/H resistors. To use the panel power switch, the resistor is cut away, opening the circuit.

The +12V input option jumper is also a 0-ohm ¼ watt T/H resistor used to route +12V from the Vin pin to the +12V pin on the Rhodeus power connector. If the Vin voltage is not +12V then the resistor is cut away to isolate the +12V pin on the Rhodeus power connector.



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