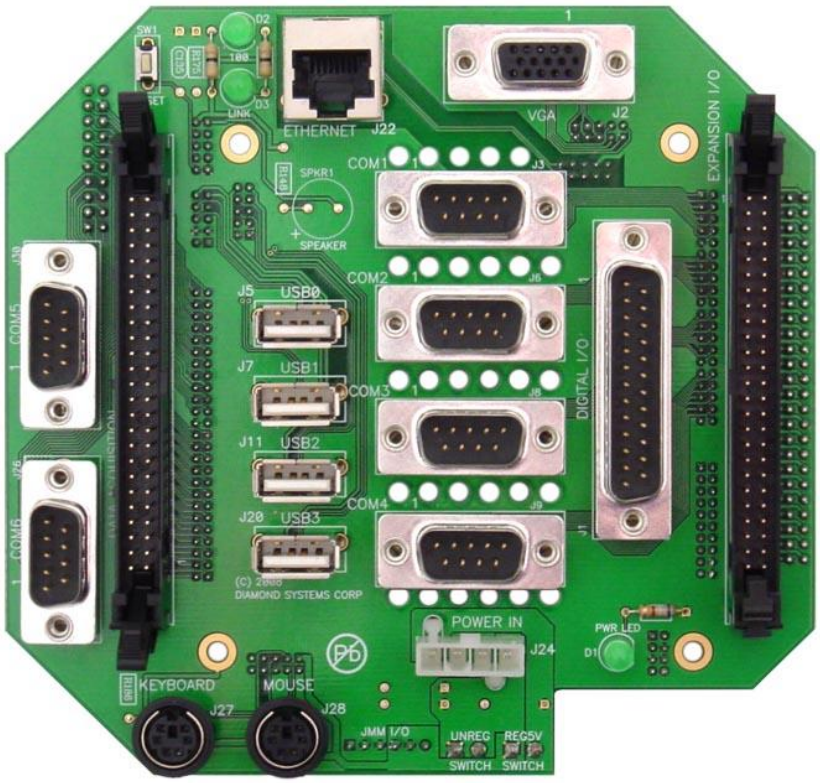
HELIOS PANEL I/O BOARD

User Manual

Revision A.01 March 2015



Revision	Date	Comment
A.00	5/9/11	Initial Release
A.01	3/3/15	Minor update to Power section

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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.

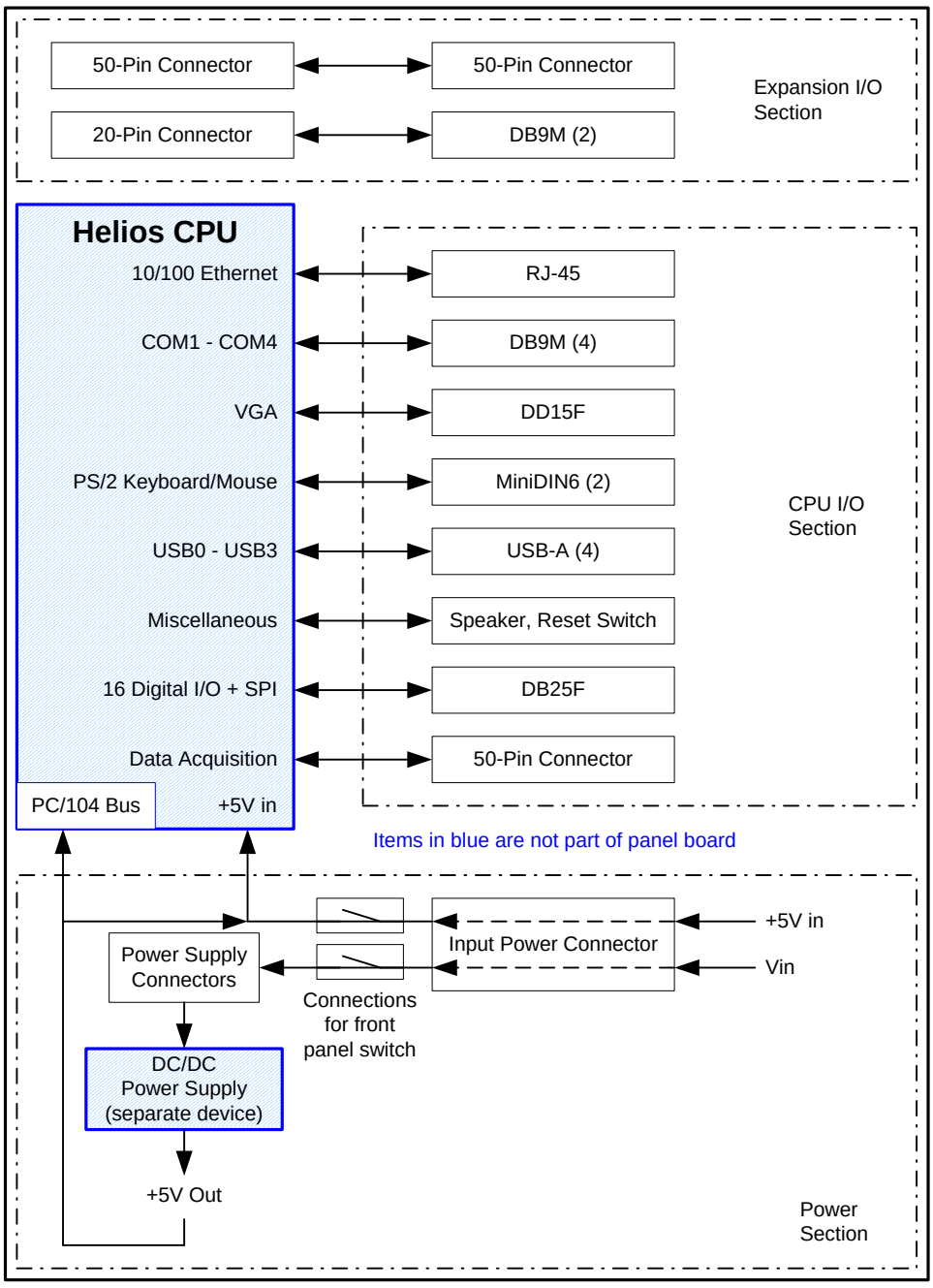
1. DESCRIPTION

The Helios panel I/O board plugs directly onto the Helios PC/104 single board computer and provides industry-type I/O connectors for all I/O features on the board. The panel I/O board mounts in the Pandora enclosure to provide a cable-free mounting system for Helios.

Key feature highlights include:

- Plugs onto the Helios SBC and provides all I/O without cables
- Provides additional front panel I/O for 2 additional PC/104 boards
- Mounts in Pandora enclosure
- Provides connection for power switch
- Provides power paths for +5V and variable voltage input

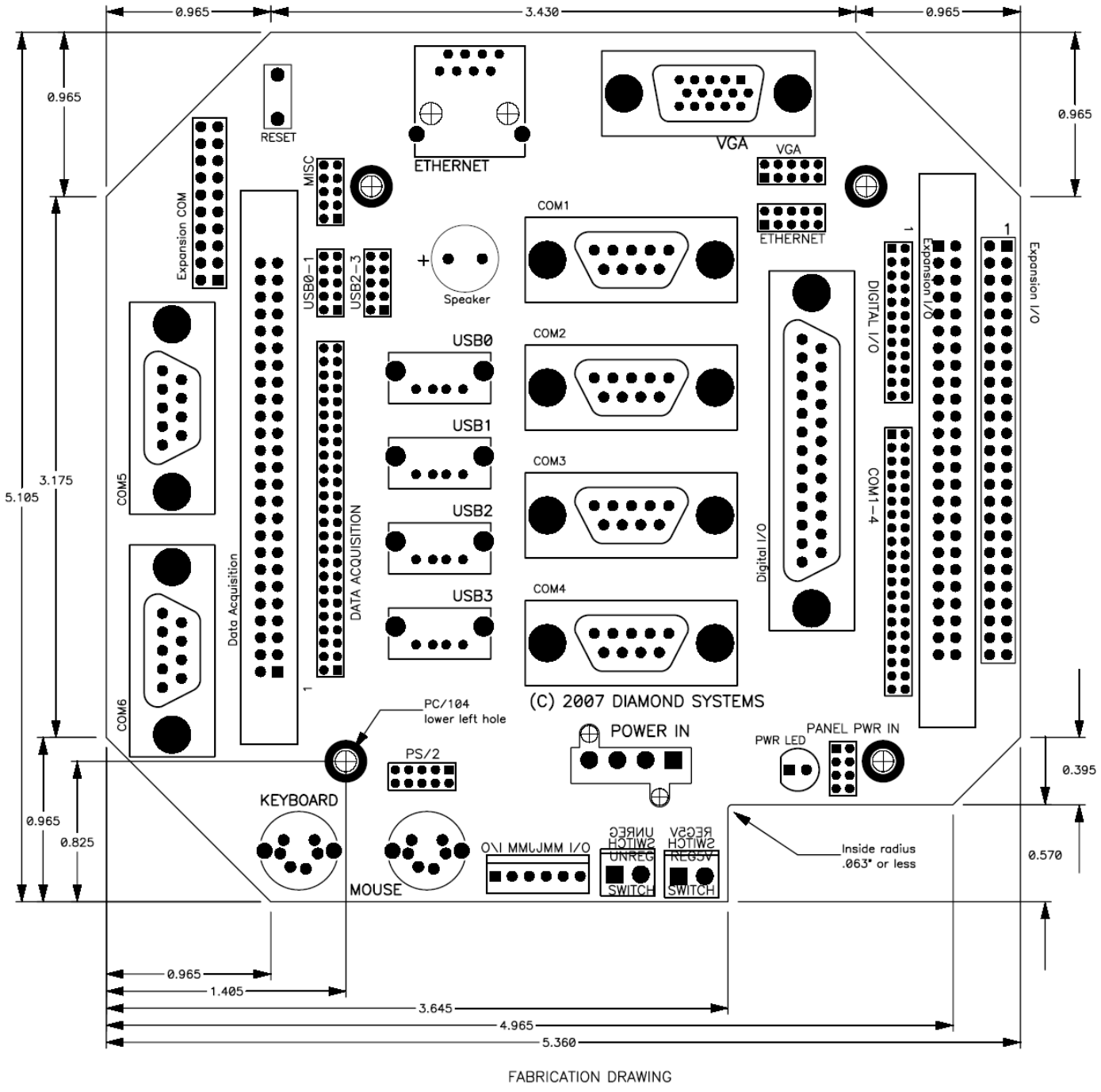
2. BLOCK DIAGRAM



3. MECHANICAL DRAWING

A mechanical drawing of the Helios panel I/O board connector layout is provided below. The drawing shows the top side of the panel I/O board with the relative connector locations.

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.



FABRICATION DRAWING

Helios Panel I/O Board Top 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 Helios 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 Helios SBC within the enclosure.

The first expansion connector provides I/O for a generic PC/104 I/O board. It includes a 50-pin 2x25 .1" pitch pin header for mating with a standard ribbon cable that connects to the I/O connector of a 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 a latching 50 pin 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 port board. It provides a 2x10 .1" pitch pin header on the bottom left side for connection to the EMM board, and 2 DB9M connectors on the top side for external access.

4.3 Power Section

The Power section provides two paths for input power coming from either a 5VDC source or a variable input voltage source.

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

The variable input voltage source is routed through another 1x2 .1" pitch friction lock connector to a front panel switch and then to a separate 1x2 .1" 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 then has two paths to the Helios SBC:

(1) It can connect directly to the PC/104 bus of the system, if the power supply is mounted on the bus; or

(2) It can be routed back to the panel I/O board with another connector and then to the Helios 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 Helios SBC through the pin socket.

The power section contains 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 Helios 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-
NC	3	4	RX-
RX+	5	6	NC
Link LED	7	8	Ground
Key	9	10	Duplex

5.2 Input Power

+5V	1	2	+5V
+5V	3	4	Ground
Ground	5	6	Ground
+12V	7	8	+12V

The power signals on this connector come from either the front panel input power connector or from a connector leading to the output from a DC/DC power supply installed in the system.

5.3 PS/2 Keyboard / Mouse

This connector provides the standard PS/2 keyboard and mouse signals. For a standard configuration, a 2x4 connector may be installed in positions 1-8 for compatibility with the existing DSC cable. For a latching configuration, the 2x5 connector is installed.

+5V	1	2	NC
KB Data	3	4	MS Data
KB Clk	5	6	MS Clk
Ground	7	8	NC
NC	9	10	NC

5.4 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 old “Monitor ID” pins used.

RED	1	2	Ground
GREEN	3	4	NC
BLUE	5	6	Ground
HSYNC	7	8	DDC-Data
VSYNC	9	10	DDC-Clock

5.5 Serial Ports

This connector provides access to the four serial ports from the Vortex CPU chip. Ports 1 and 2 may be jumper-configured for RS-232, RS-422, or RS-485 protocols, while ports 3 and 4 are fixed RS-232 only.

RS-232 Configuration

Port 1	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
Port 2	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
Port 3	DCD 3	21	22	DSR 3
	RXD 3	23	24	RTS 3
	TXD 3	25	26	CTS 3
	DTR 3	27	28	RI 3
	GND	29	30	NC
Port 4	DCD 4	31	32	DSR 4
	RXD 4	33	34	RTS 4
	TXD 4	35	36	CTS 4
	DTR 4	37	38	RI 4
	GND	39	40	NC

RS-422 Configuration

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
	21	22	
	23	24	
	25	26	
	27	28	
	29	30	
	31	32	
	33	34	
	35	36	
	37	38	
	39	40	

RS-485 configuration

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
	21	22	
	23	24	
	25	26	
	27	28	
	29	30	
	31	32	
	33	34	
	35	36	
	37	38	
	39	40	

5.6 USB 0/1 and USB 2/3 Connectors

These connectors provide access to the 4 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+

NC	1	2	Shield / Ground
USB3 Pwr-	3	4	USB2 Pwr-
USB3 Data+	5	6	USB2 Data+
USB3 Data-	7	8	USB2 Data-
USB3 Pwr+	9	10	USB2 Pwr+

5.7 Digital I/O

This connector provides 16 digital I/O signals from the Helios SBC. It connects to a DB25F connector on the front panel. It is a 2x10 .1" pitch female pin socket connector.

DIO LCA0	1	2	DIO LCA1
DIO LCA2	3	4	DIO LCA3
DIO LCA4	5	6	DIO LCA5
DIO LCA6	7	8	DIO LCA7
DIO LCB0	9	10	DIO LCB1
DIO LCB2	11	12	DIO LCB3
DIO LCB4	13	14	DIO LCB5
DIO LCB6	15	16	DIO LCB7
+5V	17	18	GND
NC	19	20	GND

5.8 Data Acquisition I/O Connector

This connector provides data acquisition signals from the Helios SBC board, if the model supports data acquisition. It connects to a 50-pin male pin header on the front panel. It is a 2x25 .1" pitch female pin socket connector.

DIO A0	1	2	DIO A1
DIO A2	3	4	DIO A3
DIO A4	5	6	DIO A5
DIO A6	7	8	DIO A7
DIO B0	9	10	DIO B1
DIO B2	11	12	DIO B3
DIO B4	13	14	DIO B5
DIO B6	15	16	DIO B7
DIO C0	17	18	DIO C1
DIO C2	19	20	DIO C3
DIO C4 / Gate 0	21	22	DIO C5 / Gate 1
DIO C6 / Clk 1	23	24	DIO C7 / Out 0
Ext Trig	25	26	Tout 1
+5V Out	27	28	Dground
Vout 0	29	30	Vout 1
Vout 2	31	32	Vout 3
Aground (Vout)	33	34	Aground (Vin)
Vin 0	35	36	Vin 8
Vin 1	37	38	Vin 9
Vin 2	39	40	Vin 10
Vin 3	41	42	Vin 11
Vin 4	43	44	Vin 12
Vin 5	45	46	Vin 13
Vin 6	47	48	Vin 14
Vin 7	49	50	Vin 15

5.9 Miscellaneous Signals

This connector provides access to common auxiliary signals used in a PC application.

Ground	1	2	Reset-
IDE LED	3	4	+5V
NC	5	6	Power LED
Reserved	7	8	LCD Backlight Ctrl
Speaker	9	10	+5V

The signals on this connector that are used on the panel I/O board are described below:

Speaker Out	The signal on this pin is referenced to +5V Out. A small buzzer is connected between this pin and +5V Out.
Power LED	Referenced to +5V Out. Does not require a series resistor. An LED visible on the outside front panel is connected directly between this pin and +5V Out.
Reset-	Connection between this pin and Ground will generate a Reset condition. A momentary switch is connected between this pin and ground.

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 Molex part number 39-30-2045. Each pin has a 6A or greater current carrying capacity.

Input power may be supplied either as +5VDC or as Vin. The +5V is intended to be switched directly to the PC/104 bus power pins via the external power switch. The Vin is intended to be switched 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 Helios SBC through the +5V pins on the SBC mating power input connector.

1	Vin
2	Ground
3	Ground
4	+5V In

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 Helios SBC mating Ethernet connector.

Proper isolation must be maintained on all Ethernet signal routing to meet industry standard signal isolation specifications. No ground or power plane should be above or underneath these signals.

The connector contains two LEDs connected to the Link and 100Mbps signals on the Ethernet SBC mating connector.

6.3 VGA

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

6.4 USB

The USB connectors are 4 vertical metal shrouded type A connectors with industry standard pinout for USB. The signals come from the two Helios 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 Helios SBC mating PS/2 connector.

6.6 Data Acquisition

The data acquisition connector is a vertical 50-pin connector with long ejector/latches for a mating ribbon cable connector with strain relief. The signals come from the Helios SBC mating data acquisition connector and have a 1 to 1 correspondence with that connector pinout.

6.7 Serial Ports

The serial port connectors are 6 vertical DB9 male connectors. They have 4-40 thread inserts and hex screwlocks. Ports 1-4 signals come from the 40-pin SBC serial port connector and use the pinout shown below. Ports 5-6 signals come from the 20-pin expansion connector, and their pinout is given in section 7.1.

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	11	12	DSR 2	6
	2	RXD 2	13	14	RTS 2	7
	3	TXD 2	15	16	CTS 2	8
	4	DTR 2	17	18	RI 2	9
	5	GND	19	20	NC	
COM3	1	DCD 3	11	12	DSR 3	6
	2	RXD 3	13	14	RTS 3	7
	3	TXD 3	15	16	CTS 3	8
	4	DTR 3	17	18	RI 3	9
	5	GND	19	20	NC	
COM4	1	DCD 4	11	12	DSR 4	6
	2	RXD 4	13	14	RTS 4	7
	3	TXD 4	15	16	CTS 4	8
	4	DTR 4	17	18	RI 4	9
	5	GND	19	20	NC	

6.8 Digital I/O

The digital I/O connector is a vertical DB25 female connector with the following pinout. It has 4-40 thread inserts and hex screwlocks. The signals come from the Helios SBC mating digital I/O connector.

DB25 Pin	Signal Name	CPU Connector Pin		Signal Name	DB25 Pin
1	DIO LCA0	1	2	DIO LCA1	14
2	DIO LCA2	3	4	DIO LCA3	15
3	DIO LCA4	5	6	DIO LCA5	16
4	DIO LCA6	7	8	DIO LCA7	17
5	DIO LCB0	9	10	DIO LCB1	18
6	DIO LCB2	11	12	DIO LCB3	19
7	DIO LCB4	13	14	DIO LCB5	20
8	DIO LCB6	15	16	DIO LCB7	21
9	+5V	17	18	GND	22
10	NC	19	20	GND	23
11	NC			NC	24
12	NC			NC	25
13	NC			NC	

6.9 Expansion I/O Connector (External)

The external expansion I/O connector is a vertical 50-pin connector with long ejector/latches for a mating ribbon cable connector with strain relief. The signals come from the general purpose expansion I/O connector on the bottom side of the panel I/O board and have a 1 to 1 correspondence with that connector's pinout.

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 Helios 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 connector is a 2x10 pin 0.1" pitch male pin header. Its signals are brought out to two DB9 male connectors for serial ports 5-6 on the top side of the panel I/O board. The signal routing is described below.

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

7.2 General Purpose Expansion

The general purpose I/O expansion connector is a 2x25 pin 0.1" pitch male pin header. The signals have a 1 to 1 correspondence with the 50-pin expansion I/O connector on the top side of the panel I/O board.

8. POWER SECTION

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

1. +5V 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 the Helios SBC through the SBC input connector.
2. Vin (8-30VDC) 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 Helios SBC through the SBC power input connector.

The input power connector J24 is connected to a power source where the voltages are determined by the desired method of operation. It the front panel switch is not connected to J25 for +5V operation, then a bypass jumper consisting of a 0 ohm, ¼ watt through hole resistor should be installed at location R149. If the +12V option is desired, +12VDC is supplied at the input connector J24 and a bypass jumper consisting of a 0 ohm, ¼ watt through hole resistor should be installed at location R150. If a Vin voltage between 8 and 30VDC is connected to J24, then either the front panel switch should be connected at J23 or a bypass jumper consisting of a 0 ohm, ¼ watt through hole resister should be installed at location R151 and no jumper is installed at location R150.