



## Application Note

### Cat 5 vs. Cat 5E vs. Cat 6 ....

#### Keywords

Cable, Cat 5, Cat 5E, Cat 6, Copper, Ethernet, Twisted-pair, Wire

#### Summary

Customers are confused about twisted-pair (i.e. copper) cable standards. Some options are purely marketing. The customer should decide, how long they will use them, then decide which to buy.

#### Scenario

Customers are upgrading their equipment to include Gigabit Ethernet (GbE). GbE transfers data at a much higher rate (1000 Mbps) than Fast Ethernet (100 Mbps) and original Ethernet (10 Mbps). Some suppliers offer a wide variety of cables: Cat 3, Cat 5, Cat 5E and Cat 6. Some even offer Cat 7 cables, but Cat 7 is not a released standard, yet. Some also use product names – not categories.

#### Question

What is the difference between Cat 5 and Cat 5E cabling? Cat 6? Cat 7? Which should be used?

#### Notes/Answer

Copper cable performance is determined, primarily, by *bandwidth, cross-talk and noise immunity*. Bandwidth measures the cable's frequency, or data rate, capacity. Cross-talk measures the transmitter's influence on its own receiver. Noise immunity is a measure of the effects, of external noise. *Cable categories* (e.g. Cat 5) are established by the **TIA/EIA-568** standard. As the cable category increases, these parameters are improved. For example, Cat 6 will pass a higher frequency, reduces cross-talk and has better noise immunity than Cat 5E.

"The secret is the *twist*." For copper cabling, each transmit and receive circuit is composed of two, twisted wires. The twist reduces the effects of noise and cross-talk. If the cable has more twists per inch, then the cable is rated higher. The higher rated cables have a higher bandwidth, too.

Cat 3 has the least twists per inch; Cat 6 has more twists than Cat 5E. "Cat 7" would have more twists. However, since that standard is not released, Cat 7 claims cannot be validated. Cat 5 wiring is the minimum cable for Gigabit Ethernet (i.e. 1000Base). Note: if the customer will migrate to 10 Gigabit Ethernet (i.e. 10GBase), then they may want Cat 5E (or greater) wiring.

Other reasons exist, for using the higher category cabling. The customer may have a non-Ethernet application. One may squeeze a little more performance out of a link, by compromising one or more parameters. For example, if one runs 10 Mbps on Cat 5E cable, then one may get a longer distance link. If speed is more important, then sacrifice distance. In either case, you may see some gain, when Cat 5E replaces Cat 5 cable. Cat 5E cable may also compensate for some poor performance by other link cables (e.g. patch cords).

*Note:* Cat 5E and Cat 6 may be marketed by a variety of names, such as "Datamax" or "350Meg." Some names were created before the Cat 5E and Cat 6 standards were released.