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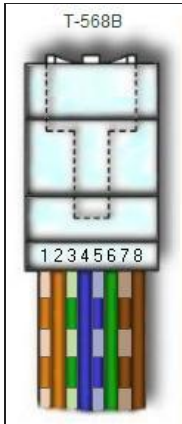
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TIA/EIA-568-A, T-568B RJ45 Wiring Standard

For wiring straight-through and cross-over RJ-45 cables

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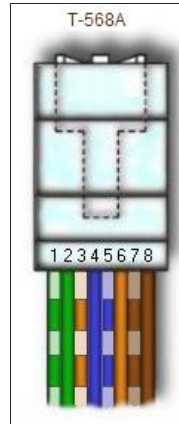
RJ-45 conductor data cable contains 4 pairs of wires each consists of a solid colored wire and a strip of the same color. There are two wiring standards for RJ-45 wiring: **T-568A** and **T-568B**. Although there are 4 pairs of wires, 10BaseT/100BaseT Ethernet uses only 2 pairs: **Orange** and **Green**. The other two colors (**blue** and **brown**) may be used for a second Ethernet line or for phone connections. **The two wiring standards are used to create a cross-over cable (T-568A on one end, and T-568B on the other end), or a straight-through cable (T-568B or T-568A on both ends).**



To create a **straight-through** cable, you'll have to use either **T-568A** or **T-568B** on both ends of the cable. The diagram depicted on the left and right shows clip of the RJ-45 connector down.

To create a **cross-over** cable, you'll wire **T-568A** on one end and **T-568B** on the other end of the cable.

The straight-through cables are used when connecting Data Terminating Equipment (DTE) to Data Communications Equipment (DCE), such as computers and routers to modems (gateways) or hubs (Ethernet Switches). The cross-over cables are used when connecting DTE to DTE, or DCE to DCE equipment; such as computer to computer, computer to router; or gateway to hub connections. The DTE equipment terminates the signal, while DCE equipment do not.



More on straight-through and cross-over connections

The RJ45 data cables we use to connect computers to a Ethernet switch is straight-through cables. As noted above, the RJ45 cable uses only 2-pairs of wires: **Orange** (pins 1 & 2) and **Green** (pins 3 & 6). Pins 4, 5 (Blue) and 7, 8 (Brown) are NOT used. Straight-through cable, as its name suggests, connects pin 1 to pin 1, pin 2 to pin 2, pin 3 to pin 3, and pin 6 to pin 6. Cross-over cables are used to connect TX+ to RX+, and TX- to RX-, which connects pin 1 to pin 3, pin 2 to pin 6, pin 3 to pin 1 and pin 6 to pin 2. The unused pins are generally connected straight-through in both straight-through and cross-over cables.

To network two computers without a hub, a cross-over cable is used. Cross-over cable is also used to connect a router to a computer, or ethernet switch (hub) to another ethernet switch without an uplink. Most ethernet switches today provide an uplink port, which prevents a use of cross-over cable to daisy chain another ethernet switch. Straight-through cables are used to connect a computer to an ethernet switch, or a router to an ethernet switch.

Pin Number Designations

There are pin number designations for each color in T-568B and T-568A.

T-568B			T-568A		
Pin	Color	Pin Name	Color	Pin Name	
1	Orange Stripe	Tx+	Green Stripe	Rx+	
2	Orange	Tx-	Green	Rx-	
3	Green Stripe	Rx+	Orange Stripe	Tx+	
4	Blue	Not Used	Blue	Not Used	
5	Blue Stripe	Not Used	Blue Stripe	Not Used	
6	Green	Rx-	Orange	Tx-	
7	Brown Stripe	Not Used	Brown Stripe	Not Used	
8	Brown	Not Used	Brown	Not Used	

RJ45 Color-Coded Scheme

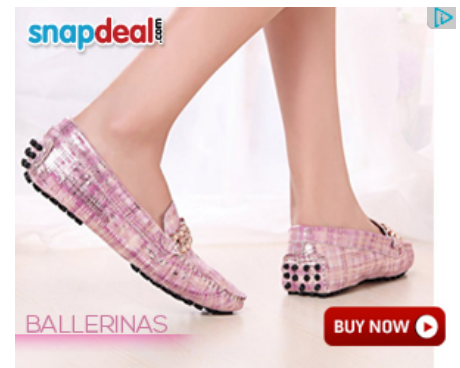
RJ45 cables have 8 color-coded wires, and the plugs have 8 pins and conductors. Eight wires are used as 4 pairs, each representing positive and negative polarity. The most commonly used wiring standard for 100baseT is T-568B standard described above. Prior to EIA 568A and 568B standards, the color-coded scheme was used to wire RJ45 cables. The table below depicts pin and color schemes used in traditional and standardized setup.

Pin	Colored Scheme	T-568B (Common)	T-568A
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1	Blue	Orange Stripe	Green Stripe
2	Orange	Orange	Green
3	Black	Green Stripe	Orange Stripe
4	Red	Blue	Blue
5	Green	Blue Stripe	Blue Stripe
6	Yellow	Green	Orange
7	Brown	Brown Stripe	Brown Stripe
8	White (or Grey)	Brown	Brown

RJ-45 Wiring FAQ

1. What are T-568A and T-568B wiring standards, and how are they different?

T-568A and T-568B are the two wiring standards for RJ-45 connector data cable specified by TIA/EIA-568-A wiring standards document. The difference between the two is the position of the orange and green wire pairs. It is preferable to wire to T-568B standards if there is no pre-existing pattern used within a building.

2. What is RJ stands for?

RJ stands for **R**egistered **J**acks. These are used in telephone and data jack wiring registered with FCC. RJ-11 is a 6-position, 4-conductor jack used in telephone wiring, and RJ-45 is a 8-position, 8-conductor jack used in 10BaseT and 100BaseT ethernet wiring.

3. What is the Category Rating System?

Electronic Industries Association (EIA) developed the TIA/EIA-568-A standard, which specifies wiring and performance standards for Unshielded Twisted Pair (UTP) cabling. Category Rating System specifies the definition of performance categories for 100 ohm UTP cabling system.

Category 3 specifies the twisted pair cable and connecting hardware that can support transmission frequency up to 16MHz, and data rates up to 10Mbps. This is primarily used in telephone wiring.

Category 4 specifies cables and connectors that supports up to 20MHz and data rates up to 16Mbps. With introduction of category 5, this is a rarely used category.

Category 5 specifies cables and connectors that supports up to 100MHz and data rates up to 100Mbps. With 100BaseT Ethernet today, Category 5 is a widely used cabling system that matches today's high-speed data requirements.

Category	TIA/EIA Standard	Description
Cat 1	None	POTS, ISDN and doorbell wiring
Cat 2	None	4 Mbps token ring networks
Cat 3	TIA/EIA 568-B	10 Mbps Ethernet - frequency up to 16MHz
Cat 4	None	16 Mbps token ring networks - frequency up to 20MHz
Cat 5	None	100 Mbps Ethernet - frequency up to 100 MHz Not suitable for GigE (1000BaseT)
Cat 5e	TIA/EIA 568-B	100 Mbps & GigE Ethernet - frequency up to 100 MHz
Cat 6	TIA/EIA 568-B	2x Performance of Cat 5 & 5e - frequency up to 250 MHz
Cat 6a	None	Future specification for 10Gbps application
Cat 7	ISO/IEC 11801 Class F	Designed for transmission at frequencies up to 600 MHz

4. What is UTP Cable?

UTP stands for **U**nshielded **T**wisted **P**air. It is the cabling system with one or more pairs of twisted insulated copper wires contained in a single sheath. It is the most widely used cabling system in telecommunications and data communications environment today.