

Cables and Wiring

20 Jonathan Mon, Aug 24, 2020 [Broadband / IC-Air](#), [Ethernet / MPLS](#), [Hosting & Datacentres](#) 14762

Cables Cabling RJ45 RJ21 MSAN

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	

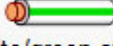
















Standard networking connectors for Ethernet connections. Bunch has it that only the "A" standard is accepted for governing networks and the B standard is being deprecated.

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	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 pins. 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**

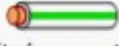

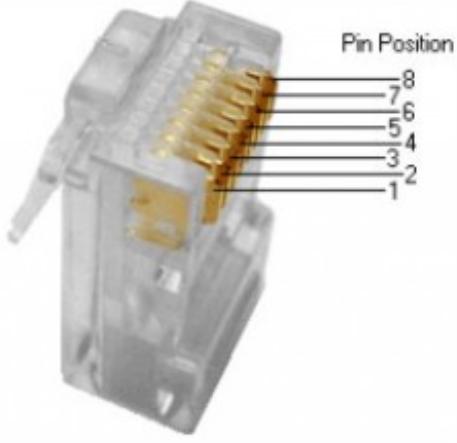










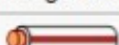

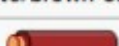
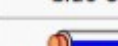
Pin	Connection 1: T568A			Connection 2: T568B			Pins on plug face
	signal	pair	color	signal	pair	color	
1	BI_DA+	3	 white/green stripe	BI_DB+	2	 white/orange stripe	
2	BI_DA-	3	 green solid	BI_DB-	2	 orange solid	
3	BI_DB+	2	 white/orange stripe	BI_DA+	3	 white/green stripe	
4		1	 blue solid		1	 blue 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 100 base-T crossover. It looks a little bit different. One of the pairs is not used and the pairs, plus 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	
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



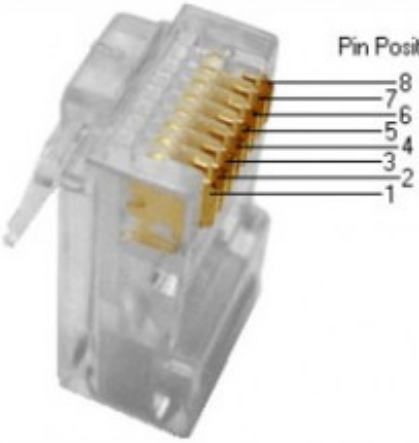






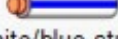
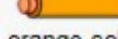

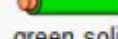
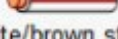
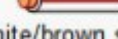
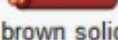
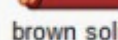
Telephone system equipment jacks.

RJ48C and RJ48X wiring

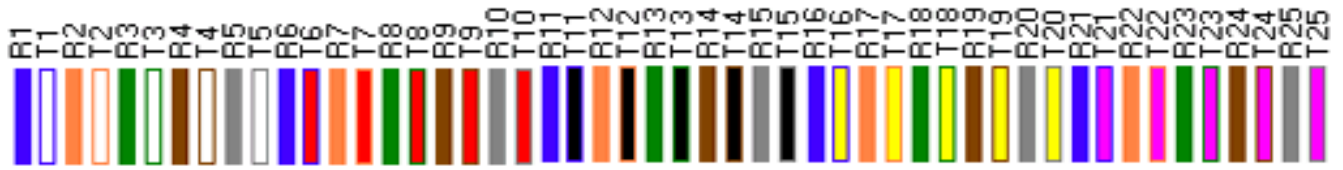
Pin	Pair	Signal	Color
1	R	RX Ring	 Orange/White
2	T	RX Tip	 White/Orange
3		reserved	 White/Green
4	R1	TX Ring	 Blue/White
5	T1	TX Tip	 White/Blue
6		reserved	 Green/White
7		shield	 White/Brown
8		shield	 Brown/White

RJ48C and RJ48X used as T1 DSX1 and DSX1 connections. Since RJ48C and RJ48X are two wire

Two pairs crossed, two pairs uncrossed T1 crossover

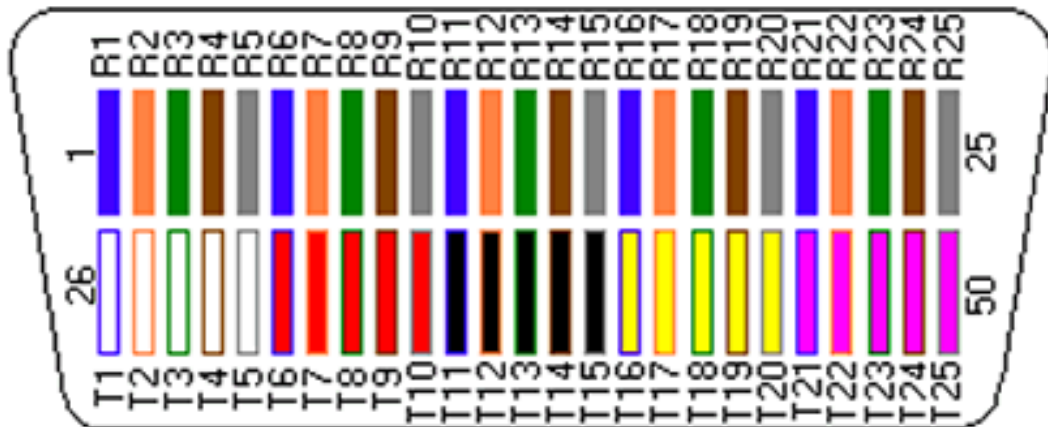
Pin	Connection 1: T568A		Connection 2: T568B		Pins on plug face
	pair	color	pair	color	
1	2	 white/orange stripe	1	 blue solid	
2	2	 orange solid	1	 white/blue stripe	
3	3	 white/green stripe	3	 white/green stripe	
4	1	 blue solid	2	 white/orange stripe	
5	1	 white/blue stripe	2	 orange solid	
6	3	 green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

Cross-over patch for T1 (DSX1 or DSX1) interface. Note: this is different from an Ethernet crossover and pin 2 to pin 5 on a RJ48C connector. Note: the back connector goes from port 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

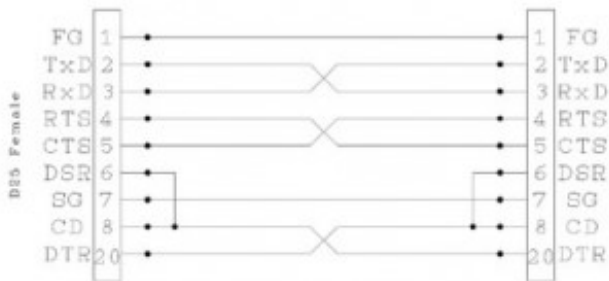
Color	Pin (Tip)	Zyxel Port	Pin (Ring)	Color
 White/Blue	26	NC	1	 Blue/White
 White/Orange	27	24	2	 Orange/White
 White/Green	28	23	3	 Green/White
 White/Brown	29	22	4	 Brown/White
 White/Slate	30	21	5	 Slate/White
 Red/Blue	31	20	6	 Blue/Red
 Red/Orange	32	19	7	 Orange/Red
 Red/Green	33	18	8	 Green/Red
 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

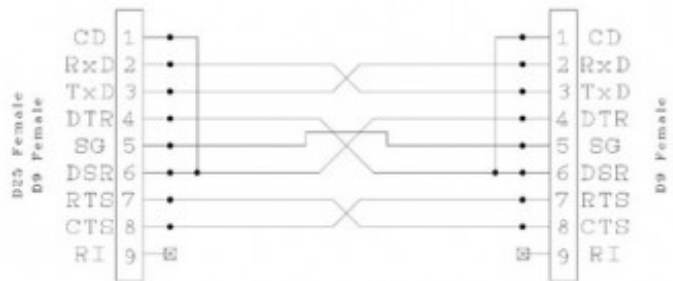
Signal		Origin		D-subminiature DB-25	D-subminiature DE-9 (TIA-574)	Modified Modular Jack(MMJ)	Modular connector 8P8C ("RJ45")			Modular connector 10P10C ("RJ50")		
Name	Abbreviation	DTE	DCE				TIA-561	Yost	Cyclades	National Instruments	Cyclades	Digi
Transmitted Data	TxD	•		2	3	2	6	3	3	8	4	5
Received 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	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



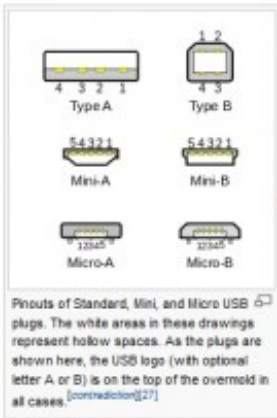
DB25 NULL MODEM CABLE WIRING DIAGRAM



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.



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

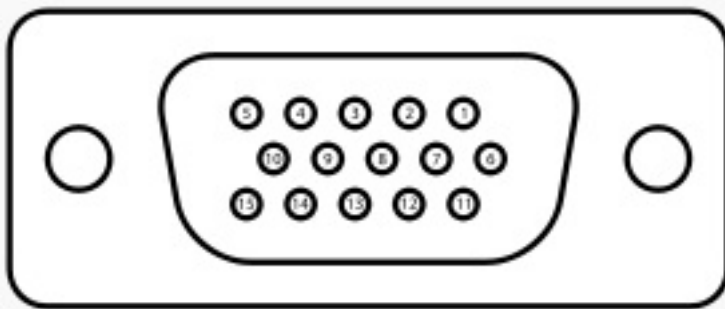
* Some manufacturers use

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.

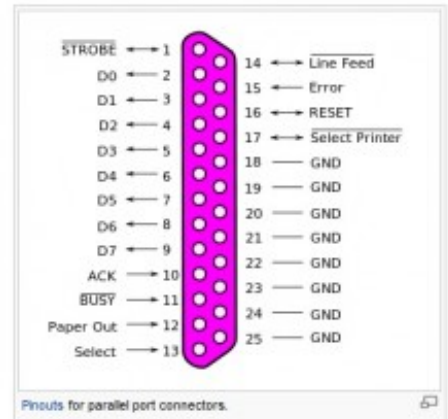


A female DE15 socket (videocard side).

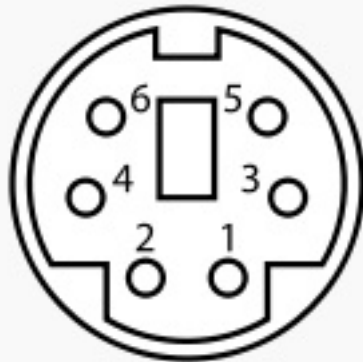
Pin 1	RED	Red video
Pin 2	GREEN	Green video
Pin 3	BLUE	Blue video
Pin 4	ID2/RES	formerly Monitor ID bit 2, reserved since E-DDC
Pin 5	GND	Ground (HSync)
Pin 6	RED_RTN	Red return
Pin 7	GREEN_RTN	Green return
Pin 8	BLUE_RTN	Blue return
Pin 9	KEY/PWR	formerly key, now +5V DC
Pin 10	GND	Ground (VSync, DDC)
Pin 11	ID0/RES	formerly Monitor ID bit 0, reserved since E-DDC
Pin 12	ID1/SDA	formerly Monitor ID bit 1, PC data since DDC2
Pin 13	HSync	Horizontal sync
Pin 14	VSync	Vertical sync
Pin 15	ID3/SCL	formerly Monitor ID bit 3, PC 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) ports for printers are normally replaced by mostly USB devices. Game controllers and MIDI controllers are also replaced by USB devices, and even for cable programming, many



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 four pin Square (19/20) type connectors are usually unlabelled and get it right.

