4.1 Serial Ports

4.1.1 General Information

4.1.1.1 Types of Serial Port Connections

This section documents the three different types of port connections that use serial protocols that are found on Silicon Graphics systems -

- serial ports
- diagnostic ports
- powered peripheral ports.

4.1.1.2 Serial Port Connections

There are two types of connectors used for serial ports on Silicon Graphics systems. They are the 9 pin “D” and the 8 pin Mini-DIN. The pinout and gender of the DB-9 depends on the system or option where they are used. The number and type of serial ports found on various platforms are found in Table 4-1 below.

Table 4-1 also shows the serial ports available via the Audio/Serial Option (ASO) card. This is a mezzanine card available for attachment to an IO4 board.

Silicon Graphics has also offered in the past options to expand the number of available serial ports. These were add-in VME cards with either 6 or 32 ports per added board. These products have been obsolete for some time now and, other than a wiring list for the “CDSIO” 6 port serial board and a modem (Section 4.1.2.3), they are not documented here.

For those systems in the Twin Tower and Single Tower chassis with more than one CPU board, four serial ports are added with each CPU, up to a maximum of 16.

4.1.1.3 Diagnostic and Powered Peripheral Ports

The diagnostic port is new with the Origin200, Origin2000 and Onyx2 products. Unlike the serial ports on the other products, these ports are dedicated to monitoring and controlling the system without also having to function as a regular serial port. In the case of the Origin2000 and Onyx2 rack systems with multiple bays, these diagnostics ports can be connected to a master system controller that can monitor the entire system.

Some systems also include a connection known as a “powered peripheral port”. This ports purpose is to provide power to external devices such as Spaceball and the StereoView emitter. This port is required because not all serial ports are capable of powering external devices as is often done with PC compatible systems. The 8 pin DIN connection also provides a sync signal used by the StereoView emitter for switching between eyes. The 4 pin Mini-DIN connection only provides power for external connections, no actual serial port signals are available.

Table 4-2 shows the systems where diagnostic and powered peripheral ports can be found.

Table 4-1 Serial Port Types on SGI Platforms

Chassis Type	Model	9 Pin (DB-9)					8 Pin Mini-DIN
		EIA-232		EIA-232/EIA-422		EIA-422	
		SGI Pinout	PC Pinout	PC Pinout + EIA-422	ASO Pinout	SGI Pinout	
Documented in Section		**4.1.2**	**4.1.5**	**4.1.6**	**4.1.4**	**4.1.3**	**4.1.7**
Twin Tower 12 Slot	4D/60, 70, 80, 120, 210, 220, 310, 320, 420	4					
Twin Tower 15 Slot	4D/120, 210, 220	4					
	4D/240, 340, 440	8					
Predator Rack	4D/240, 280, 340, 380, 440, 480	8 or 16[1]					
Single Tower 13 Slots	4D/85, 210, 220, 240, 310, 320, 340, 420, 440, Crimson	4					
	4D/240, 340, 440	8					
Terminator Rack/ Eveready Deskside	Onyx/8, 16, 24 Challenge XL, Power Challenge L, Power Challenge XL	3				1	
	ASO Serial Option				6		
Personal IRIS	4D/20, 25	2					
	4D/30, 35	2					2
Indigo	All						2
Indigo2	All						2
Indy	All						2
O2	All		2				
OCTANE	All			2			
Origin200	All			2			
Origin2000	Deskside			2			
	Rack			2			
Onyx2	Deskside			4			
	Rack			4			

1. Minimum 8 serial ports available for 4 CPU systems (240, 340, 440), 16 ports available for 8 CPU systems (280, 380, 480).

Table 4-2 Diagnostic Ports and Powered Peripheral Ports

Chassis Type	Model	Diagnostic Ports		Powered Peripheral Ports	
		8 Pin Mini-DIN	9 Pin (DB-9)	8 Pin DIN	4 Pin Mini-DIN
Twin Tower 12 Slot	4D/60, 70, 80, 120, 210, 220, 310, 320, 420			2[1]	
Twin Tower 15 Slot	4D/120, 210, 220			2[1]	
	4D/240, 340, 440				
Predator Rack	4D/240, 280, 340, 380, 440, 480			2	
Single Tower 13 Slots	4D/85, 210, 220, 240, 310, 320, 340, 420, 440, Crimson			2	
	4D/240, 340, 440				
Terminator Rack/ Eveready Deskside	Onyx/8, 16, 24 Challenge XL, Power Challenge L, Power Challenge XL			2	
Personal IRIS	4D/20, 25				2[2]
	4D/30, 35				2[2]
Indigo	All				
Indigo2	All				
Indy	All				
O2	All				
OCTANE	All				
Origin200	All	1			
Origin2000	Deskside	1 (front)	1 (rear)		
	Rack	1 (front)	1 (rear)		
Onyx2	Deskside	1 (front)	1 (rear)		
	Rack	1 (front)	1 (rear)		

1. Available only as an option taking up one I/O Panel space
2. Available as an option only for the TFLU type chassis.

4.1.1.4 Serial Port Access and Naming

Serial ports are access by using the device file /dev/tty*xnn*, where x is the type of connection desired, and nn is the number of the serial port. SGI systems provide three types of serial port connections.

A ttyd*nn* (where *nn* is the port number) device is used for simple serial connections that do not require hardware flow control. An example would be terminals or tablet type devices.

A ttym*nn* device is used for devices that require modem control signals.

A ttyf*nn* device is used for devices that understand hardware flow control signals.

The serial man page contains more detailed information about serial port usage.

4.1.1.5 Serial Port Voltage Levels

The table below defines the input and output voltage levels for the various serial port implementations.

Table 4-3 Serial Port I/O Voltage Levels

Protocol	Platform	I/O Voltages	
		Mark	Space
EIA-232	R2300, IP4, IP5, IP6, O2, OCTANE, Origin200, Origin2000, Onyx2	-12 V	+12 V
EIA-423	Indigo, 4D/30, 4D/35	-5 V	+5 V
	Indigo^2, Indy	-9 V	+9 V
EIA-422	Onyx, Challenge, OCTANE, Origin200, Origin2000, Onyx2	0 V	+5 V

On the Indigo specifically, it is possible that the control signals could drop below the acceptable “legal” limits.

4.1.1.6 Powering External Devices From the Serial Port

The practice of powering external devices from signal pins of the serial port has become common on some systems, especially PC compatibles. Some developers and customers have tried to use serial port devices - like dongles - on the Silicon Graphics systems and have had trouble getting them to work.

The serial ports on Silicon Graphics systems were designed to meet the EIA-232 specification but some systems also include the capability to switch the port to the EIA-422 mode. The parts used for this do not have the same voltage and current characteristics as the components commonly used in PC compatibles. However, they do meet the minimum specifications as required by the EIA-232 specification.

The situation is one of the port meeting the minimum as defined by the specification (1.6 mA), while some external devices require current at, or near, the maximum defined by the specification (10 mA). Any device that requires current that exceeds the minimum specs as defined by EIA-232 (5 Volts across a 3KΩ = 1.6 mA) may not operate properly. It is possible that a specific device will operate properly with a specific system type. This is probably due to the combination of the components used to drive the serial port in both the system and the device.

It is preferable that external devices derive power from some external source. Since the components used for the serial interface have varied from system to system there is no guarantee that because a device works on one system, it will work on a different one.

4.1.1.7 Maximum Data Transfer Rates

The maximum data transfer rates for the serial ports are shown in Table 4-4. The serial port drivers in IRIX only officially support baud rates up to 115,200.

Table 4-4 Serial Port Baud Rate Maximums

Chassis & Connector		Maximum Baud Rate		
		EIA-232	EIA-422	EIA-423
Twin Tower 12 Slot	DB-9	9,600		
Twin Tower 15 Slot				
Predator Rack				
Single Tower 13 Slots				
Terminator Rack/ Eveready Deskside			38,400 (built-in) or 115,200 (ASO ports)	
Personal IRIS	DB-9	9,600		
Indigo	Mini-DIN 8	38,400		38,400
Indigo2				
Indy				
O2	See Table 4-1	460,000		
OCTANE			460,000	
Origin200				
Origin2000				
Onyx2				

4.1.1.8 Comparison of 9 Pin (DB-9) Pinouts

Since there are several DB-9 style serial or diagnostic ports across the product line, Table 4-5 shows a comparison of their pinouts.

Table 4-5 Comparison of DB-9 Style Connector Pinouts

	4D DB-9	4D DB-9	ASO		PC Compatible	Diagnostic Port	PC Pinout + EIA-422	
Protocol	**EIA-232**	**EIA-422**	**EIA-232**	**EIA-422**	**EIA-232**	**EIA-232**	**EIA-232**	**EIA-422**
Gender	**Female**				**Male**			
Pin1	N/C	DTR	N/C	TXDH	DCD			N/C
Pin 2	TD	TXDL			RD			RXDL
Pin 3	RD	RXDL			TD			TXDL
Pin 4	RTS	DCD	RTS		DTR			TXDH
Pin 5	CTS				GND			
Pin 6	N/C	GND	N/C	RXDH	DSR	N/C		RXDH
Pin 7	GND	TXDH	GND		RTS			HSKoA
Pin 8	DCD	RXDH	DCD		CTS			HSKiA
Pin 9	DTR	RTS	DTR		RI (O2 & OCTANE Only)	N/C		

For reference, here are the definitions of the serial port signals:

Table 4-6 Serial Port Signal Definitions

Name	Description
DTR	Data Terminal Ready
DCD	Data Carrier Detect
RD	Receive Data
TD	Transmit Data
DSR	Data Set Ready
RTS	Ready to Send
CTS	Clear To Send
RI	Ring Indicator

Name	Description
RXDL	Receive Data Low
RXDH	Receive Data High
TXDL	Transmit Data Low
TXDH	Transmit Data High
HSKiA	Handshake Input
HSKoA	Handshake Output

4.1.2 9 Pin (DB-9), EIA-232 Serial Port

This serial port was used on the early “4D” systems. It does use the DB-9 connector but it is not compatible with “PC Style” DB-9 serial ports. The pinout is similar, but not exactly the same. This means that cables and adapters designed for PC serial ports will not work correctly with this port in all cases. For clarification, see Table 4-5, “Comparison of DB-9 Style Connector Pinouts”, on page 4-10.

4.1.2.1 Connector Drawing

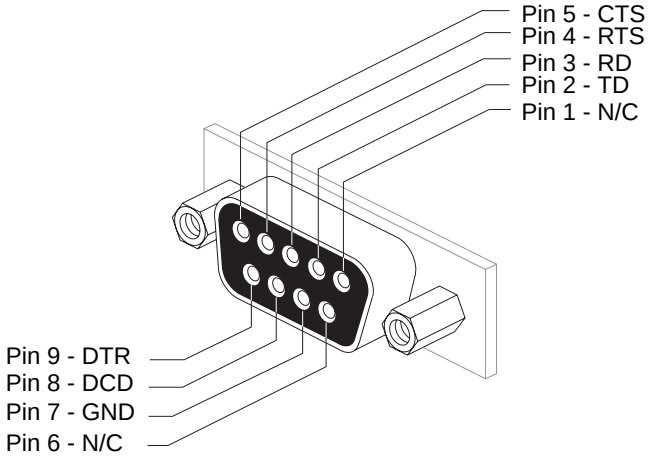

Figure 4-1 DB-9, EIA-232 Serial Port Connector

4.1.2.2 Pinout

Table 4-7 9 Pin EIA-232 Pinout

Pin	Signal Name	Description
1	N/C	No Connection
2	TD	Transmit Data
3	RD	Receive Data
4	RTS	Request To Send
5	CTS	Clear To Send
6	N/C	No Connection
7	GND	Signal Ground
8	DCD	Data Carrier Detect
9	DTR	Data Terminal Ready

4.1.2.3 Modem Cables for “CDSIO” Serial Ports

At one point in time, Silicon Graphics offered a 6 port serial VME card that is commonly referred to as a the “cdsio” board. The board was made by Central Data (thus the ‘cd’ in ‘cdsio’). There were two IO panel assemblies with three DB-9 connectors apiece that were used to bring the ports out to the IO panel. Many people assumed that the pinouts of these connectors were identical to the DB-9’s found in the rest of the 4D series, but this was not the case. Typical connections to terminals worked just fine, but modem connections had difficulty due to the unusual pinout.

To construct a cable to connect a modem to one of the cdsio ports use the following wiring:

Table 4-8 CDSIO Port Modem Cable Wiring

DB-9	DB-25	Signal
1	6	DSR
2	2	TX
3	3	RX
4	4	CTS
5	5	RTS
6	22	RI
7	7	SG
8	8	DCD
9	20	DTR

4.1.3 9 Pin (DB-9), EIA-422 Serial Port

This serial port connection was used on the early “4D” systems and should not be confused with the later EIA-422 serial ports that also use the DB-9 connector. See Table 4-5, “Comparison of DB-9 Style Connector Pinouts”, on page 4-10 for clarification.

4.1.3.1 Connector Drawing

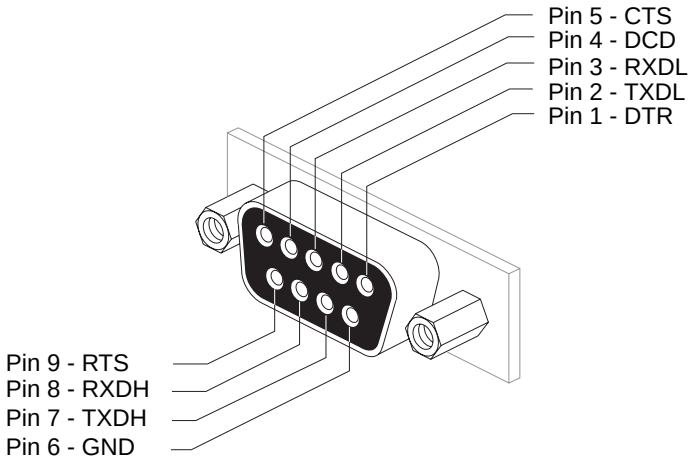

Figure 4-2 DB-9, EIA-422 Serial Port Connector

4.1.3.2 Pinout

Table 4-9 9 Pin EIA-422 Serial Port Pinout

Pin	Signal Name	Description
1	DTR	Data Terminal Ready
2	TXDL	Transmit Data Low
3	RXDL	Receive Data Low
4	DCD	Data Carrier Detect
5	CTS	Clear To Send
6	GND	Signal Ground
7	TXDH	Transmit Data High
8	RXDH	Receive Data High
9	RTS	Request To Send

4.1.4 9 Pin (DB-9), Audio/Serial Option (ASO) EIA-232/422 Serial Port

4.1.4.1 Connector Drawing

EIA-422 Mode signals shown in [brackets].

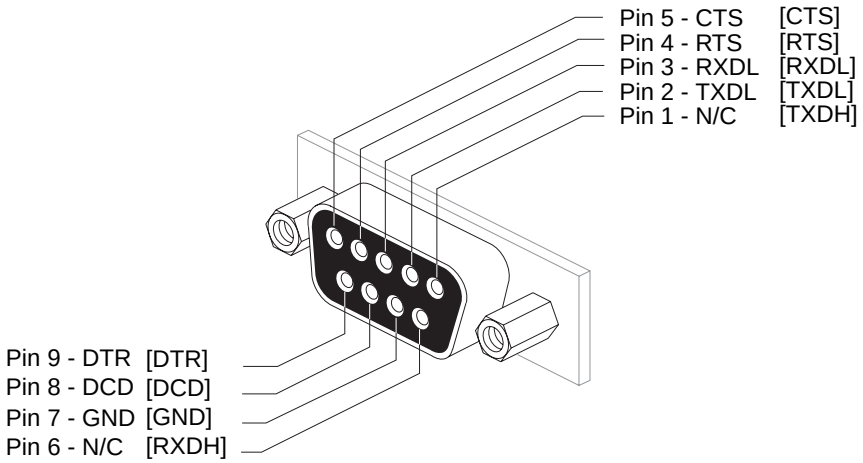

Figure 4-3 Audio/Serial Option (ASO) Serial Port Connector

4.1.4.2 Pinout

Table 4-10 Audio/Serial Option Serial Port Connector Pinout

Pin #	EIA-232 Mode		EIA-422 Mode	
	Signal Name	**Description**	**Signal Name**	**Description**
1	N/C	No Connection	TXDH	Transmit high
2	TXDL	Transmit low	TXDL	Transmit low
3	RXDL	Receive low	RXDL	Receive low
4	RTS	Request to send	RTS	Request to send
5	CTS	Clear to send	CTS	Clear to send
6	N/C	No Connection	RXDH	Receive high
7	GND	Signal ground	GND	Signal ground
8	DCD	Data Carrier Detect	DCD	Data Carrier Detect
9	DTR	Data Terminal Ready	DTR	Data Terminal Ready

4.1.5 9 Pin (DB-9), PC Compatible EIA-232 Serial Port

4.1.5.1 Connector Drawing

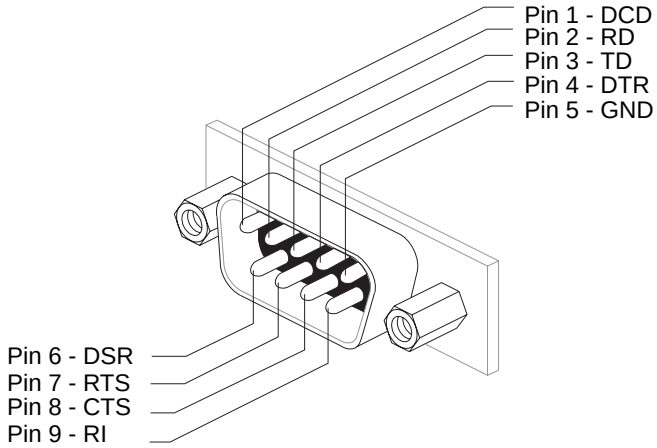

Figure 4-4 PC Compatible EIA-232 Serial Port Connector

4.1.5.2 Pinout

Table 4-11 PC Compatible EIA-232 Serial Port Connector Pinout

Pin	RS-232	
	Assignment	**Description**
1	DCD	Data Carrier Detect
2	RD	Receive Data
3	TD	Transmit Data
4	DTR	Data Terminal Ready
5	GND	Signal Ground
6	DSR	Data Set Ready
7	RTS	Request To Send
8	CTS	Clear To Send
9	RI (O2 Only)	Ring Indicator

4.1.6 9 Pin (DB-9), EIA-232/EIA-422 Serial Port (OCTANE, Origin & Onyx2)

4.1.6.1 Connector Drawing

EIA-422 Mode signals shown in [brackets].

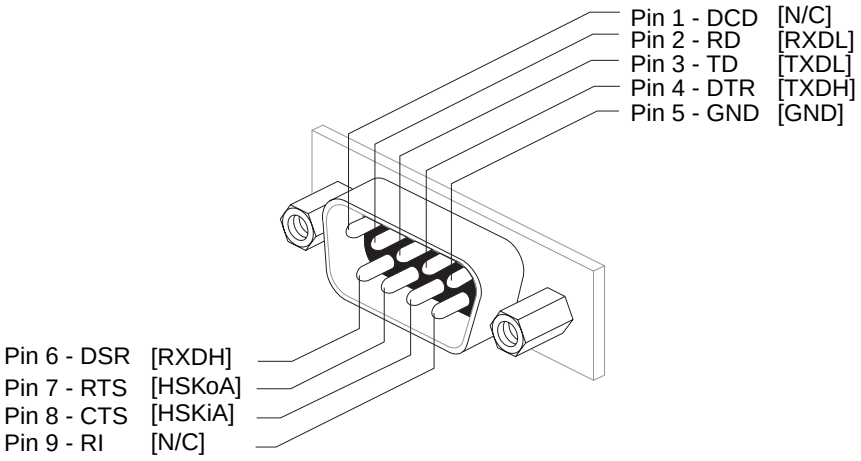

Figure 4-5 DB-9 EIA-232 / 422 Serial Port Connector

4.1.6.2 Pinout

Table 4-12 DB-9 EIA-232 / 422 Serial Port Connector Pinout

Pin	EIA-232		EIA-422	
	Signal Name	Description	Signal Name	Description
1	DCD	Data Carrier Detect	N/C	No Connection
2	RD	Receive Data	RXDL	Receive Data Low
3	TD	Transmit Data	TXDL	Transmit Data Low
4	DTR	Data Terminal Ready	TXDH	Transmit Data High
5	GND	Signal Ground	GND	Signal Ground
6	DSR	Data Set Ready	RXDH	Receive Data High
7	RTS	Request To Send	HSKoA	Handshake Output
8	CTS	Clear To Send	HSKiA	Handshake Input
9	N/C	No Connection	N/C	No Connection

The EIA-232 pinout of this connector is identical to the connection found on the O2 with the exception that pin 9 is a no connect in this case. On the O2 pin 9 is the Ring Indicator signal.

4.1.7 8 Pin Mini-DIN Serial Port

4.1.7.1 Connector Drawing

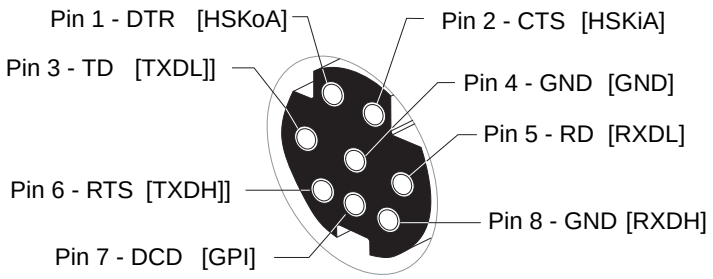

Figure 4-6 8 Pin Mini-DIN Serial Port Connector

4.1.7.2 Pinout

Table 4-13 8 Pin Mini-DIN EIA-232 Serial Port Pinout

Pin	EIA-423 Mode		EIA-422 Mode	
	Signal Name	Description	Signal Name	Description
1	DTR	Data Terminal Ready	HSKoA	Output Handshake
2	CTS	Clear To Send	HSKiA	Input Handshake Or External Clock
3	TD	Transmit Data	TXDL	Transmit Data Low
4	GND	Signal Ground	GND	Signal Ground
5	RD	Receive Data	RXDL	Receive Data Low
6	RTS	Request To Send	TXDH	Transmit Data High
7	DCD	Data Carrier Detect	GPi	General Purpose Input
8	GND	Signal Ground	RXDH	Receive Data High

1. Switching between EIA-423 and EIA-422 modes is accomplished by using a streams ioctl. Consult the serial man page for more information.

4.1.8 8 Pin Mini-DIN Diagnostic Port

4.1.8.1 Connector Drawing

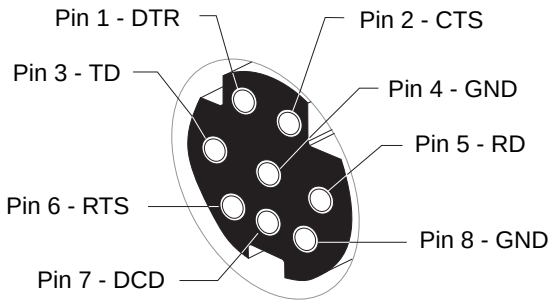

Figure 4-7 8 Pin Mini-DIN Diagnostic Port

4.1.8.2 Pinout

Table 4-14 8 Pin Mini-DIN Diagnostic Port Pinout

Pin	Signal Name	Description
1	DTR	Data Terminal Ready
2	CTS	Clear To Send
3	TD	Transmit Data
4	GND	Signal Ground
5	RD	Receive Data
6	RTS	Request To Send
7	DCD	Data Carrier Detect
8	GND	Signal Ground

4.1.9 9 Pin (DB-9) Diagnostic Port

4.1.9.1 Connector Drawing

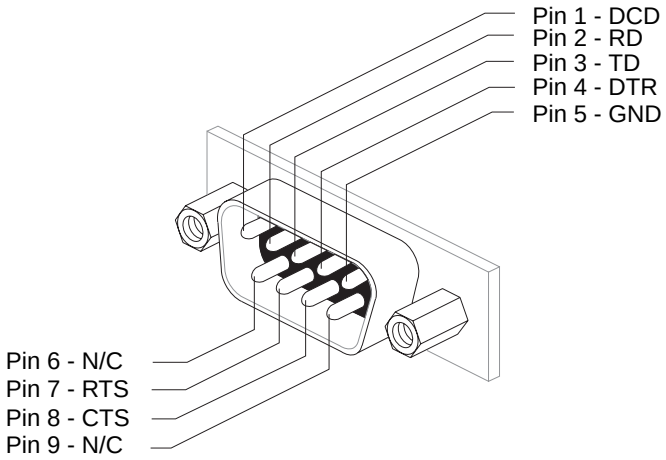

Figure 4-8 DB-9 Diagnostic Port Connector

4.1.9.2 Pinout

Table 4-15 DB-9 Diagnostic Port Pinout

Pin	RS-232	
	Assignment	**Description**
1	DCD	Data Carrier Detect
2	RD	Receive Data
3	TD	Transmit Data
4	DTR	Data Terminal Ready
5	GND	Signal Ground
6	N/C	No Connection
7	RTS	Request To Send
8	CTS	Clear To Send
9	N/C	No Connection

1. The pinout of the this diagnostic port differs from the regular serial ports found on O2, Origin200/2000 and Onyx2 only in the Pin 6 and Pin 9 signals.

4.1.10 8 Pin DIN Powered Peripheral Port

This port was not originally built into the Twin Tower chassis. Two ports were added on a separate I/O panel as an option. Starting with the Single Tower (Diehard) chassis, the high-end systems were designed to incorporate two of these ports.

4.1.10.1 Connector Drawing

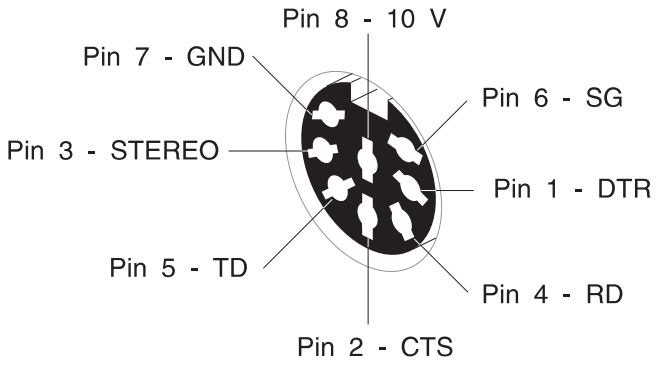

Figure 4-9 8 Pin DIN Powered Peripheral Port Connector

4.1.10.2 Pinout

Table 4-16 8 Pin DIN Powered Peripheral Port Pinout

Pin	Signal Name	Description
1	DTR	Data Terminal Ready
2	CTS	Clear To Send
3	STEREO	Stereo Field Sync
4	RD	Receive Data
5	TD	Transmit Data
6	GND	Signal Ground
7	GND	Ground Point
8	V10P	10 Volt Supply (max 500 mA)

1. This port only operates in EIA-232 mode.
2. The ground point is provided as a chassis ground primarily for EMI considerations.
3. On those systems with this port, the available Powered Peripheral Ports share the signal lines with tty2, tty3, and tty4 (if applicable), the regular 9 Pin ports. This implies that if the 9 pin serial port is in use, the Powered Peripheral Port may not be used.

4.1.11 4 Pin Mini-DIN Power Ports (+5 and +12 Vdc)

While these ports are not strictly serial ports, they are typically used in conjunction with the serial ports on a Personal IRIS. There are two connections. One supplies + 5 Vdc, the other supplies +12 Vdc. Typically a “Y” cable is used to connect this port and a regular serial port to a serial device that requires power. A small I/O panel with two of these ports is available as an option on most of the Personal IRIS chassis. Early chassis did not have the opening in the chassis for this I/O panel. With the TFLU chassis the space for these connectors became standard.

4.1.11.1 Connector Drawing

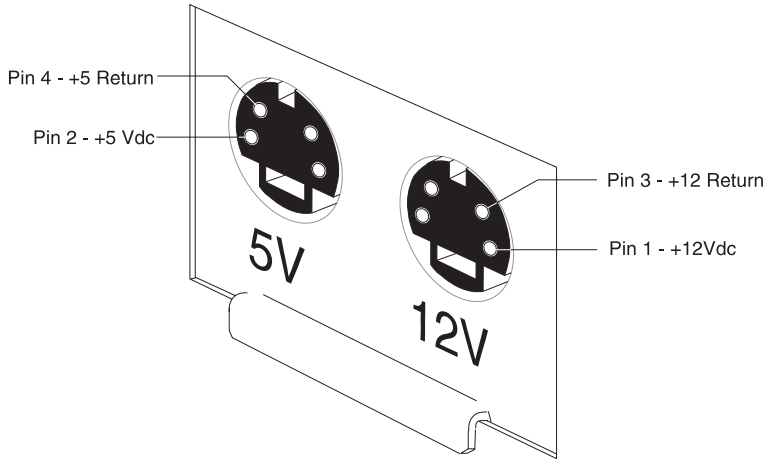

Figure 4-10 4 Pin Mini-DIN Power Port Connectors

4.1.11.2 Pinout

Table 4-17 4 Pin Mini-DIN Power Port Pinout

Type	Pin	Signal Name	Description
+5 Vdc Connection	1	N/C	No Connection
	2	+5	+ 5 Volts dc (1A max)
	3	N/C	No Connection
	4	5VRTN	+ 5 Volt Return
+12 Vdc Connection	1	+12	+12 Volts dc (0.5A max)
	2	N/C	No Connection
	3	12RTN	+ 12 Volt Return
	4	N/C	No Connection