
IEEE P802.3bt Guidelines For Field Deployment

**Chris DiMinico MC Communications/Panduit
cdiminico@ieee.org**

Background

- Power delivery over BASE-T PHYS with specified operation over TIA/ISO cabling
 - 802.3af, 802.3at, 802.3bt
- Coordination with TIA/ISO cabling committees on power delivery - 802.3af and 802.3at
 - Cabling specifications
 - Guidelines

Purpose

- Review applicability of TIA-184 power delivery “installation” guidelines for 802.3bt.
 - Use review outcome to suggest additional considerations in TIA/ISO.
- Please note, this does presentation not preclude of other considerations.

Technical Systems Bulletin (TSB)-184

- Guidelines to support safety extra low voltage (SELV*) limited power source (LPS) applications using remote power supplied over balanced twisted-pair cabling.
 - 802.3af, 802.3at
 - TIA-862 building automation and security devices
 - Remote cameras
 - IP telephone
 - Multimedia devices supported by IEEE Std 1394-2008.
- Environmental conditions related to the installed cabling,
 - bundled cabling, cabling in conduit, different cabling categories and cable types
- Parameters needed for remote powering;
- References to safety standards;
- Different installation conditions that require special considerations;
- Application considerations;
- Mitigation considerations; and
- cabling configurations and related field test considerations

*SELV power as defined in IEC 60950-1.

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Annex A (informative) – Additional installation guidelines

A.1 General

A.2 Minimum cabling category

A.3 Temperature rise and current capacity

A.4 Measurement results for current capacity

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TSB-184 Annex A

- TSB-184 Annex A - Additional installation guidelines supporting the delivery of power over installations of category 5e, category 6 or category 6A cabling.
- Maximum current capacity guidelines in this document ensures that balanced twisted-pair cabling installations meeting the installation requirements of ANSI/TIA-568-C.1 and the requirements for pathways and spaces in ANSI/TIA-569-B, will function properly for data and remote power delivery.
- No additional spacing or separation requirements are needed for the cabling that is supporting power delivery.

Temperature rise and current capacity

- Temperature of the cabling will rise due to heat generation of the conductors. Heat will dissipate (generally) until a steady state is reached with the temperature of the cable bundle higher than the ambient temperature of the surrounding environment.
- The temperature of any cable should not exceed the temperature rating for the cable. Generally, cables used in commercial premises have a temperature rating of 60 °C.

Current capacity per pair - 100 cable bundle

Table A.1 - Current capacity per pair for a 100-cable bundle

Temperature rise (°C)	Current capacity (mA)		
	Category 5e	Category 6	Category 6A
0.0	0	0	0
1.0	190	208	223
2.0	268	294	316
3.0	329	360	387
4.0	380	416	447
5.0	424	465	499
6.0	465	509	547
7.0	502	550	591
7.5	520	569	612
8.0	537	588	632
9.0	569	624	670
10.0	600	657	706
11.0	629	689	741
12.0	657	720	774
12.5	671	735	790
13.0	684	749	805
14.0	710	778	836
15.0	735	805	865

- Closed form equation is provided to calculate the maximum current per pair given ambient temperature (t).

$$I_t = \rho \times 10^3 \times (1 - t/60)^{0.5} \text{ mA}$$

ρ factors for equation

Category 5e	Category 6	Category 6A
1.47	1.61	1.73

Ambient temp	ItCat5e ma	ItCat6 ma	ItCat6A ma
25	1122.73	1229.66	1321.31
30	1039.45	1138.44	1223.29
35	948.88	1039.25	1116.71
40	848.70	929.53	998.82
45	735.00	805.00	865.00

- TSB-184 specifies 15°C as the maximum allowed temperature rise above ambient. Given a cable temperature rating of 60 °C and ambient temperature's above 45 °C.
- A table of maximum current per pair that can be supported by category 5e, 6 and 6A cabling without exceeding the cable temperature is provided.

Additional Installation Considerations

- Additional guidance for situations where installed cabling conditions differ from assumptions used above that include;
 - a maximum allowable temperature rise of 15 °C (max ambient of 45 °C)
 - a bundle size of 100 cables
 - power delivery on all four pairs.
- Cable bundle count >100 cables

Temperature rise for a category of cable v. cable bundle size (720mA per pair)

Number of cables	Temperature rise (°C)		
	Category 5e	Category 6	Category 6A
1	1.1	0.9	0.8
7	2.0	1.6	1.4
19	3.8	3.0	2.6
37	6.7	5.3	4.6
61	9.9	7.9	6.9
91	13.9	11.1	9.6
127	18.8	15.0	13.0
169	24.3	19.4	16.8

NOTE - The temperature rise (°C) is based upon a current of 720 mA per pair, for all pairs in all cables in the bundle.

Additional Installation Considerations

- Energizing the number of pairs within a 100 cable bundle for different cabling categories.
- The temperature rise for applications delivering 600 mA on two pairs of each cable in a 100-cable bundle of category 5e is 5 °C.

Temperature rise for category of cable vs. number of energized pairs in 100-cable bundle (600 mA per pair)

Number of pairs	Temperature rise (°C)		
	Category 5e	Category 6	Category 6A
24	0.6	0.5	0.4
48	1.2	1.0	0.9
96	2.4	2.0	1.7
144	3.6	3.0	2.6
192	4.8	4.0	3.5
200	5.0	4.2	3.6
236	5.9	4.9	4.2
284	7.1	5.9	5.1
332	8.3	6.9	6.0
380	9.5	7.9	6.8
400	10.0	8.3	7.2

NOTE - The temperature rise (°C) is based upon a current of 600 mA on each energized pair.

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