


















# Cables and Wiring

20 Jonathan Mon, Aug 24, 2020 [Broadband / IC-Air](#), [Ethernet / MPLS](#), [Hosting & Datacentres](#)  
13580

## Cables Cabling RJ45 RJ21 MSAN

















Wiring standards for Ethernet

### EIA/TIA-568A and 568B pinouts

Pin	T568A Pair	T568B Pair	1000BASE-T Signal ID	Wire	T568A Color	T568B Color	Pins on plug face (socket is reversed)
1	3	2	DA+	tip			
2	3	2	DA-	ring			
3	2	3	DB+	tip			
4	1	1	DC+	ring			
5	1	1	DC-	tip			
6	2	3	DB-	ring			
7	4	4	DD+	tip			
8	4	4	DD-	ring			

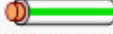

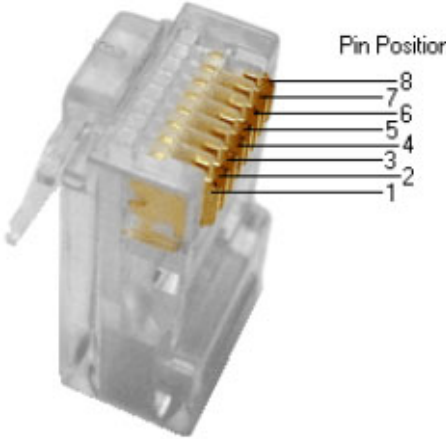














Standard networking connectors for Ethernet connections. Rumor has it that only the “A” standard is accepted for moving on work and the “B” standard is being deprecated.

### Power over Ethernet, IEEE 802.3af standards A and B

PINS on Switch	T568A Color	T568B Color	10/100 DC on Spares (mode B)	10/100 Mixed DC & Data (mode A)	1000 (1 Gigabit) DC & Bi-Data (mode B)	1000 (1 Gigabit) DC & Bi-Data (mode A)
Pin 1			Rx +	Rx + DC +	TxRx A +	TxRx A + DC +
Pin 2			Rx -	Rx - DC +	TxRx A -	TxRx A - DC +
Pin 3			Tx +	Tx + DC -	TxRx B +	TxRx B + DC -
Pin 4			DC +	unused	TxRx C + DC +	TxRx C +
Pin 5			DC +	unused	TxRx C - DC +	TxRx C -
Pin 6			Tx -	Tx - DC -	TxRx B -	TxRx B - DC -
Pin 7			DC -	unused	TxRx D + DC -	TxRx D +
Pin 8			DC -	unused	TxRx D - DC -	TxRx D -

Power over Ethernet pinouts. More and more commonly used in VOIP phone systems, but can also be used for wireless access points and other network devices.

**Two pairs crossed, two pairs uncrossed  
10BASE-T or 100BASE-TX crossover**









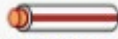
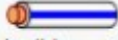





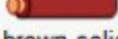
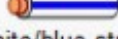
Pin	Connection 1: T568A			Connection 2: T568B			Pins on plug face
	signal	pair	color	signal	pair	color	
1	BI_DA+	3	 white/green stripe	BI_DB+	2	 white/orange stripe	
2	BI_DA-	3	 green solid	BI_DB-	2	 orange solid	
3	BI_DB+	2	 white/orange stripe	BI_DA+	3	 white/green stripe	
4		1	 blue solid		1	 blue solid	
5		1	 white/blue stripe		1	 white/blue stripe	
6	BI_DB-	2	 orange solid	BI_DA-	3	 green solid	
7		4	 white/brown stripe		4	 white/brown stripe	
8		4	 brown solid		4	 brown solid	

Ethernet crossover cables are useful for connecting two similar pieces of equipment together, such as a 1000 base-T crossover looks a little bit different. One of the main differences is that it uses all four pairs, not a

### Gigabit T568A crossover

























All four pairs crossed

10BASE-T, 100BASE-TX, 100BASE-T4 or 1000BASE-T crossover (shown as T568A)

Pin	Connection 1: T568A			Connection 2: T568A Crossed			Pins on plug face
	signal	pair	color	signal	pair	color	
1	BI_DA+	3	 white/green stripe	BI_DB+	2	 white/orange stripe	 <div style="position: absolute; top: 260px; left: 840px;">Pin Position</div> <div style="position: absolute; top: 278px; left: 878px;">8</div> <div style="position: absolute; top: 288px; left: 878px;">7</div> <div style="position: absolute; top: 298px; left: 878px;">6</div> <div style="position: absolute; top: 308px; left: 878px;">5</div> <div style="position: absolute; top: 318px; left: 878px;">4</div> <div style="position: absolute; top: 328px; left: 878px;">3</div> <div style="position: absolute; top: 338px; left: 878px;">2</div> <div style="position: absolute; top: 348px; left: 878px;">1</div>
2	BI_DA-	3	 green solid	BI_DB-	2	 orange solid	
3	BI_DB+	2	 white/orange stripe	BI_DA+	3	 white/green stripe	
4	BI_DC+	1	 blue solid	BI_DD+	4	 white/brown stripe	
5	BI_DC-	1	 white/blue stripe	BI_DD-	4	 brown solid	
6	BI_DB-	2	 orange solid	BI_DA-	3	 green solid	
7	BI_DD+	4	 white/brown stripe	BI_DC+	1	 blue solid	
8	BI_DD-	4	 brown solid	BI_DC-	1	 white/blue stripe	

This type cable is backwards compatible with 10/100 base T systems.

**Registered Jack (RJ) 11, 14, 25**

Position	Pair	T/R	±	RJ11	RJ14	RJ25	25-pair color code	U.S. Bell System colors	German colors	Australian colors
1	3	T	+			T3	 white/green	 white	 violet	 orange
2	2	T	+		T2	T2	 white/orange	 black	 green	 red
3	1	R	-	R1	R1	R1	 blue/white	 red	 white	 blue
4	1	T	+	T1	T1	T1	 white/blue	 green	 brown	 white
5	2	R	-		R2	R2	 orange/white	 yellow	 yellow	 black
6	3	R	-			R3	 green/white	 blue	 slate	 green

Telephone system equipment jacks.





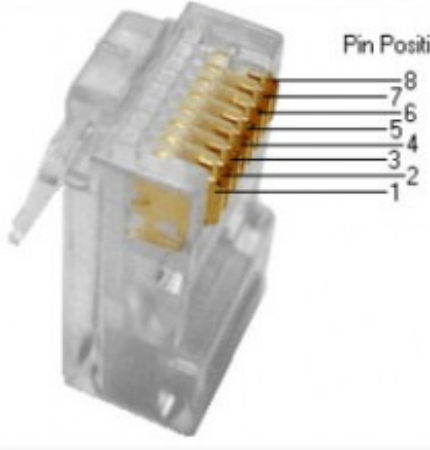


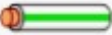
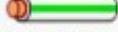


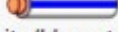



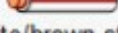
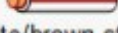
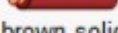
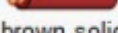
## RJ48C and RJ48X wiring

Pin	Pair	Signal	Color
1	R	RX Ring	 Orange/White
2	T	RX Tip	 White/Orange
3		reserved	 White/Green
4	R1	TX Ring	 Blue/White
5	T1	TX Tip	 White/Blue
6		reserved	 Green/White
7		shield	 White/Brown
8		shield	 Brown/White

RJ48C and RJ48X used on T1 DSX-1 and DSX-1 connections. Since BRI and PRI DSX-1 are two wire

### Two pairs crossed, two pairs uncrossed

#### T1 crossover

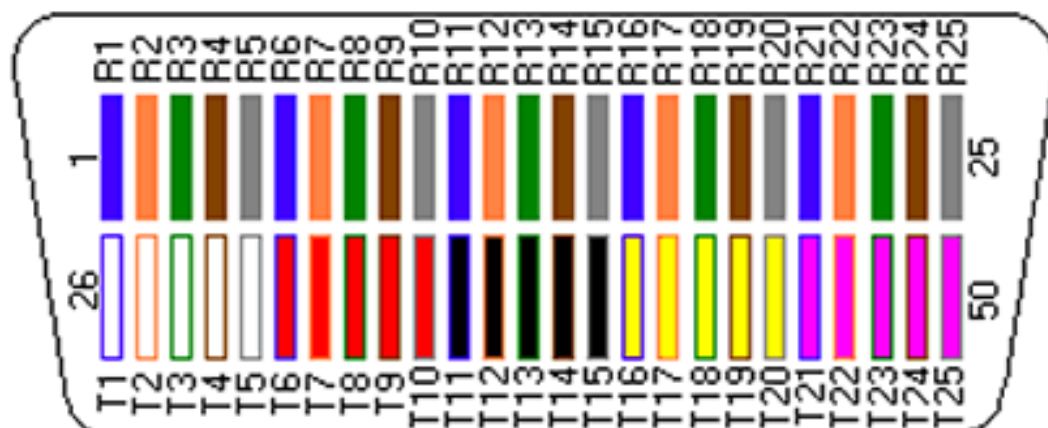
Pin	Connection 1: T568A		Connection 2: T568B		Pins on plug face
	pair	color	pair	color	
1	2	 white/orange stripe	1	 blue solid	
2	2	 orange solid	1	 white/blue stripe	
3	3	 white/green stripe	3	 white/green stripe	
4	1	 blue solid	2	 white/orange stripe	
5	1	 white/blue stripe	2	 orange solid	
6	3	 green solid	3	 green solid	
7	4	 white/brown stripe	4	 white/brown stripe	
8	4	 brown solid	4	 brown solid	

Group 2 to pin 5 on a DSX-1 or DSX-1 interface. Note, this is different from an Ethernet crossover and pin 2 to pin 5 on a DSX-1 connector. Note, this is different from an Ethernet crossover





















































Above (and left) colour-code order is applied to a RJ21 socket as shown below (and on the right)

The RJ21 mage is rotated for clarity of numbering.



### RJ21 RJ21X



















































Color	Pin (Tip)	Pin (Ring)	Color
 White/Blue	26	1	 Blue/White
 White/Orange	27	2	 Orange/White
 White/Green	28	3	 Green/White
 White/Brown	29	4	 Brown/White
 White/Slate	30	5	 Slate/White
 Red/Blue	31	6	 Blue/Red
 Red/Orange	32	7	 Orange/Red
 Red/Green	33	8	 Green/Red
 Red/Brown	34	9	 Brown/Red
 Red/Slate	35	10	 Slate/Red
 Black/Blue	36	11	 Blue/Black
 Black/Orange	37	12	 Orange/Black
 Black/Green	38	13	 Green/Black
 Black/Brown	39	14	 Brown/Black
 Black/Slate	40	15	 Slate/Black
 Yellow/Blue	41	16	 Blue/Yellow
 Yellow/Orange	42	17	 Orange/Yellow
 Yellow/Green	43	18	 Green/Yellow
 Yellow/Brown	44	19	 Brown/Yellow
 Yellow/Slate	45	20	 Slate/Yellow
 Violet/Blue	46	21	 Blue/Violet
 Violet/Orange	47	22	 Orange/Violet
 Violet/Green	48	23	 Green/Violet
 Violet/Brown	49	24	 Brown/Violet
 Violet/Slate	50	25	 Slate/Violet

RJ21 and 21X connectors are often found on the side of punch blocks and make for quick connections on cable trays.





## RJ21 wiring

Color	Pin (Tip)	Zyxel Port	Pin (Ring)	Color
 <a href="#">White/Blue</a>	26	NC	1	 <a href="#">Blue/White</a>
 <a href="#">White/Orange</a>	27	24	2	 <a href="#">Orange/White</a>
 <a href="#">White/Green</a>	28	23	3	 <a href="#">Green/White</a>
 <a href="#">White/Brown</a>	29	22	4	 <a href="#">Brown/White</a>
 <a href="#">White/Slate</a>	30	21	5	 <a href="#">Slate/White</a>
 <a href="#">Red/Blue</a>	31	20	6	 <a href="#">Blue/Red</a>
 <a href="#">Red/Orange</a>	32	19	7	 <a href="#">Orange/Red</a>
 <a href="#">Red/Green</a>	33	18	8	 <a href="#">Green/Red</a>
 <a href="#">Red/Brown</a>	34	17	9	 <a href="#">Brown/Red</a>
 <a href="#">Red/Slate</a>	35	16	10	 <a href="#">Slate/Red</a>
 <a href="#">Black/Blue</a>	36	15	11	 <a href="#">Blue/Black</a>
 <a href="#">Black/Orange</a>	37	14	12	 <a href="#">Orange/Black</a>
 <a href="#">Black/Green</a>	38	13	13	 <a href="#">Green/Black</a>
 <a href="#">Black/Brown</a>	39	12	14	 <a href="#">Brown/Black</a>
 <a href="#">Black/Slate</a>	40	11	15	 <a href="#">Slate/Black</a>
 <a href="#">Yellow/Blue</a>	41	10	16	 <a href="#">Blue/Yellow</a>
 <a href="#">Yellow/Orange</a>	42	9	17	 <a href="#">Orange/Yellow</a>
 <a href="#">Yellow/Green</a>	43	8	18	 <a href="#">Green/Yellow</a>
 <a href="#">Yellow/Brown</a>	44	7	19	 <a href="#">Brown/Yellow</a>
 <a href="#">Yellow/Slate</a>	45	6	20	 <a href="#">Slate/Yellow</a>
 <a href="#">Violet/Blue</a>	46	5	21	 <a href="#">Blue/Violet</a>
 <a href="#">Violet/Orange</a>	47	4	22	 <a href="#">Orange/Violet</a>
 <a href="#">Violet/Green</a>	48	3	23	 <a href="#">Green/Violet</a>
 <a href="#">Violet/Brown</a>	49	2	24	 <a href="#">Brown/Violet</a>
 <a href="#">Violet/Slate</a>	50	1	25	 <a href="#">Slate/Violet</a>

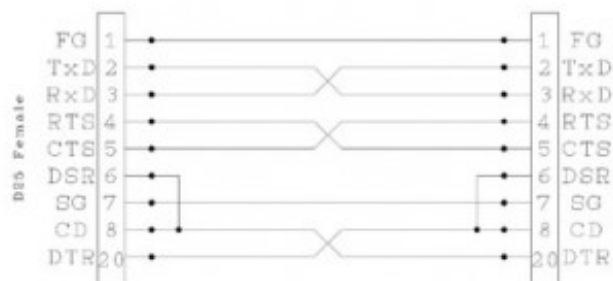


The generic 25 pair color code, which is always a good thing to have

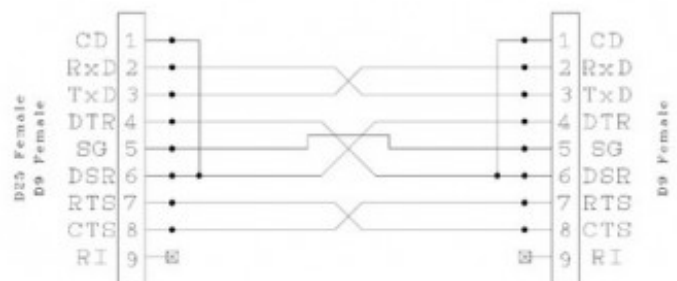
Signal		Origin		D-subminiature DB-25	D-subminiature DE-9 (TIA-574)	Modified Modular Jack(MMJ)	Modular connector 8P8C ("RJ45")			Modular connector 10P10C ("RJ50")		
Name	Abbreviation	DTE	DCE				TIA-561	Yost	Cyclades	National Instruments	Cyclades	Digi
Transmitted Data	TxD	•		2	3	2	6	3	3	8	4	5
Received Data	RxD		•	3	2	5	5	6	6	9	7	6
Data Terminal Ready	DTR	•		20	4	1	3	2	2	7	3	9
Carrier Detect	DCD		•	8	1	—	2	7	7	10	8	10 (alt 2)
Data Set Ready	DSR		•	6	6	6	1		8	5	9	2 (alt 10)
Ring Indicator	RI		•	22	9	—		—	—	2	10	1
Request To Send	RTS	•		4	7	—	8	1	1	4	2	3
Clear To Send	CTS		•	5	8	—	7	8	5	3	6	8
Common Ground	G	common		7	5	3,4	4	4,5	4	6	5	7
Protective Ground	PG	common		1	—	—	—	—	—	—	1	4

RS-232 is still commonly used for data transfer in broadcast facilities; RS-485 is also used, however.

### Null modem cables and diagrams



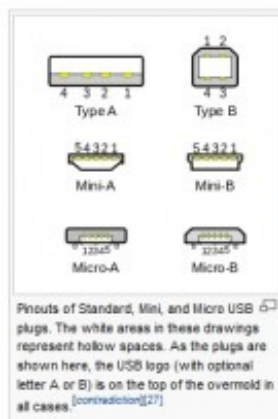
D25 NULL MODEM CABLE WIRING DIAGRAM



D9 NULL MODEM CABLE WIRING DIAGRAM

Signal Name and Abbreviation		DB-25 Pin	DE-9 Pin	Direction	DE-9 Pin	DB-25 Pin	Signal Name Abbreviation
Frame Ground (chassis)	FG	1	—		—	1	FG
Transmitted Data (TD)	TxD	2	3	→	2	3	RxD
Received Data (RD)	RxD	3	2	←	3	2	TxD
RS-232 Request to Send	RTS	4	7	→	8	5	CTS
RS-232 Clear To Send	CTS	5	8	←	7	4	RTS
Signal Ground	SG	7	5		5	7	SG
Data Set Ready	DSR	6	6				
Data Carrier Detect (CD)	DCD	8	1	←	4	20	DTR
Data Terminal Ready	DTR	20	4	→	1	8	DCD
					6	6	DSR

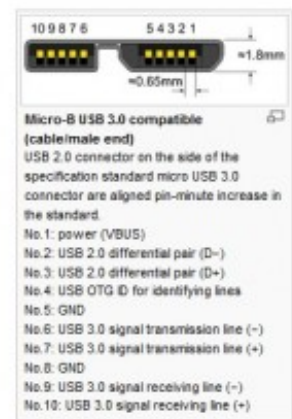
Null modems for connecting equipment together and testing.



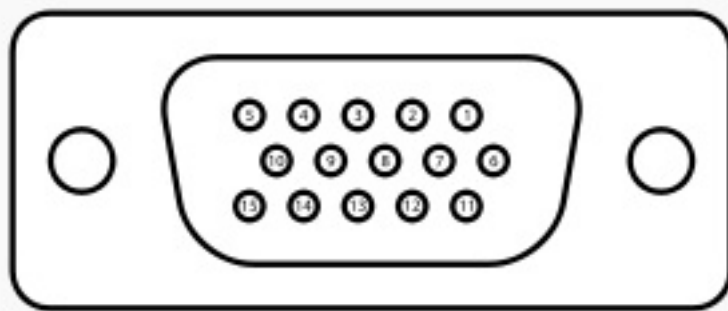
Pin	Name	Cable color	Description
1	VBUS	Red (Orange*)	+5 V
2	D-	White (Gold*)	Data -
3	D+	Green	Data +
4	GND	Black (Blue*)	Ground

\* Some manufacturers use

Pin	Name	Cable color	Description
1	VBUS	Red	+5 V
2	D-	White	Data -
3	D+	Green	Data +
4	ID	None	Permits distinction of host connection from slave connection * host: connected to Signal ground * slave: not connected
5	GND	Black	Signal ground



Various USB connectors and pinouts. USB has replaced RS-232 data ports on most newer computers.



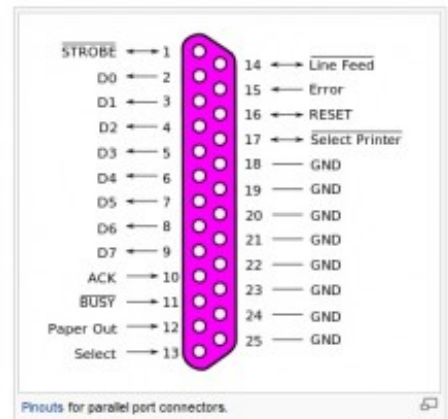
A female DE15 socket (videocard side).

<b>Pin 1</b>	RED	Red video
<b>Pin 2</b>	GREEN	Green video
<b>Pin 3</b>	BLUE	Blue video
<b>Pin 4</b>	ID2/RES	formerly Monitor ID bit 2, reserved since E-DDC
<b>Pin 5</b>	GND	Ground (HSync)
<b>Pin 6</b>	RED_RTN	Red return
<b>Pin 7</b>	GREEN_RTN	Green return
<b>Pin 8</b>	BLUE_RTN	Blue return
<b>Pin 9</b>	KEY/PWR	formerly key, now +5V DC
<b>Pin 10</b>	GND	Ground (VSync, DDC)
<b>Pin 11</b>	ID0/RES	formerly Monitor ID bit 0, reserved since E-DDC
<b>Pin 12</b>	ID1/SDA	formerly Monitor ID bit 1, <a href="#">PC</a> data since DDC2
<b>Pin 13</b>	HSync	Horizontal sync
<b>Pin 14</b>	VSync	Vertical sync
<b>Pin 15</b>	ID3/SCL	formerly Monitor ID bit 3, <a href="#">PC</a> clock since DDC2

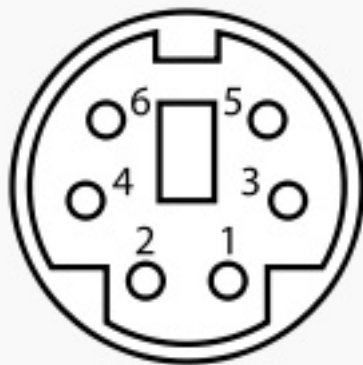
Computer graphics card pinouts.



Pin No (DB25)	Pin No (36 pin)	Signal name	Direction	Register - bit	Inverted
1	1	Strobe	In/Out	Control-0	Yes
2	2	Data0	Out	Data-0	No
3	3	Data1	Out	Data-1	No
4	4	Data2	Out	Data-2	No
5	5	Data3	Out	Data-3	No
6	6	Data4	Out	Data-4	No
7	7	Data5	Out	Data-5	No
8	8	Data6	Out	Data-6	No
9	9	Data7	Out	Data-7	No
10	10	Ack	In	Status-6	No
11	11	Busy	In	Status-7	Yes
12	12	Paper-Out	In	Status-5	No
13	13	Select	In	Status-4	No
14	14	Linefeed	In/Out	Control-1	Yes
15	32	Error	In	Status-3	No
16	31	Reset	In/Out	Control-2	No
17	36	Select-Printer	In/Out	Control-3	Yes
18-25	19-30,33,17,16	Ground	-	-	-



Computer parallel port (IEEE 1284) used for connecting a printer or scanner. Some are replaced by mostly USB devices. Can also be used as a parallel port for connecting a printer or scanner.



Female connector from the front

Pin 1	+DATA	Data
Pin 2	Not connected	Not connected*
Pin 3	GND	Ground
Pin 4	Vcc	+5 V DC at 275 mA
Pin 5	+CLK	Clock
Pin 6	Not connected	Not connected**

\* On some computers mouse data for splitter cable.

\*\* On some computers mouse clock for splitter cable.

PS2 mouse and keyboard connectors, again, replaced by USB but still found on older motherboards. Swapping the five and ground square (19/20) type connectors are usually unlabelled and get it right.

