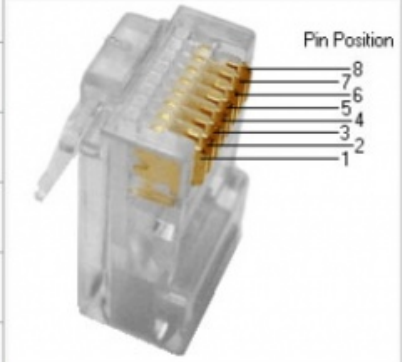
Cables and Wiring

20 Jonathan Mon, Aug 24, 2020 Broadband / IC-Air, Ethernet / MPLS, Hosting & Datacentres 13796

Cables Cabling RJ45 RJ21 MSAN

We use WAN 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	

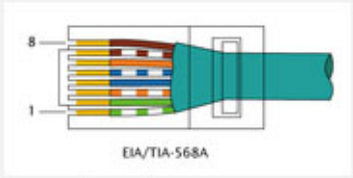
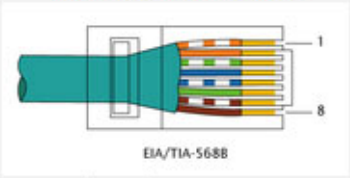
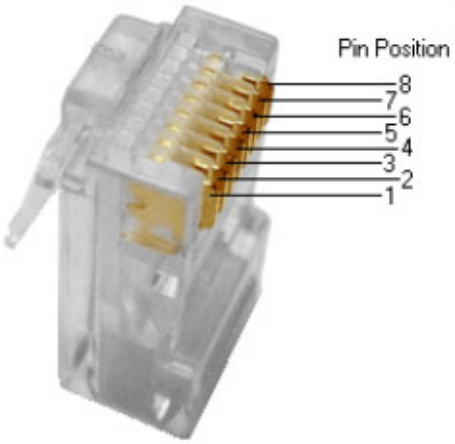
Standard networking connectors for Ethernet connections. Rumor has it that only the “A” standard is accepted for government work and the “B” standard is being deprecated.

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 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

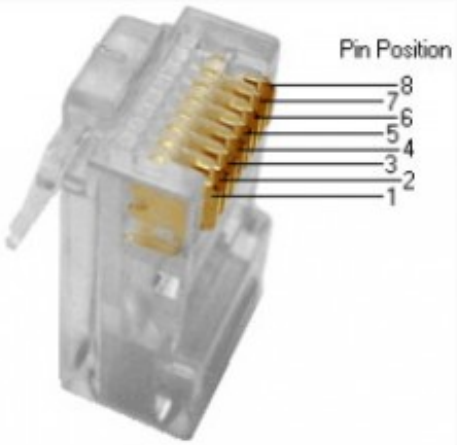
Pin	Connection 1: T568A 			Connection 2: T568B 			Pins on plug face
	signal	pair	color	signal	pair	color	
1	BI_DA+	3	white/green stripe	BI_DB+	2	white/orange stripe	
2	BI_DA-	3	green solid	BI_DB-	2	orange solid	
3	BI_DB+	2	white/orange stripe	BI_DA+	3	white/green stripe	
4		1	blue solid		1	blue solid	
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. in [illegible] 1000 base-T crossover looks a little bit different. [illegible] Gigabit Ethernet uses all four pairs, thus 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	Bl_DA+	3	white/green stripe	Bl_DB+	2	white/orange stripe	
2	Bl_DA-	3	green solid	Bl_DB-	2	orange solid	
3	Bl_DB+	2	white/orange stripe	Bl_DA+	3	white/green stripe	
4	Bl_DC+	1	blue solid	Bl_DD+	4	white/brown stripe	
5	Bl_DC-	1	white/blue stripe	Bl_DD-	4	brown solid	
6	Bl_DB-	2	orange solid	Bl_DA-	3	green solid	
7	Bl_DD+	4	white/brown stripe	Bl_DC+	1	blue solid	
8	Bl_DD-	4	brown solid	Bl_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

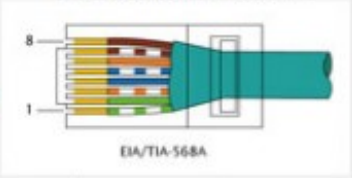
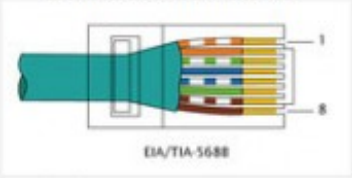
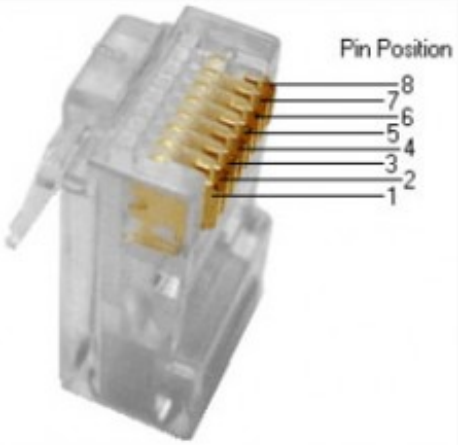
Telephone system equipment jacks.

RJ48C and RJ48X wiring

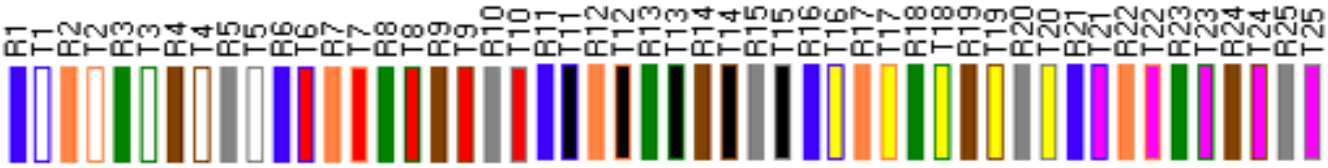
Pin	Pair	Signal	Color
1	R	RX Ring	Orange/White
2	T	RX Tip	White/Orange
3		reserved	White/Green
4	R1	TX Ring	Blue/White
5	T1	TX Tip	White/Blue
6		reserved	Green/White
7		shield	White/Brown
8		shield	Brown/White

RJ48 and 48X used on T-1 (DS-1) and ISDN connections. Since BRI and PRI ISDN are two wire circuits and the wire colors are the which is the same as an RJ11. I have often used RJ11 jacks for

Two pairs crossed, two pairs uncrossed
T1 crossover

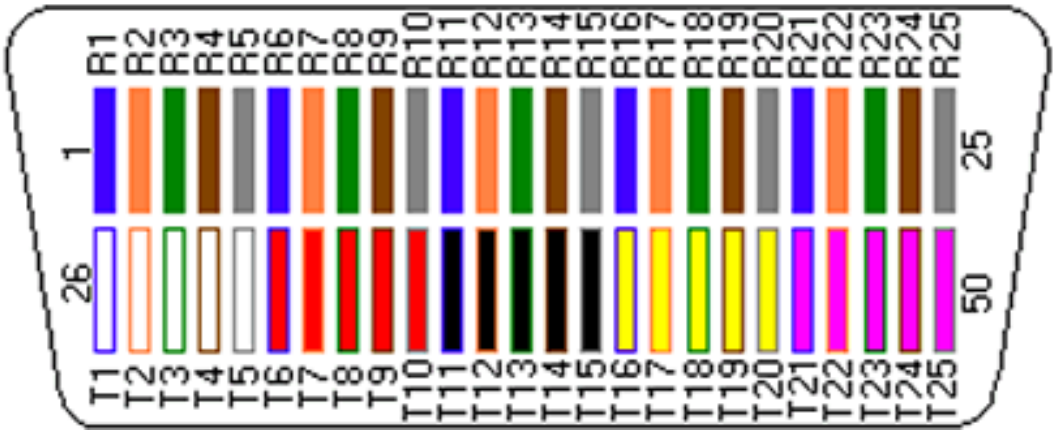
Pin	Connection 1: T568A		Connection 2: T568B		Pins on plug face
					
	pair	color	pair	color	
1	2	white/orange stripe	1	blue solid	
2	2	orange solid	1	white/blue stripe	
3	3	white/green stripe	3	white/green stripe	
4	1	blue solid	2	white/orange stripe	
5	1	white/blue stripe	2	orange solid	
6	3	green 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 and pin 2 to pin 5 on a 8P8C connector. A T-1 loopback connector goes from pin 1 to pin 4



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.

1 2 1
1 2 2
1 2 3
1 2 4
1 2 5
1 2 6
1 2 7
1 2 8
1 2 9
1 2 10
1 2 11
1 2 12
1 2 13
1 2 14
1 2 15
1 2 16
1 2 17
1 2 18
1 2 19
1 2 20
1 2 21
1 2 22
1 2 23
1 2 24
1 2 25

RJ21 wiring

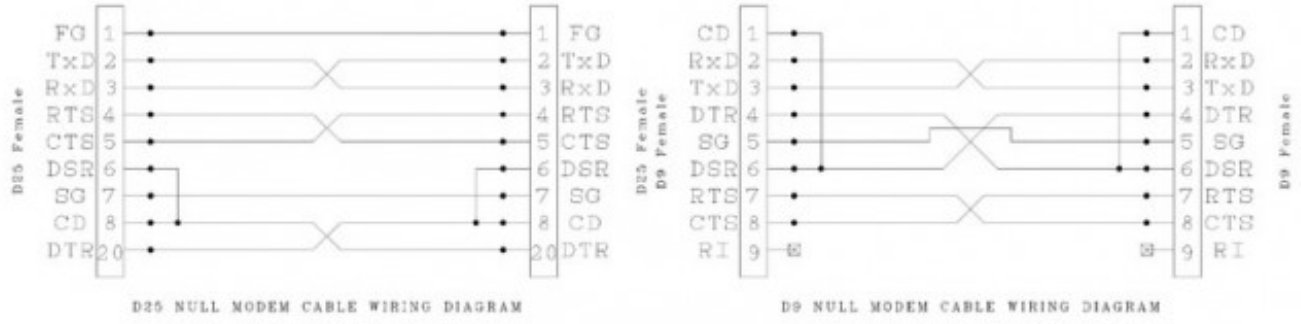
Color	Pin (Tip)	Zyxel Port	Pin (Ring)	Color
White/Blue	26	NC	1	Blue/White
White/Orange	27	24	2	Orange/White
White/Green	28	23	3	Green/White
White/Brown	29	22	4	Brown/White
White/Slate	30	21	5	Slate/White
Red/Blue	31	20	6	Blue/Red
Red/Orange	32	19	7	Orange/Red
Red/Green	33	18	8	Green/Red
Red/Brown	34	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	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

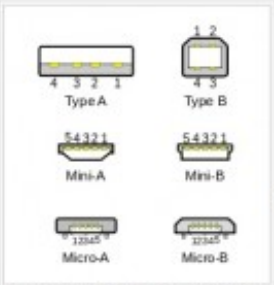
RS-232 is still commonly used for data transfer in broadcast facilities. RS-485 is also used, however, that is a multi-point bus and is not point-to-point like RS-232.

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	←	4	20	DTR
Data Carrier Detect (CD)	DCD	8	1				
Data Terminal Ready	DTR	20	4	→	1	8	DCD
					6	6	DSR

Null modems for connecting equipment together and testing.



Pinouts of Standard, Mini, and Micro USB plugs. The white areas in these drawings represent hollow spaces. As the plugs are shown here, the USB logo (with optional letter A or B) is on the top of the overmold in all cases.[contradiction][27]

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

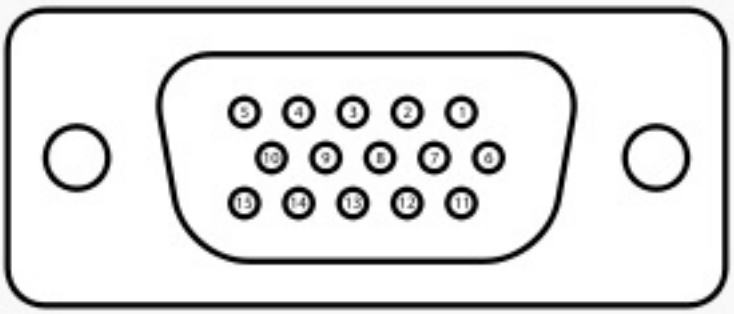
- * Some manufacturers use

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

Micro-B USB 3.0 compatible (cable/male end)
USB 2.0 connector on the side of the specification standard micro USB 3.0 connector are aligned pin-minute increase in the standard.
No.1: power (VBUS)
No.2: USB 2.0 differential pair (D−)
No.3: USB 2.0 differential pair (D+)
No.4: USB OTG ID for identifying lines
No.5: GND
No.6: USB 3.0 signal transmission line (−)
No.7: USB 3.0 signal transmission line (+)
No.8: GND
No.9: USB 3.0 signal receiving line (−)
No.10: USB 3.0 signal receiving line (+)

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

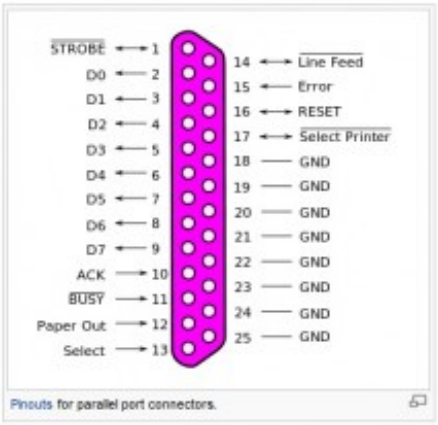


A female DE15 socket (videocard side).

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, I²C data since DDC2
Pin 13	HSync	Horizontal sync
Pin 14	VSync	Vertical sync
Pin 15	ID3/SCL	formerly Monitor ID bit 3, I²C clock since DDC2

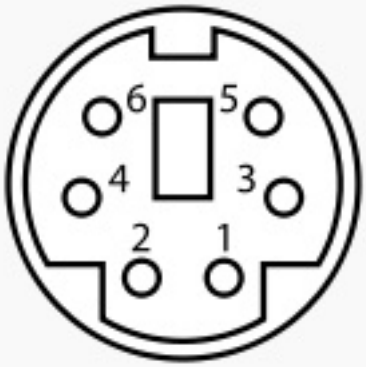
Computer graphics card pinouts.

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	-	-	-



Pinouts for parallel port connectors.

Computer parallel port pinouts are used very much anymore, replaced by mostly USB devices. Can
and are available in PCI slot form. Information here is for 17 to, and 17 for output switching, machine



Female connector from the front

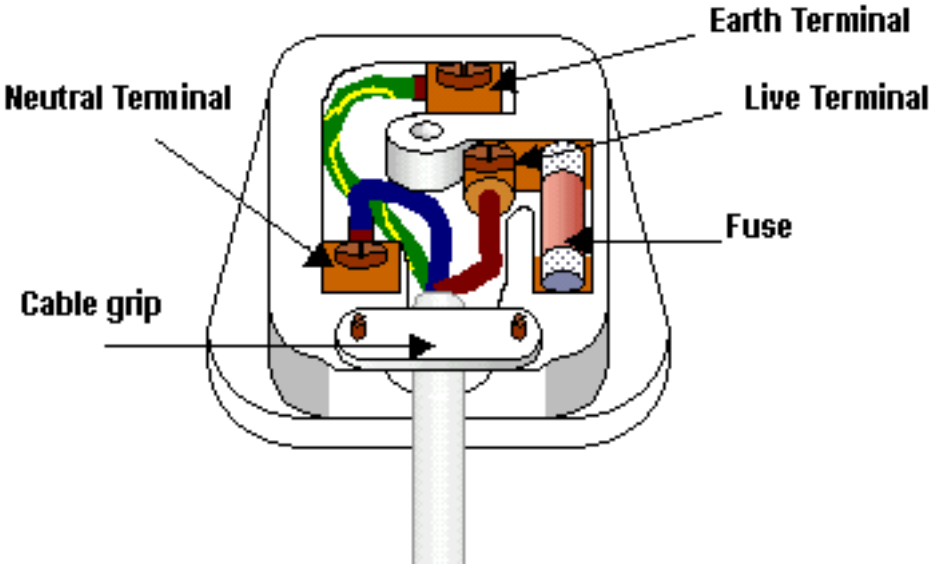
Pin 1	+DATA	Data
Pin 2	Not connected	Not connected*
Pin 3	GND	Ground
Pin 4	Vcc	+5 V DC at 275 mA
Pin 5	+CLK	Clock
Pin 6	Not connected	Not connected**

* 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 live and neutral can leave devices like when they are off so it's important to get it right.
DIN5, Kettle (615/14) and Squareish (610/20) type connectors are usually unlabelled and

Power Cable Wiring



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