

Ethernet Twisted Pair Cable Categories.

LPTPCATX_AN_ENB01W

This Application Note explains the differences between twisted pair categories used for Structured Cabling.

A Category 5 cable.

Category 5 (CAT 5) cable is a multi-pair (usually 4 pair) high performance cable that consists of twisted pair conductors, used mainly for data transmission. Basic CAT 5 cable was designed for characteristics of up to 100 MHz. CAT 5 cable is typically used for LAN Ethernet networks running at 10 or 100 Mbps. Unshielded Twisted Pair (UTP) construction makes the cable highly cost-effective for data networks.

B Category 5e Cable.

Category 5e (CAT 5e) cable, also known as Enhanced Category 5, is designed to support full-duplex Fast Ethernet operation and Gigabit Ethernet. The main differences between CAT 5 and CAT 5e can be found in the specifications. The performance requirements have been raised slightly in the new standard.

CAT 5e has stricter specifications for Power Sum Equal-Level Far-End Crosstalk (PS-ELFEXT), Near-End Crosstalk (NEXT), attenuation, and Return Loss (RL) than those for CAT 5. Like CAT 5, CAT 5e is a 100 MHz standard, but it has the capacity to handle bandwidth superior to that of CAT 5.

C Category 6 Cable

Category 6 (CAT 6) cable provides higher performance than CAT 5e and features more stringent specifications for crosstalk and system noise.

The quality of the data transmission depends upon the performance of the components of the channel. To transmit according to CAT 6 specifications, jacks, patch cables, patch panels, cross-connects, and cabling must all meet CAT 6 standards. The CAT 6 components are tested individually, and they are also tested together for performance. In addition, the standard calls for generic system performance so that CAT 6 components from any vendor can be used in the channel.

All CAT 6 components must be backward compatible with CAT 5e, CAT 5, and CAT 3. If different category components are used with CAT 6 components, then the channel will achieve the transmission performance of the lower category. For instance, if CAT 6 cable is used with CAT 5e jacks, the throughput will perform at a CAT 5e level.

D Category 6a Cable.

Category 6a (CAT 6a), also known as Augmented Category 6, requires a cable to operate at a minimum of 500 MHz and provide up to 10 Gigabits of bandwidth. The CAT 6a standard also includes a new measurement called Power-Sum Alien Crosstalk to 500 MHz. CAT6a cables will reduce the interference on a 10GBASE-T network caused by Alien Crosstalk thereby improving network performance.

E Category 7 Cable.

Category 7 (CAT 7) cable, also known as Class F, requires a cable to operate at a minimum of 600 MHz and provides up to 10 Gigabits of bandwidth. To further reduce interference, CAT 7 cable requires individually fully shielded twisted pairs. Screened Shielded Twisted Pair (SSTP), also referred to as Screened Foiled Twisted Pair (S/FTP) all but eliminates alien crosstalk and greatly improves noise resistance making it the ideal networking cable in high EMI environments such as power stations, data centers, factories and hospitals.

This table compares each category against the others.

Category 5, 5e, 6, 6a & 7 Cable Comparison					
Specifications	CAT 5	CAT 5e	CAT 6	CAT 6a	CAT 7 (Proposed)
Frequency	100 MHz	100 MHz	250 MHz	500 MHz	600 MHz
Attenuation (min. at 100 MHz)	22 dB	22 dB	19.8 dB	--	20.8 dB
Characteristic Impedance	100 Ohms = 15%	100 Ohms = 15%	100 Ohms = 15%	--	100 Ohms = 15%
NEXT (min. at 100 MHz)	32.3 dB	35.3 dB	44.3 dB	27.9 dB	62.1 dB
PS-NEXT (min. at 100 MHz)	N/A	32.3 dB	42.3 dB	--	59.1 dB
EL-FEXT (min. at 100 MHz)	N/A	23.8 dB	27.8 dB	9.3 dB	Not yet specified
PS-ELFEXT (min. at 100 MHz)	N/A	20.8 dB	24.8 dB	--	Not yet specified
PS-ANEXT (min. at 500 MHz)	--	--	--	49.5 dB	--
PS-AELFEXT (min. at 500 MHz)	16 dB	20.1 dB	20.1 dB	23.0 dB	14.1 dB
Return Loss (min. at 100 MHz)	16 dB	20.1 dB	20.1 dB	8 dB	14.1 dB
Delay Skew (max. per 100 m)	N/A	45 ns	45 ns	--	20 ns
Networks Supported	100 BASE-T	1000 BASE-T	1000 BASE-TX	10 GBASE	Not yet specified