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UTP Cable Termination Standards

568A Vs 568B

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Summary

In the past there have been two main termination specifications for UTP data cable infrastructure and yet another for phone cable infrastructure. In today's world of structured cable systems where many different services can be run over one type of cable it is important to keep up with changing technology and standards, to remain cutting edge is to remain profitable. This report outlines the uses of the three different standards and when to use them.

Contents

1.0 Introduction

The Australian Standards (AS 3080) and the International Standards (ISO/IEC 11801:1995) for structured cabling systems refer to the TIA/EIA produced standard for terminating a category 5 (CAT 5) unshielded twisted pair (UTP) cable in a structured cable system, 568A. Both of these standards also refer to the AT&T produced standard, 258A (now known under the TIA/EIA name of 568B). Neither one of the standards indicate a preferred specification or if one has a technical advantage over the other. Do individual companies just choose one and stick with it? Do companies use a mixture of both depending on the site or area of the site? Are the rules as to which standard is preferred differ in different countries around the world?

In this report I will outline the political and technical backgrounds of these look

alike specifications, the technical specifications of the two standards and which the TIA/EIA/ISO and other standards organizations around the world prefer.

2.0 What is 568

In the world of structured cabling systems the cryptic number 568 refers to the order in which the individual wires inside a CAT 5 cable are terminated. The termination could come at either the user's end socket, the patch panel or termination frame or even the individual leads that connect a computer to the wall socket. There are currently two different specifications with respect to the order these cables should be terminated contained in the international standards document (ISO/IEC 11801:1995) as previously mentioned there is no indication as to which of these standards is preferred.

3.0 The Standards Organizations

There are many standards organizations around the world; here in Australia our standards body is Standards Australia. In America there is the ANSI (American National Standards Institute, the world wide standards organization is the ISO (International Standards Organization). The purpose of standards organizations is to formulate a common set of rules for everyone in an industry to follow, in this case to specify a cabling system for commercial premises that is non-exclusive and will support a multi product multi vendor industry. The 568 standards were actually developed by the TIA (Telecommunications Industry Association) and the EIA (Electronics Industry Association) in America to reduce confusion in their industry. These were then adopted by other standards organizations around the world.

4.0 The AT&T "Standard"

Before the TIA/EIA standard was created in 1985 AT&T the giant telecommunications company had been developing at its research labs newer and faster computer networks. These networks were designed to run over existing telecommunications infrastructure, this used USOC as its termination method (described later in this document). To provide backward compatibility for a single line phone AT&T created its own way of terminating cables for

UTP networks; this specification was named 258A. 258A started to become well known and widely used (especially in the USA) and UTP networks became more and more popular.

5.0 TIA/EIA Standard

In 1985 many companies from the telecommunications industry, becoming concerned about the lack of a third party premises cabling standard and their governing body the CCIA (Computer Communications Industry Association) requested that the EIA (Electronics Industry Association) develop this standard. The first draft of the standard wasn't released until July of 1991 this was given the name EIA/TIA-568. Although similar to the existing AT&T method of terminating twisted pair cables the new standard provided backward compatibility for phones that used two pairs instead of just one – enabling them to operate on pairs 1 and 2. Later in 1991 a Technical Systems Bulletin (TSB-36) was released with references to category 4 and 5 cables. Twelve months later TSB-40 was published addressing higher speed UTP for hardware connecting, this was revised in January of 1994 to include RJ45 modular jacks and fly leads. At this time TIA/EIA-568 was also revised and renamed TIA/EIA 568A, the existing AT&T standard 258A was included and referred to as TIA/EIA-568B. As both these standards were popular and widely used they were both adopted into the International Standards titled Generic Cabling for Customer Premises Cabling (ISO/IEC 11801:1995).

6.0 USOC

USOC (Universal Service Order Codes), historically has been the most common and has long been used in the telephone infrastructure in the USA. The pairs are terminated differently to either 568A or 568B. Although nowadays USOC isn't used regularly as its termination sequence only allows for voice signals to be carried over the cable and not data. A cable terminated to USOC specifications cannot carry data as pins one/two three/six are not terminated on the same pair as required for Ethernet. This therefore renders it useless for a structured cabling system where both voice and data may need be run over one line at some stage in its installed life.
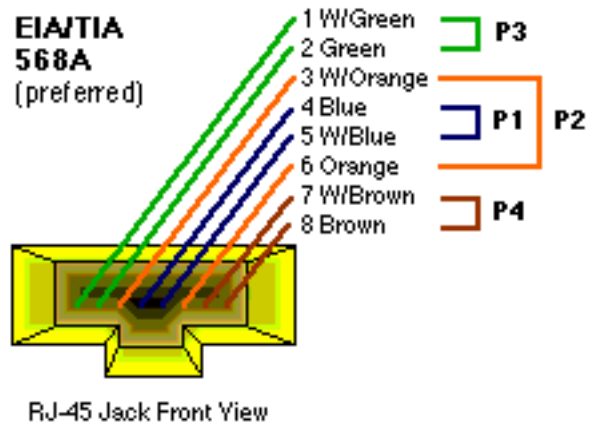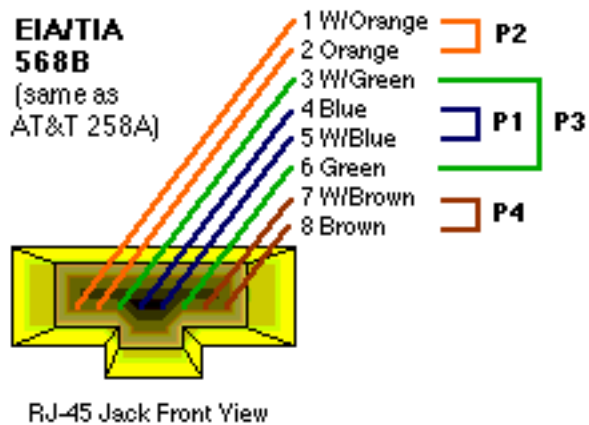
7.0 Technical Specifications

EIA/TIA 568A (preferred)

RJ-45 Jack Front View

Figure 1.0 shows how the TIA/EIA 568A standard is to be terminated. Note the position of the green/white green and the orange/white orange pairs.

EIA/TIA 568B (same as AT&T 258A)

RJ-45 Jack Front View

In figure 1.1 you can see the TIA/EIA 568B standard. Once again note the position of the green/white green and orange/white orange pairs.
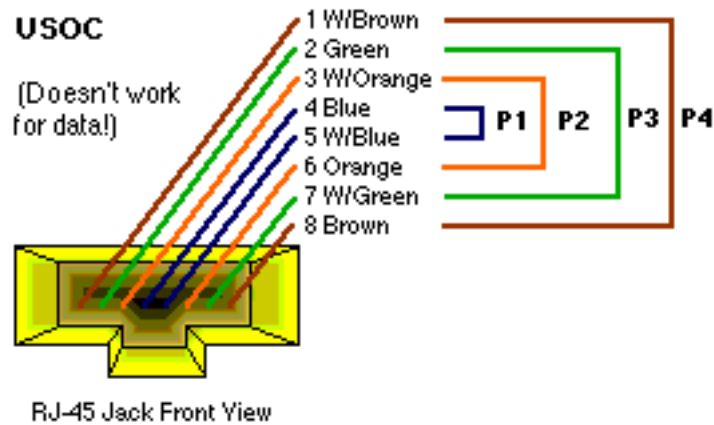
Figure 1.2 clearly shows the large difference between this and the other two standards. Note how the pairs are nested inside each other.

7.1 Comparing 568A and 568B

By looking at the first two specifications we see that the only difference is that the green and orange pairs are terminated to different pins, there is no difference as to what signal is used on what pin, only what colour wire is terminated onto it. So technically the standards are the same, they operate in the same manner and neither one is technically superior to another when used in Ethernet applications.

It is when an Ethernet system and a phone system are combined that the difference really becomes apparent.

7.2 Comparing 568B to USOC

Comparing 568B to USOC we see that the blue pair on both are terminated on pins four/five, so an existing single line USOC phone can operate on 568B circuitry. Although when an existing USOC phone requires two pairs we see that the green pair has replaced the orange pair in a 658B system, in this way 568B isn't completely backward compatible with standard USOC hardware.

7.3 Comparing 568A to USOC

Once again using the telephone standard USOC as a reference we can see that with the 568A standard both the blue pair and the orange pair appear in the same order, so both existing one and two line phones can be used with a

568A system.

8.0 Which Specification is Preferred?

If 568A and 568B specifications are technically identical and both are international standards which one is preferred? The information here is sketchy and I have not received a response from many standards organizations, from what I can understand is that although 568B is widespread (especially in the USA) all new installations should be carried out using the TIA/EIA developed 568A. Standards Australia – The Australian equivalent the ISO says, "There is no reason to change existing 568B installations to 568A although all new installations should be implemented with 568A." More recent information, "As published in the EIA Commercial Building Draft 9.0 as the preferred sequence for termination of UTP data cabling… This is also the preferred option for AS/NZS 3080."

9.0 Conclusion

Historically 568B was the specification on choice due to its early development and implemented base, but as the market and the political climate has changed over the years 568A has become the more dominate and preferred specification. This is only due to a desire by world standards organizations to provide a specification as backwardly compatible as possible. All new installations should be carried out using the 568A standard and cables only to be terminated to 568B specification on existing 568B systems.

Appendices

Appendix 1.0

The layout of the pairs

There are four pairs of wires contained in a CAT 5 UTP cable. These pairs of cables are colour coded white blue/blue, white orange/orange, white green/green, white brown/brown, they are also numbered one to four in the order shown. When terminated to an RJ45 connector these pairs are not layed out next to each other. The reason behind this is simple. Ethernet was created to run over existing phone networks, this design left pins 4 and 5 on an RJ45

socket free. The reason for this is when an RJ11 plug (the type used on common phones) is plugged into an RJ45 the middle two pins (pins 2 and 3) connects with pins 4 and 5 of the RJ45, allowing a single line phone to work. If on the other hand you plug an RJ45 plug into the RJ45 socket the network will run use pins 1 and 2 as one pair and pins 3 and 6 as another pair, thus avoiding conflicts. This does get more complicated when a two pair phone system is used.

Appendix 2.0

The Standards Organizations Stance

In the future I'd like to supply a list of the different world standards organizations and their response to the 568A or 568B question. So far Standards Australia is the only one to respond to my approaches.

<u>Standards Australia</u>

"There is no reason to change existing 568B installations to 568A although all new installations should be implemented with 568A" – Dean Basset.

i. Synergy Networks – http://www.synergyworks.com/faq.html
ii. Clipsal Electronic, Telecommunications Equipment Technical Catalogue
iii. LAN Cabling Basics – http://www.combsnet.com/networks/cable_basics.html
iv. LAN Cabling Basics – http://www.combsnet.com/networks/cable_basics.html
v. Terms and Definitions – http://www.digitalmx.com/wires/terms.html
vi. Clipsal Electronic, Telecommunications Equipment Technical Catalogue
vii. Clipsal Electronic, Telecommunications Equipment Technical Catalogue
viii. LAN Cabling Basics – http://www.combsnet.com/networks/cable_basics.html
ix. Dean Basset, Standards Australia
x. Clipsal Electronic, Telecommunications Equipment Technical Catalogue

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