
**Comments#99
IEEE P802.3bt/D3.3**

Rosemont, IL

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

Purpose

- Provide supporting information for Comment#99

CI 145 SC 145.1.4 P115 L19 # r03-99

Diminico, Christopher

Comment Type **G** *Comment Status* **X**

The cautionary note on the use of cables with conductors smaller than 26 AWG should be replaced with reference to TIA-TSB-184-A Annex E. which is to provide installation guidelines to support the delivery of power over installations with 28 AWG cord cable.

Suggested Remedy



Replace cautionary note with reference to TIA-TSB-184-A Annex E in development under TR42.7 which is to provide installation guidelines to support the delivery of power over installations with 28 AWG cord cable.

Presentation to be provided.

Proposed Response *Response Status* **O**

TIA TR-42: TSB-184-A-1

TIA TR-42 Activities

- **TR-42.7 (Copper Cabling):**
 -  - New project: ANSI/TIA-568.2-D, “Balanced Twisted-Pair Telecommunications Cabling and Components Standard” circulating for default ballot
 -  - New project: TSB-184-A-1, “Guidelines for Supporting Power Delivery Over Balanced Twisted-Pair Cabling: Addendum 1, Guidance to Support 28 AWG Cords” circulating for committee ballot

http://www.ieee802.org/3/minutes/mar18/0318_TIA_TR42_report_to_802d3.pdf

TIA TR-42: TSB-184-A-1

TR-42.7 Meeting - 01/30/2018 - 01/31/2018

- Task Group chartered to draft text for 184-A-1 for impact of managing cord cables.

Content under discussion in TG:

Section: Impact of adjacent 28 AWG cord cable bundles

- Cord cable bundling
- Current limits for cord cables
- Vertical management (equipment rack configurations)
- IL margin for 28 AWG cord cables.
- Cord cables smaller than 28 AWG are not recommended.

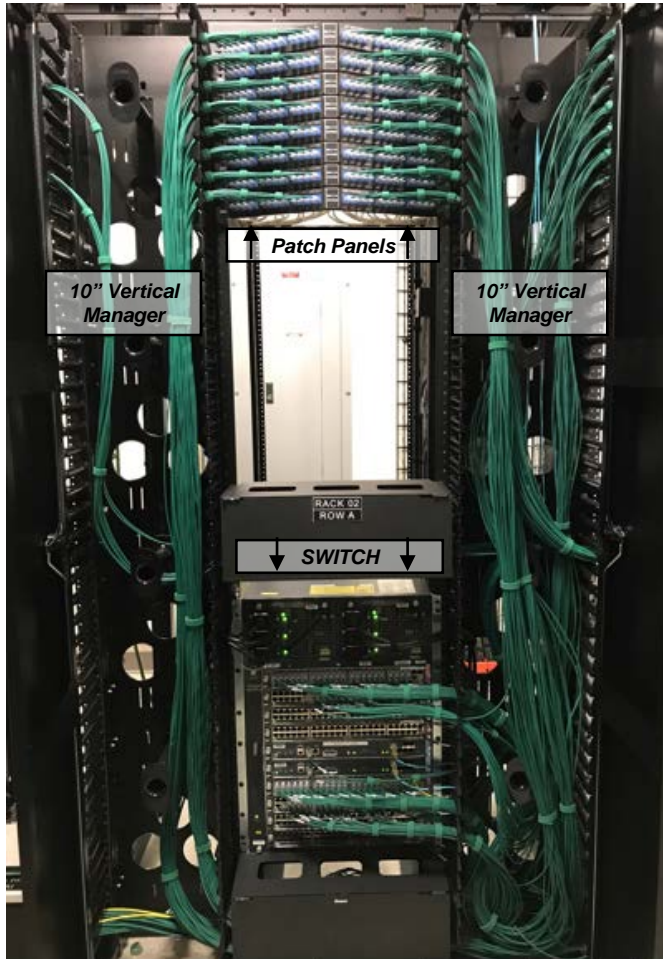
28 AWG Patch Cord PoE Testing

(Temperature Rise over Ambient in high density Switching Cabinets)

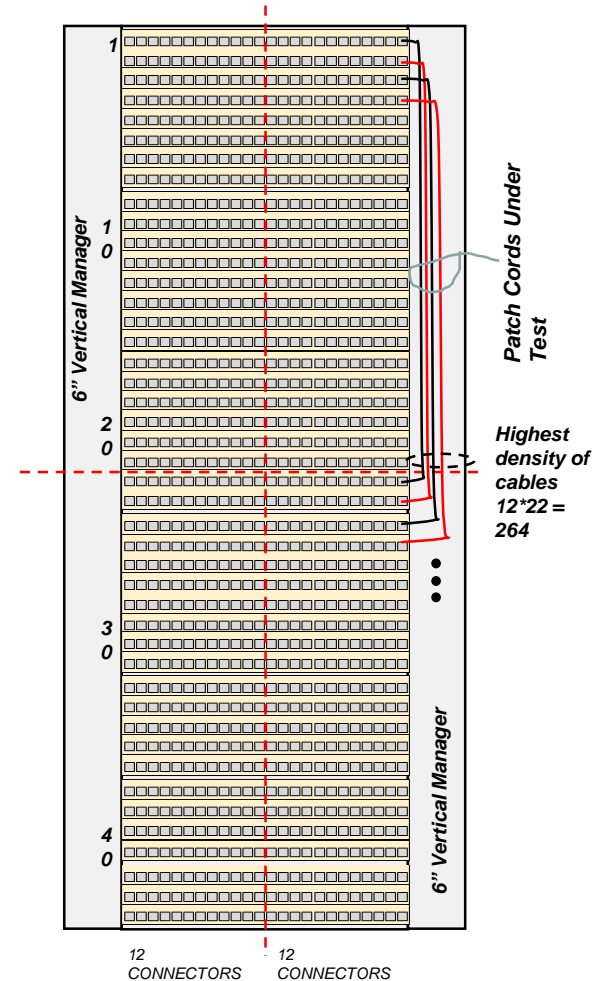
Source: Panduit

28 AWG Patch Cord Application

Patch Cords from top 22 Patch panels connected to the bottom 22 Patch panels in a one to one correspondence (only Right vertical manager used, only right ½ patch panel used)



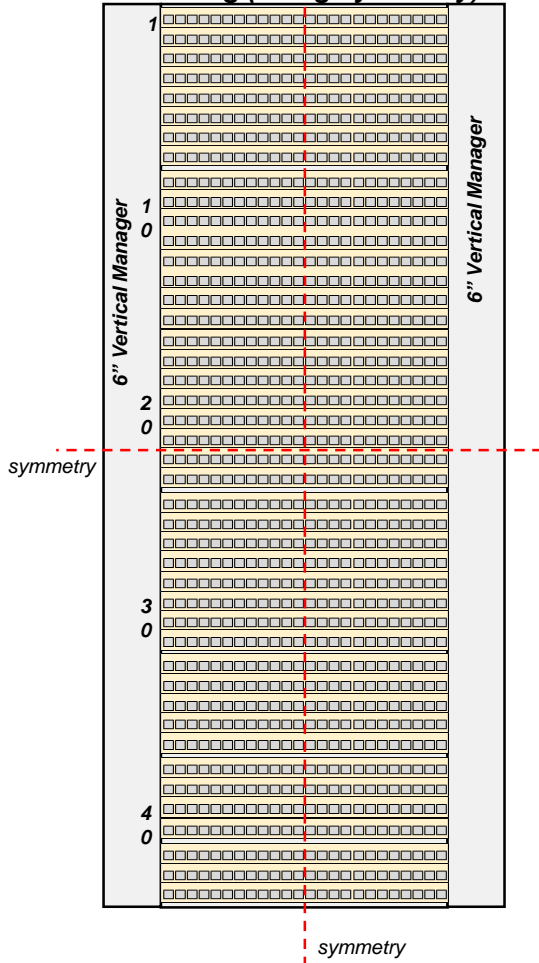
←
Simulating the Application
→



Source: Panduit

28 AWG Patch Cord Application

28 AWG Patch Cord Application Modeling (using symmetry)



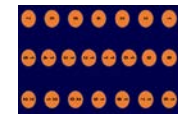
Patch Cord - Rack Under Test



RU22
Highest
Cord
density

Source: Panduit

- 22 bundles of 12 cables per bundle (e.g., 1 bundle per RU – ½ patch panel)
- 1A per pair for all 264 cables
- Vertical manager door shut during tests
- All bundles have 3 thermocouples placed in the center cable
 - One placed at RU22
 - One placed at Top (where it leaves vertical manager into Patch panel)
 - One placed at Bottom (where it leaves vertical manager into Patch panel)
- Measurements are done with the vertical manger door closed and:
 - In still air and with slight air movement
 - 28 AWG and 24 AWG patch cords
 - 6" & 10" wide Vertical Managers
- Bundles are configured as
 - Optimized in physical orientation



Airgaps
between
bundles

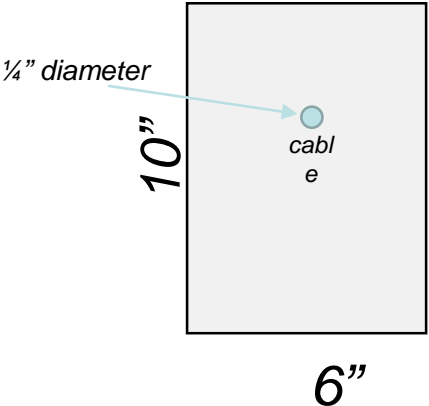
- Non-optimized (natural location)



No airgaps
between bundles
(super bundle)

Experimental Setup: Vertical Manager

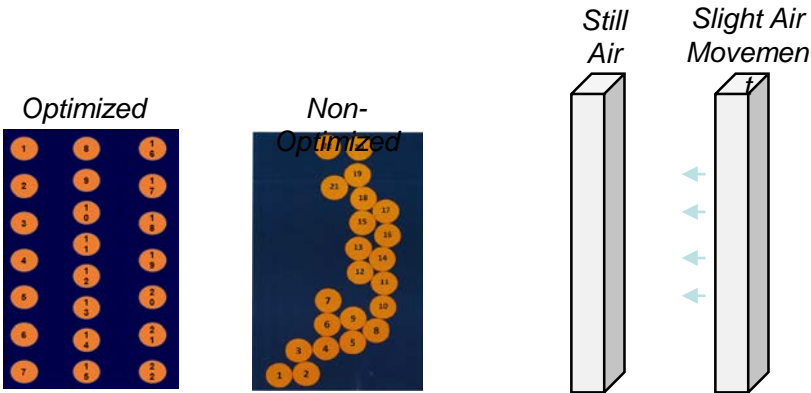
Cross Section Vertical Cable Manager (Top View)



Used during measurements

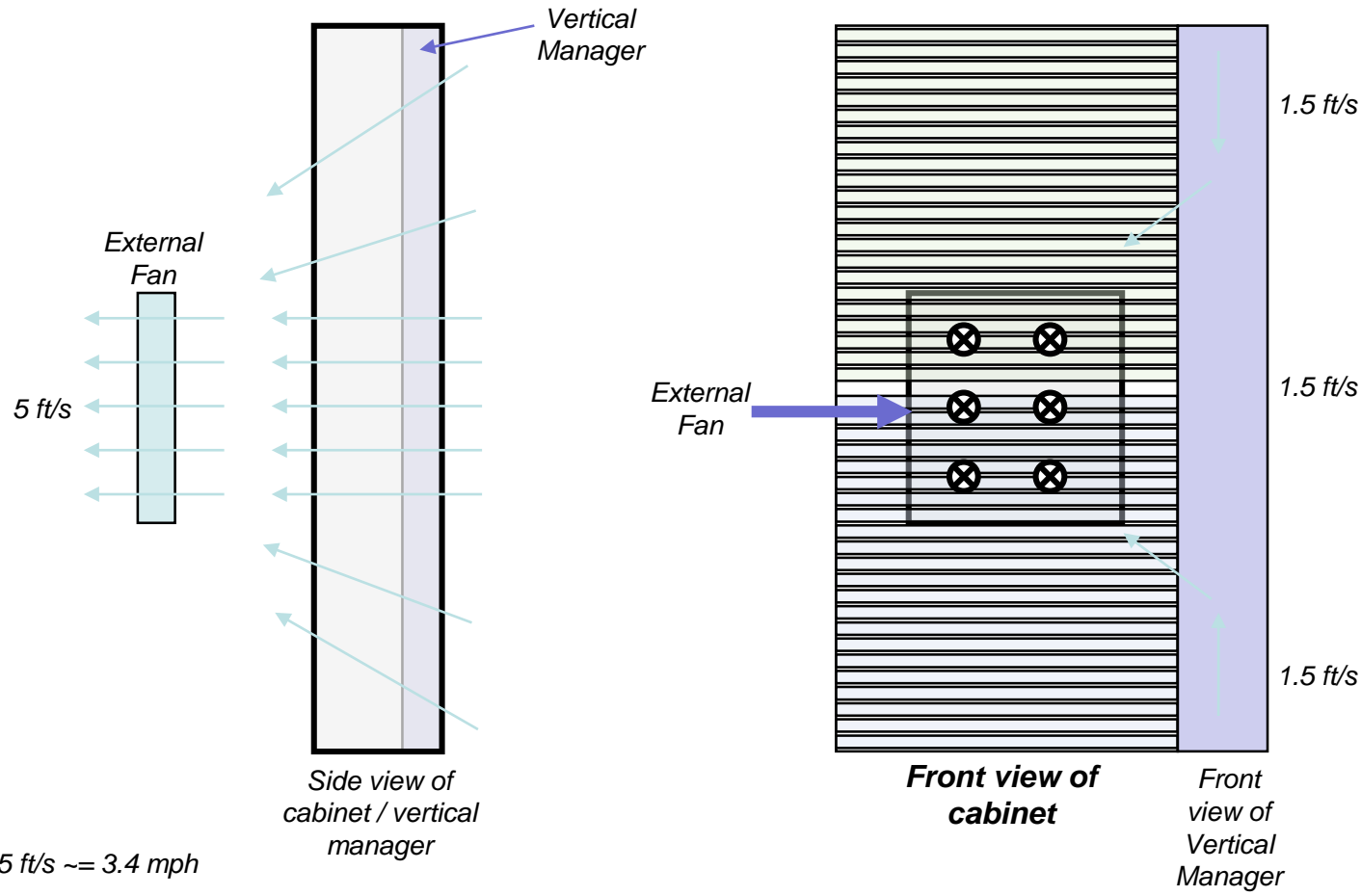
		Vertical Manager Cable Fill Percentage				
		30%	40%	50%	60%	
Used during measurements	6"	261	347	434	521	Cat 6 Cable (24AWG)
	8"	347	463	579	695	
	10"	434	579	724	869	
	12"	521	695	869	1042	
Used during measurements	6"	640	853	1066	1279	Cat 6 Cable (28AWG)
	8"	853	1137	1422	1706	
	10"	1066	1422	1777	2132	
	12"	1279	1706	2132	2559	

Cable Bundle Test Conditions:



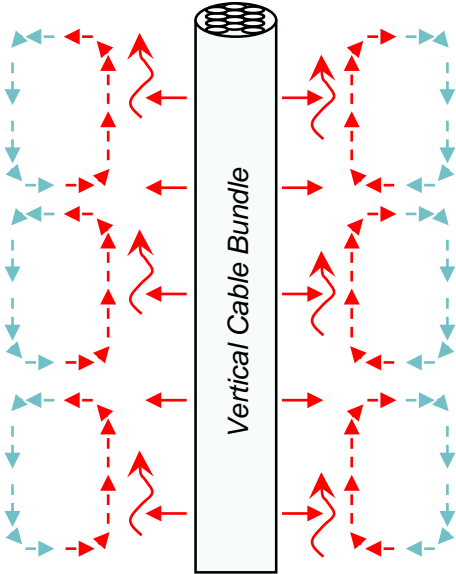
Assumed Cable Diameter (in) = 0.235	24 AWG
Assumed Cable Diameter (in) = 0.150	28 AWG
circular packing efficiency =	78.5%
Vert Mangr Dimension efficiency =	80.0%
depth of Vertical Manager =	10"

Experimental Setup: Slight air flow in the Vertical Manager

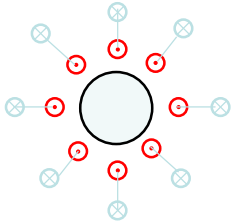


Calibration:

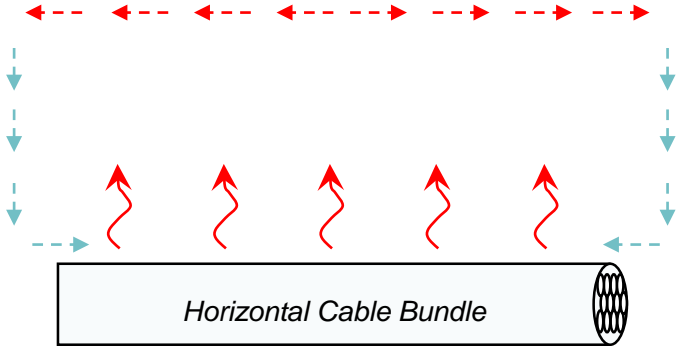
Calibration: What is the Temperature Rise over Ambient (TRoA) for a single 12-cable 28 AWG bundle



Small amount of self cooling due to convection air current



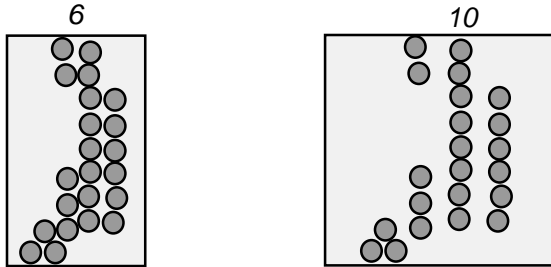
Measured Data
10.02 °C



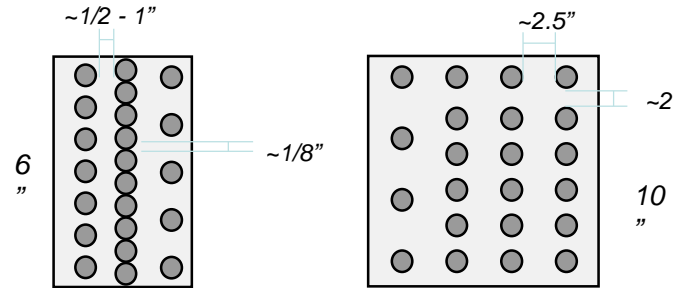
Using TIA TSB-184a
10.4 °C

Summary

Non-organized



Organized



Class 8 Power - No air

Organized Bundles in a 6" vertical manager – temp rise = 19

Organized Bundles in a 10" vertical manager – temp rise = 12

Non-Organized Bundles in a 6" vertical manager – temp rise = 27

Non-Organized Bundles in a 10" vertical manager – temp rise = did not measure but estimated to be 17

Class 8 Power - With slight amount of air

Organized Bundles in a 6" vertical manager – temp rise = 13

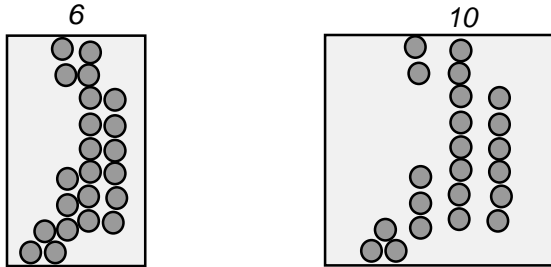
Organized Bundles in a 10" vertical manager – temp rise = 10

Non-Organized Bundles in a 6" vertical manager – temp rise = 25

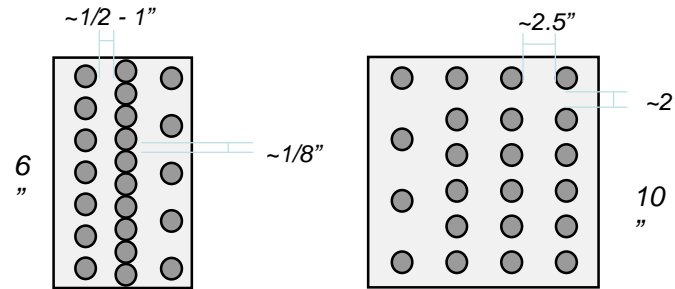
Non-Organized Bundles in a 10" vertical manager – temp rise = did not measure but estimated to be <17

Summary

Non-organized



Organized



Class 6 Power - No air

Organized Bundles in a 6" vertical manager – temp rise = 11.6

Organized Bundles in a 10" vertical manager – temp rise = 7.2

Non-Organized Bundles in a 6" vertical manager – temp rise = 16.4

Non-Organized Bundles in a 10" vertical manager – temp rise = did not measure but estimated to be 7

Class 6 Power - With slight amount of air

Organized Bundles in a 6" vertical manager – temp rise = 6.8

Organized Bundles in a 10" vertical manager – temp rise = 6.1

Non-Organized Bundles in a 6" vertical manager – temp rise = 14

Non-Organized Bundles in a 10" vertical manager – temp rise = did not measure but estimated to be <6

Recommendation

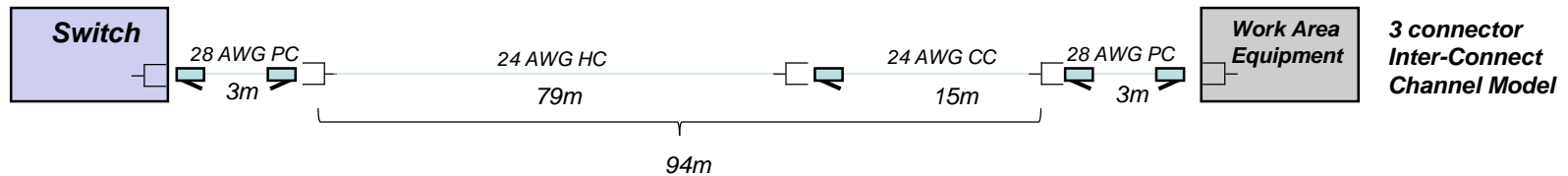
Replace sentence P302, L45: “Using cable smaller than 26 AWG is not recommended in powering applications.”

With:

Cable cords smaller than 26 AWG are not recommended for Class 8 or Class 7 powering applications. See TIA-TSB-A Annex E for installation guidelines when delivering power using 28 AWG cord cable.

BACKUP

What does this mean in regards to Ethernet performance when the TRoA of these 28 AWG Patch Cords are high?



Determine the following:

- 1.) Insertion loss in the above model except using 24/26/28 AWG Patch Cords (all cables at 20°C)
 - a.) IL when all cable at 20°C except for equipment room Patch Cord(s) at 35°C
 - b.) IL when all cable at 40°C
 - c.) IL when all cable at 40°C except for equipment room Patch Cord(s) at 55°C

Cat 6 Max Insertion Loss Specification (dB)	Max Frequency 250MHz			Cat 6a Max Insertion Loss Specification (dB)	Max Frequency 500MHz		
	35.94 at 20°C	all cable at 40°C	all cable at 40°C PC = 55°C		49.31 at 20°C	all cable at 40°C	all cable at 40°C PC = 55°C
(24 AWG PCs) Total (dB)	34.19	36.85	37.06	(24 AWG PCs) Total (dB)	47.14	50.81	51.10
derating horizontal cable length	0.00	3.00	4.00	derating horizontal cable length	0.00	3.00	4.00
(26 AWG PCs) Total (dB)	34.78	37.49	37.76	(26 AWG PCs) Total (dB)	47.96	51.69	52.05
derating horizontal cable length	0.00	5.00	6.00	derating horizontal cable length	0.00	5.00	6.00
(28 AWG PCs) Total (dB)	35.57	38.34	38.68	(28 AWG PCs) Total (dB)	49.04	52.86	53.32
derating horizontal cable length	0.00	7.00	8.00	derating horizontal cable length	0.00	8.00	9.00

Note: max combined Patch Cord Lengths for 24AWG = 10m, 26AWG = 8m, and for 28AWG = 6m