

# TIA/EIA-568-B

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(Redirected from T568A/B)

**TIA/EIA-568-B** is a set of three telecommunications standards from the Telecommunications Industry Association, a 1988 offshoot of the EIA. The standards address commercial building cabling for telecom products and services. The three standards are formally titled ANSI/TIA/EIA-568-B.1-2001, -B.2-2001, and -B.3-2001.

The TIA/EIA-568-B standards were first published in 2001. They supersede the TIA/EIA-568-A standards set, which are now obsolete.

Perhaps the best known features of TIA/EIA-568-B.1-2001 are the pin/pair assignments for eight-conductor 100-ohm balanced twisted pair cabling. These assignments are named T568A and T568B, and are frequently referred to (erroneously) as TIA/EIA-568A and TIA/EIA-568B.

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## History

TIA/EIA-568-B was developed through the efforts of more than 60 contributing organizations including manufacturers, end-users, and consultants. Work on the standard began with the Electronic Industries Alliance (EIA), a standards organization, to define standards for telecommunications cabling systems. EIA agreed to develop a set of standards, and formed the TR-42 committee, with nine subcommittees to perform the work.

The first revision of the standard, TIA/EIA-568-A.1-1991 was released in 1991, and was updated in 1995. The demands placed upon commercial wiring systems increased dramatically over this period due to the adoption of personal computers and data communication networks and advances in those technologies. The development of high-performance twisted pair cabling and the popularization of fiber optic cables also drove significant change in the standards, which were eventually superseded by the current TIA/EIA-568-B set.

## Goals

TIA/EIA-568-B attempts to define standards that will enable the design and implementation of structured cabling systems for commercial buildings, and between buildings in campus environments. The bulk of the standards define cabling types, distances, connectors, cable system architectures, cable termination standards and performance characteristics, cable installation requirements and methods of testing installed cable. The main standard, TIA/EIA-568-B.1 defines general requirements, while -568-B.2 focuses on components of balanced twisted-pair cable systems and -568-B.3 addresses components of fiber optic cable systems.

The intent of these standards is to provide recommended practices for the design and installation of cabling systems that will support a wide variety of existing and future services. Developers hope the standards will provide a lifespan for commercial cabling systems in excess of ten years. This effort has been largely successful, as evidenced by the definition of category 5 cabling in 1991, a cabling standard that (mostly) satisfied cabling requirements for 1000BASE-T, released in 1999. Thus, the standardization process can reasonably be said to have provided at least a nine-year lifespan for premises cabling, and arguably a longer one.

All these documents accompany related standards that define commercial pathways and spaces (569-A), residential cabling (570-A), administration standards (606), grounding and bonding (607) and outside plant cabling (758).

## Structured cable system topologies

TIA/EIA-568-B defines a hierarchical cable system architecture, in which a main cross-connect (MCC) is connected via a star topology across backbone cabling to intermediate cross-connects (ICC) and horizontal cross-connects (HCC). Telecommunications design traditions utilized a similar topology, and many people refer to cross-connects by their older, nonstandard names: "distribution frames" (with the various hierarchies called MDFs, IDF's and wiring closets). Backbone cabling is also used to interconnect entrance facilities (such as telco demarcation points) to the main cross-connect. Maximum allowable backbone cable distances vary between 300 m and 3000 m, depending upon the cable type and use.

Horizontal cross-connects provide a point for the consolidation of all horizontal cabling, which extends in a star topology to individual work areas such as cubicles and offices. Under TIA/EIA-568-B, maximum allowable horizontal cable distance varies between 70 m and 90 m for twisted-pair cable types, depending upon patch cord length and gauge. Fiber optic horizontal cabling is limited to 90 m. Optional consolidation points or transition points are allowable in horizontal cables, although many industry experts discourage their use.

At the work area, equipment is connected to horizontal cabling by patch cords.

TIA/EIA-568-B also defines characteristics and cabling requirements for entrance facilities, equipment rooms and telecommunications room.

## T568A and T568B termination

Perhaps the widest known and most discussed feature of TIA/EIA-568-B.1-2001 is the definition of pin/pair assignments for eight-conductor 100-ohm balanced twisted-pair cabling, such as Category 3, Category 5 and Category 6 unshielded twisted-pair (UTP) cables. These assignments are named T568A and T568B and they define the pinout, or order of connections, for wires in 8P8C (often incorrectly referred to as RJ45) eight-pin modular connector plugs and sockets. Although these definitions consume only one of the 468 pages in the standards documents, a disproportionate amount of attention is paid to them. This is because cables that are

terminated with differing standards on each end will not function normally.

TIA/EIA-568-B specifies that horizontal cables should be terminated using the T568A pin/pair assignments, "or, optionally, per [T568B] if necessary to accommodate certain 8-pin cabling systems." Despite this instruction, many organizations continue to implement T568B for various reasons, chiefly associated with tradition (T568B is equivalent to AT&T 258A). The United States National Communication Systems Federal Telecommunications Recommendations do not recognize T568B.

The primary color of pair one is blue, pair two is orange, pair three is green and pair four is brown. Each pair consists of one conductor of solid color, and a second conductor which is white with a stripe of the same color. The specific assignments of pairs to connector pins varies between the T568A and T568B standards.



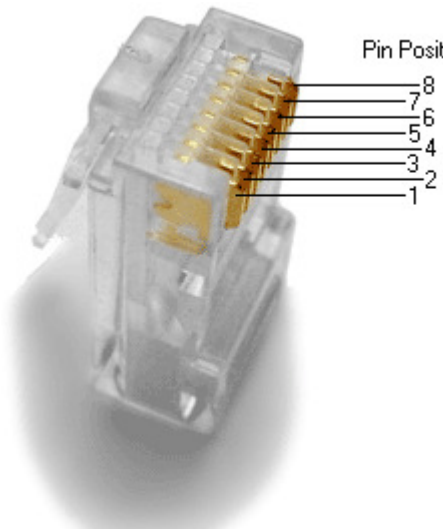














Mixing T568A-terminated patch cords with T568B-terminated horizontal cables (or the reverse) does not produce pinout problems in a facility. Although it may very slightly degrade signal quality, this effect is marginal and certainly no greater than that produced by mixing cable brands in-channel.

## Wiring

See modular connector for numbering of the pins in these 8P8C modular connectors.

The assignments of wire pairs to plug and socket pins are as follows:

**T568A and T568B Wiring**

Pin	T568A Pair	T568B Pair	Wire	T568A Color	T568B Color	Pins on plug face (socket is reversed)
1	3	2	tip	 white/green stripe	 white/orange stripe	
2	3	2	ring	 green solid	 orange solid	
3	2	3	tip	 white/orange stripe	 white/green stripe	
4	1	1	ring	 blue solid	 blue solid	
5	1	1	tip	 white/blue stripe	 white/blue stripe	
6	2	3	ring	 orange solid	 green solid	
7	4	4	tip	 white/brown stripe	 white/brown stripe	
8	4	4	ring	 brown solid	 brown solid	

Note that the only difference between T568A and T568B is that pairs 2 and 3 (orange and green) are swapped. Both configurations wire the pins "straight through", i.e., pins 1 through 8 on one end are connected to pins 1 through 8 on the other end. Also, the same sets of pins are paired in both configurations: pins 1 and 2 form a pair, as do 3 and 6, 4 and 5 and 7 and 8. However the different pairs in an Ethernet cable are identical, so one can use cables wired according to either configuration in the same installation without significant problem; problems involving crosstalk can occur (which is normally minimized by correctly twisting a pair together), but are usually insignificant in all but the most stringent specifications such as Category 6 cable. The primary thing one has to be careful of is not to accidentally wire the ends of the **same cable** according to **different configurations** (except if one intends to create an Ethernet crossover cable).

## Use for T1 connectivity

In T1 service, the pairs 1 and 3 (T568A) are used, and the USOC-8 jack is wired as per spec RJ-48C. The Telco termination jack is often wired to spec RJ-48X, which provides for a Transmit-to-Receive loopback when the plug is withdrawn.

Vendor cables are often wired with Tip and Ring reversed -- i.e. pins 1 and 2 reversed, or pins 4 and 5 reversed. This has no effect on the signal quality of the T1 signal, which is fully differential, and which generally uses the Binary Eight Zero Substitution (B8ZS) or more rarely, the older Alternate Mark Inversion (AMI) line coding scheme.

It should be noted that sometimes a T1 crossover cable is needed from the LEC demarcation to the customer equipment such as a PBX. **IMPORTANT:** A T1 crossover cable is **NOT** the same as an Ethernet crossover cable. A T1 crossover has pins 1 and 2 going to pins 5 and 4, and pins 4 and 5 going to pins 2 and 1.

## Backwards compatibility

Because pair 1 connects to the center pins (4 and 5) of the 8P8C connector in both T568A and T568B, both standards are compatible with the first line of RJ11, RJ14, RJ25, and RJ61 connectors that all have the first pair in the center pins of these connectors.

If the second line of an RJ14, RJ25 or RJ61 plug is used, it connects to pair 2 (orange/white) of jacks wired to T568A but to pair 3 (green/white) in jacks wired to T568B. This makes T568B potentially confusing in telephone applications.

Because of different pin pairings, the RJ25 and RJ61 plugs cannot pick up lines 3 or 4 from either T568A or T568B without splitting pairs. This would most likely result in unacceptable levels of hum, crosstalk and noise.

## Theory

The original idea in wiring modular connectors, which you see exemplified in the registered jacks, was that the first pair would go in the center positions, the next pair on the next outermost ones, and so on. Also, signal shielding would be optimized by alternating the "live" and "earthy" pins of each pair. As you can see, the TIA/EIA-568-B terminations vary a little bit from this concept. That's because on the 8 position connector, this results in a pinout in which the outermost pair are too far apart to meet the electrical requirements of high-speed LAN protocols.

## See also

- Cable
- Category 5 cable
- Power over Ethernet (PoE)
- Ethernet crossover cable

## References

National Communications System Federal Telecommunications Recommendation 1090-1997  
([http://www.ncs.gov/library/fed\\_rec/FTR%201090-1997.pdf](http://www.ncs.gov/library/fed_rec/FTR%201090-1997.pdf))

## External links

- TIA Online (<http://www.tiaonline.org/>)
- UTP Cable Termination Standards 568A Vs 568B (<http://www.ablecables.com.au/568avb.htm>)
- proAV / data and information, lists, tables and links (<http://bnoack.com/index.html?http&&&bnoack.com/data/cables/CAT5.html>)
- Ethernet Cable Colour code standards ([http://www.dragon-it.co.uk/files/cat5\\_colour\\_codes.htm](http://www.dragon-it.co.uk/files/cat5_colour_codes.htm))
- How to create your own Ethernet Cables ([http://www.ertyu.org/steven\\_nikkel/ethernetcables.html](http://www.ertyu.org/steven_nikkel/ethernetcables.html))

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