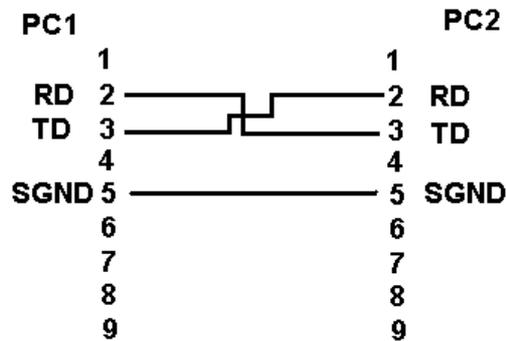
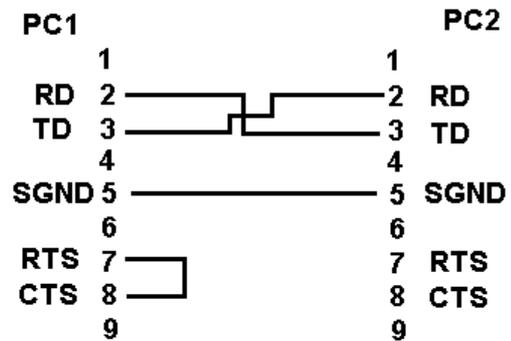


PC connections

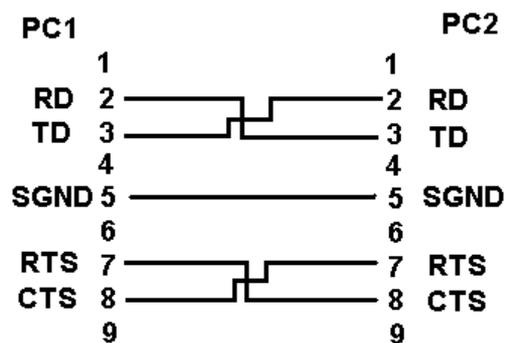
I always have difficulties finding pin numbers for different connectors when I am messing around with various projects in my ham shack. So here I have put together a file containing the most common connections needed. First different handshaking schemes:



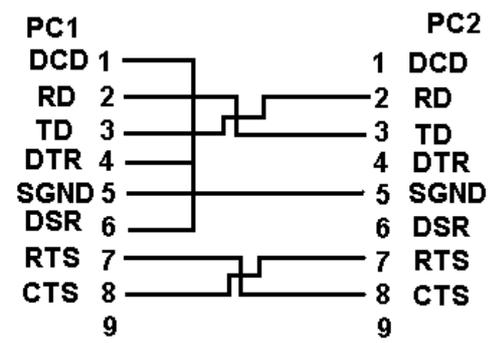
Minimal serial connection - just data.



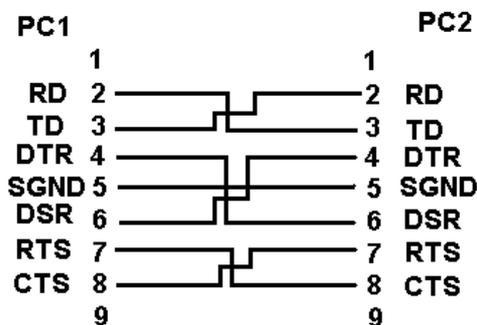
Serial connection with RTS-loop



Serial connection with RTS/CTS handshaking



Serial connection with RTS/CTS and handshaking and DTR loop.



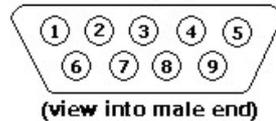
Serial connection with complete handshaking.

Now we go for the serial connectors. There are three different ones of them. Most common today is the DB9. On older machines the DB25 is common and occasionally even the RJ45 is seen used in a serial interface. The RJ45 is however, most common in the network cabling (more on that later).

At the right is the pin configuration for the 9-pin serial interface. This is when you look at the connector at the back of a PC (the serial connector is of male type - with pins). When looking at a female connector (used on cables that attaches to the PC) the view is of course mirrored.

Pin No.	Name	Notes/Description
1	DCD	Data Carrier Detect
2	RD	Receive Data (a.k.a RxD, Rx)
3	TD	Transmit Data (a.k.a TxD, Tx)
4	DTR	Data Terminal Ready
5	SGND	Ground
6	DSR	Data Set Ready
7	RTS	Request To Send
8	CTS	Clear To Send
9	RI	Ring Indicator

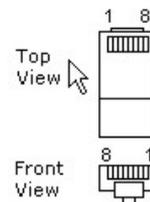
RS232 DB9 (EIA/TIA 574)



View - looking into male connector

Here we have the pin configuration for the RJ45 serial connector. There are only 8 pins, so the RI and the DSR signals share pin 1.

Pin No.	Name	Notes/Description
1	DSR/RI	Data set Ready/ring indicator
2	DCD	Data Carrier Detect
3	DTR	Data Terminal Ready
4	SGND	Signal Ground
5	RD	Receive Data
6	TD	Transmit Data
7	CTS	Clear to Send
8	RTS	Request to Send



RJ45 Male Connector Pin Numbering

Next we'll look into some 'applications' which uses both DB9 and DB25 connectors.

First we have the DB9-DB25 null modem cable; such a cable interconnects two serial interfaces of the 'same sex' i.e. two DTE:s (data terminal equipments) or DCE:s (data communication equipments). Some of the signal lines are crossed (RTS/CTS and DSR/DTR).

DB9	Signal	DB25	Signal
2	RD	2	TD
3	TD	3	RD
4	DTR	6,8	DSR, DCD
6,1	DSR, DCD	20	DTR
7	RTS	5	CTS
8	CTS	4	RTS
5	SGND	7	SGND
9	RI	22	RI

Leave all pins not specified above unconnected.

And here is a DB9-DB9 null modem cable; such a cable interconnects two serial interfaces of the 'same sex' i.e. two DTE:s (data terminal equipments) or DCE:s (data communication equipments). Some of the signal lines are crossed (RTS/CTS and DSR/DTR).

DB9	Signal	DB9	Signal
2	RD	3	TD
3	TD	2	RD
4	DTR	6,1	DSR, DCD
6,1	DSR, DCD	4	DTR
7	RTS	8	CTS
8	CTS	7	RTS
5	SGND	5	SGND
9	RI	9	RI

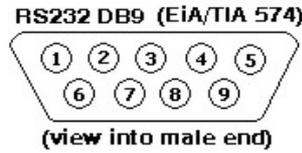
This one is a 'normal' extension cable with different connectors (when you need to change between DB9 and DB25).

DB9	Signal	DB25
1	DCD	8
2	RD	3
3	TD	2
4	DTR	20
5	SGND	7
6	DSR	6
7	RTS	4
8	CTS	5
9	RI	22

Leave all pins not specified above unconnected.

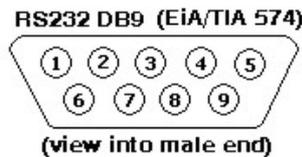
Here are some obsolete uses of the DB9 connector on a PC; the CGA and EGA connectors for ancient types of video terminals (screens). These are not serial interfaces to/from the computers in a normal sense, they were used to output the video signals for the computer screen. CGA stands for 'Computer Graphics Array' and EGA stands for 'Enhanced Graphics Array' - hard to imagine anybody using these anymore.

Here the CGA:



DB9 Pin	Name	Function/Notes
1	GND	Ground
2	GND	Ground
3	RED	Red Video
4	GREEN	Green Video
5	BLUE	Blue Video
6	Intensity	Color Intensity
7	RESERVED	Reserved
8	HSYNC	Horizontal Sync.
9	VSYNC	Vertical Sync.

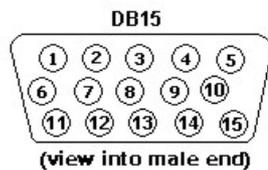
And the EGA:



DB9 Pin	Name	Function/Notes
1	GND	Ground
2	SRED	Secondary Red Video
3	PRED	Primary Red Video
4	PGREEN	Primary Green Video
5	PBLUE	Primary Blue Video
6	SGREEN	Secondary Green Video
7	SBLUE	Secondary Blue Video
8	HSYNC	Horizontal Sync.
9	VSYNC	Vertical Sync.

Today's PC:s use VGA, or varieties thereof (Video Graphics Array) if they still are using analogue technique. Lately most new screens (LCD:s and such) uses digital interface, which is beyond the scope of this paper (i. e. I'm not fiddling with those - yet ☺)

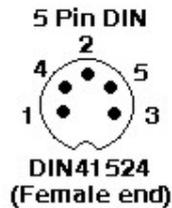
Here the VGA and its signals.



Pin No	Name	Function/Notes	VESA DDC	Notes
1	RED *	Red Video		
2	GREEN *	Green Video		
3	BLUE *	Blue Video		
4	ID2	Monitor ID Bit2		
5	GND	Vertical Sync.		
6	RGND	Red Ground (Return)		
7	GGND	Green Ground (Return)		
8	BGND	Blue Ground (Return)		
9	NC	No Connect		
10	SGND	Sync Ground (Return)		
11	ID1	Monitor ID bit 1		
12	ID0	Monitor ID bit 0	DDC	Serial Data
13	HSYNC	Horizontal (or Composite) Sync		
14	VSYNC	Vertical Sync		
15	NC	No Connect	DDC	Serial Clock

The old PC:s (AT:s and XT:s) used a DIN plug for the keyboard connection. Later these were changed to something called mini-DIN:s. However, these connectors are useful to get for example +5 volts out for some logic circuits, or perhaps a GPS receiver for your APRS application.

Here the older 5-pin configuration for the PC keyboard.



Pin	Wire Color	Name	Function/Notes
1	_____	CLOCK	CLK/CTS, Open collector
2	_____	DATA	RxD/TxD/RTS, Open collector
3	_____	NC	Not connected
4	_____	GND	Ground
5	_____	VCC	Power +5VDC



And here the newer 6-pin Mini-DIN assignment both for mouse and keyboard. The stone age PC (AT et al) did not have any special mouse connector; the mouse was connected to (and occupied!) a serial port.



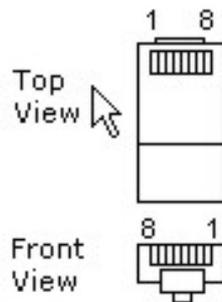
Pin	Wire Color	Name	Function/Notes
1	_____	DATA	Bi-directional Data
2	_____	NC	Not Connected
3	_____	GND	Ground
4	_____	VCC	Power +5VDC
5	_____	CLK	Clock. From Host/PC.
6	_____	NC	Not connected



The mouse connector and the keyboard connector on a modern PC have similar pin configurations. Due to this, the keyboard or mouse is not damaged, if plugged into the wrong hole, but it will of course not work as expected. ☺

Finally we have the LAN or network connection. Below is the connections needed both for a 'straight' LAN cable, and a 'crossover' cable needed, for example, between two switches or hubs.

Straight Through Cable Wiring



RJ-45 Pin #	Color (both sides identical)
Pin 1	White with Orange
Pin 2	Orange
Pin 3	White with Green
Pin 4	Blue
Pin 5	White with Blue
Pin 6	Green
Pin 7	White with Brown
Pin 8	Brown

The RJ45 male (plug) pin numbering

Cross Over Cable Wiring

RJ-45 Pin #	1 Side Color	2 Side Color
Pin 1	White with Orange	White with Green
Pin 2	Orange	Green
Pin 3	White with Green	White with Orange
Pin 4	Blue	Blue
Pin 5	White with Blue	White with Blue
Pin 6	Green	Orange
Pin 7	White with Brown	White with Brown
Pin 8	Brown	Brown

Well, these were what I have found out - enjoy, and keep working on those projects.

NB! I will take no responsibility for damage to your equipment if you rely on the data presented here. Double check with other sources, and check your connections before turning power on.

You know, ultimately every electronic appliance works with smoke - if you let the smoke out of it, it will cease working, and will have to be sent away for repairing. At the repair-shop they'll put new smoke in, ... or something... and it will work again.

73:s, Thomas, OH6NT