



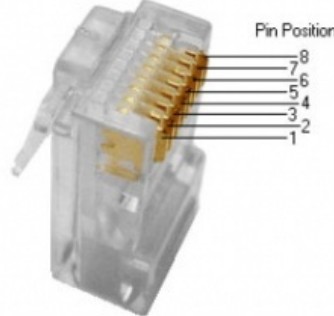














# Cables and Wiring

Article Number: 20 | Rating: 5/5 from 1 votes | Last Updated: Mon, Aug 24, 2020 at 10:44 AM

Cables Cabling RJ45 RJ21 MSAN

















We use 568B for almost everything 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	 white/green stripe	 white/orange stripe	
2	3	2	DA-	ring	 green solid	 orange solid	
3	2	3	DB+	tip	 white/orange stripe	 white/green stripe	
4	1	1	DC+	ring	 blue solid	 blue solid	
5	1	1	DC-	tip	 white/blue stripe	 white/blue stripe	
6	2	3	DB-	ring	 orange solid	 green solid	
7	4	4	DD+	tip	 white/brown stripe	 white/brown stripe	
8	4	4	DD-	ring	 brown solid	 brown solid	



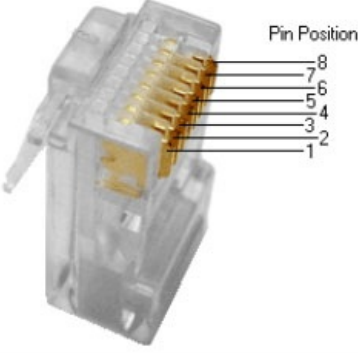














Standard networking connectors for Ethernet connections. Rumor has it that only the "A" standard is accepted for government work and the "B" standard is being depreciated.

## 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	 white/green stripe	 white/orange stripe	Rx +	Rx + DC +	TxRx A +	TxRx A + DC +
Pin 2	 green solid	 orange solid	Rx -	Rx - DC +	TxRx A -	TxRx A - DC +
Pin 3	 white/orange stripe	 white/green stripe	Tx +	Tx + DC -	TxRx B +	TxRx B + DC -
Pin 4	 blue solid	 blue solid	DC +	unused	TxRx C + DC +	TxRx C +
Pin 5	 white/blue stripe	 white/blue stripe	DC +	unused	TxRx C - DC +	TxRx C -
Pin 6	 orange solid	 green solid	Tx -	Tx - DC -	TxRx B -	TxRx B - DC -
Pin 7	 white/brown stripe	 white/brown stripe	DC -	unused	TxRx D + DC -	TxRx D +
Pin 8	 brown solid	 brown solid	DC -	unused	TxRx D - DC -	TxRx D -

Power over Ethernet pinouts. More and more commonly used in VOIP phone systems, but can also be found in wireless access points and other things of that nature.

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



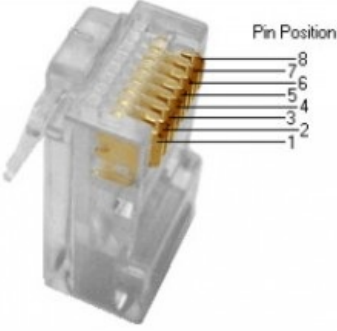














Pin	Connection 1: T568A			Connection 2: T568B			Pins on plug face
	signal	pair	color	signal	pair	color	
1	BI_DA+	3	 white/green stripe	BI_DB+	2	 white/orange stripe	
2	BI_DA-	3	 green solid	BI_DB-	2	 orange solid	
3	BI_DB+	2	 white/orange stripe	BI_DA+	3	 white/green stripe	
4		1	 blue solid		1	 blue 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 to similar pieces of equipment together, e.g. a computer to a computer, or a switch to a switch. Many new switches have port sensing, which will automatically cross the connection if a straight through cable is used. Others have a specific port or a switch for a specific port which will cross over the cable. Gigabit Ethernet uses all four pairs, thus a 1000 base T crossover looks a little bit different.

**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	
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	blue/white	red	white	blue	
4	1	T +	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

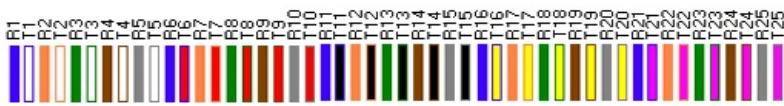
Pin	Pair	Signal	Color
1	R	RX Ring	Orange/White
2	T	RX Tip	White/Orange
3		reserved	White/Green
4	R1	TX Ring	Blue/White
5	T1	TX Tip	White/Blue
6		reserved	Green/White
7		shield	White/Brown
8		shield	Brown/White

RJ48 and 48X used on T-1 (DS-1) and ISDN connections. Since BRI and PRI ISDN are two wire circuits, the active pins are 4/5, which is the same as an RJ11. I have often used RJ11 jacks for ISDN and found no issues with doing so.

Two pairs crossed, two pairs uncrossed  
T1 crossover

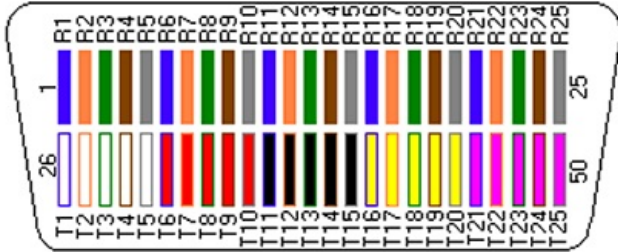
Pin	Connection 1: T568A		Connection 2: T568B		Pins on plug face
	pair	color	pair	color	
1	2	white/orange stripe	1	blue solid	
2	2	orange solid	1	white/blue stripe	
3	3	white/green stripe	3	white/green stripe	
4	1	blue solid	2	white/orange stripe	
5	1	white/blue stripe	2	orange solid	
6	3	green solid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

Crossover cable for T-1 (DS-1 or DSX-1 interface). Note, this is different from an Ethernet crossover cable, which will not work for in a DS-1 interface. A T-1 loopback connector goes from pin 1 to pin 4 and pin 2 to pin 5 on a 8P8C connector.



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.

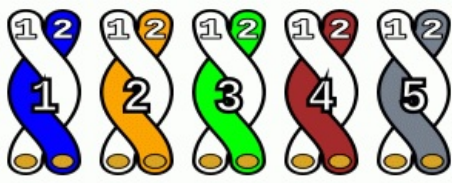


RJ21 RJ21X



















































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 cabling trunks.





## RJ21 wiring

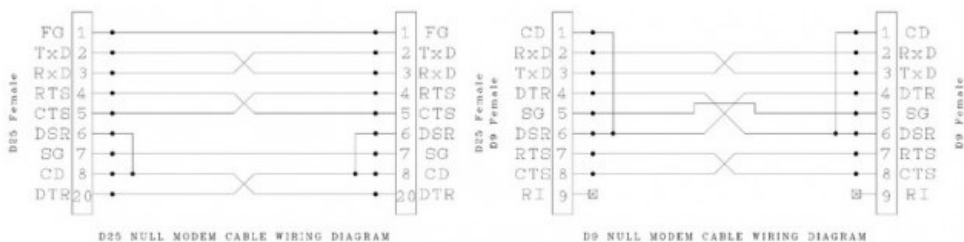
Color	Pin (Tip)	Zyxel Port	Pin (Ring)	Color
 White/Blue	26	NC	1	 Blue/White
 White/Orange	27	24	2	 Orange/White
 White/Green	28	23	3	 Green/White
 White/Brown	29	22	4	 Brown/White
 White/Slate	30	21	5	 Slate/White
 Red/Blue	31	20	6	 Blue/Red
 Red/Orange	32	19	7	 Orange/Red
 Red/Green	33	18	8	 Green/Red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

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	10	8	10 (alt 2)
Data Set Ready	DSR	•		6	6	6			8	5	9	2 (alt 10)
Ring Indicator	RI	•		22	9	—	1		—	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

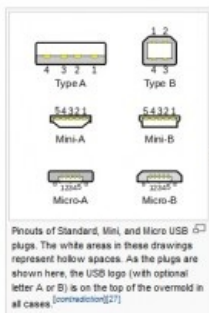
RS-232 is still commonly used for data transfer in broadcast facilities. RS-485 is also used, however, that standard is often used with screw terminals or some other generic connection.

### Null modem cables and diagrams



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.



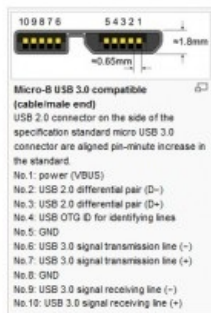
**USB 1.x/2.0 standard pinout**

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

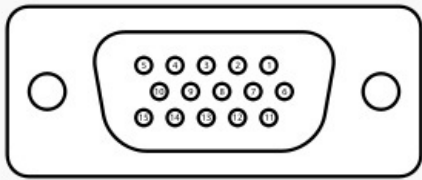
\* Some manufacturers use

**USB 1.x/2.0 Mini/Micro pinout**

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.

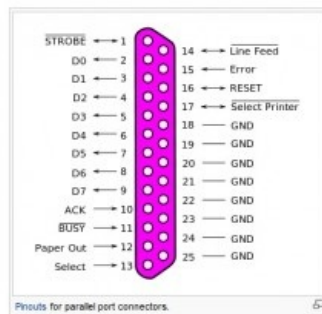


A female DE15 socket (videocard side).

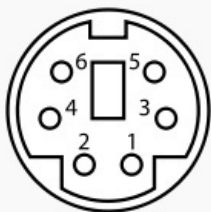
<b>Pin 1</b>	RED	Red video
<b>Pin 2</b>	GREEN	Green video
<b>Pin 3</b>	BLUE	Blue video
<b>Pin 4</b>	ID2/RES	formerly Monitor ID bit 2, reserved since E-DDC
<b>Pin 5</b>	GND	Ground (HSync)
<b>Pin 6</b>	RED_RTN	Red return
<b>Pin 7</b>	GREEN_RTN	Green return
<b>Pin 8</b>	BLUE_RTN	Blue return
<b>Pin 9</b>	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, I <sup>2</sup> C 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, I <sup>2</sup> C 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 pinout, not used very much anymore, replaced by mostly USB devices. Can also be used as a limited GPI/GPO interface. Some small automation software programs use pins 10,11,12,13 and 15 for closure information and pins 1, 14, 16, and 17 for output switching, machine starts and the like.



Female connector from the front

<b>Pin 1</b>	+DATA	Data
<b>Pin 2</b>	Not connected	Not connected*
<b>Pin 3</b>	GND	Ground
<b>Pin 4</b>	V <sub>cc</sub>	+5 V DC at 275 mA
<b>Pin 5</b>	+CLK	Clock
<b>Pin 6</b>	Not connected	Not connected**

\* On some computers mouse data for splitter cable.

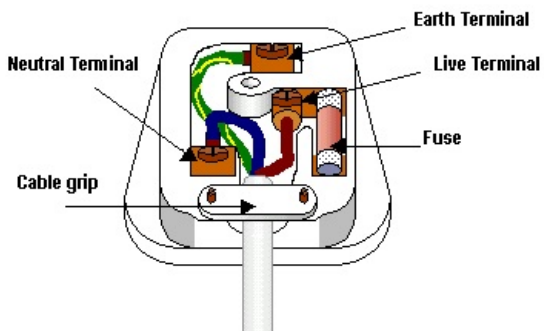
\*\* On some computers mouse clock for splitter cable.

PS2 mouse and keyboard connectors, again, replaced by USB but still found on older motherboards.



# Power Cable Wiring

UK 13A, Kettle (c13/14) and Squareish (c19/20) type connectors are usually unlabelled and swapping the live and neutral can leave devices live when they are off so it is important to get it right.



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