Panduit 28 AWG Patch Cords Installation Guideline

Introduction

Panduit is a leading supplier of Structured Cabling Systems and Unified Physical Infrastructure. Panduit solutions enable the physical infrastructure to be scalable, flexible, and easily manageable, while supporting Ethernet communications at ever-increasing data rates.

Panduit is aware of the many challenges presented by today's commonly used patch cords. These challenges include the amount of space required for cable management, restricted airflow, inconsistent performance characteristics between vendors, and the increasing pressure to find cost effective solutions.

Panduit has developed a small diameter patch cord using 28 AWG conductors that can be used in Category 6 and Category 5e installations to facilitate deployments through ease of wire management and improved airflow.

Background

Panduit 28 AWG Category 6 and Category 5e patch cords use the standard RJ45 plug interface and a significantly smaller cable with 28 AWG conductors. Typical Category 6 and Category 5e patch cords use 24 AWG conductors. While 24 AWG patch cabling is sufficient for many applications, it can present challenges with cable management. For example, cabinets populated with hundreds of patch cords may have issues with airflow, difficulty accessing certain ports, and trouble finding space for clean cable management. This can make simple moves, adds, and changes a challenge. Panduit 28 AWG patch cords alleviate many of these concerns by offering standard compliant parts using significantly smaller cable.

The main advantages of these patch cords are:

- Smaller diameter cords occupy less than ½ the space of traditional patch cords. This enables simplified wire management and improved airflow, reducing pathway fill and operating costs.
- Smaller wire gauge offers improved flexibility for easier moves, adds, and changes.
- Tighter bend radius provides ultimate flexibility in patch cable routing, dressing, and management.

While providing these benefits, the user should be aware of the following limitations:

- Higher attenuation, which means a higher de-rating factor must be used when designing channels.
- If running PoE or PoE+ applications, bundle size is limited due to heat dissipation.

Relationship to Standards

Performance Standards

ANSI/TIA-568-C.2 and ISO 11801 Edition 2.1 define performance standards for Ethernet communication systems and their sub-components. Panduit 28 AWG Category 6 and Category 5e patch cords are designed to meet applicable patch cord requirements, and are 100% tested to component level requirements for wire map, NEXT, and return loss. They are compliant to patch cord standards when using an attenuation de-rating factor of 1.9.

Connector Standards

IEC 60603-7 specifications include common dimensions, mechanical, electrical, and environmental characteristics (and applicable tests) for the plug and jack. These specifications ensure all plug and jacks that are in compliance to this standard are intermateable. Panduit 28 AWG patch cord plugs meet all IEC 60603-7 requirements.

IEC 60352-6 governs solderless connections for insulation piercing contacts. While it may be a lesser-known specification, it is extremely relevant for plugs. These tests ensure the plug contact / cable conductor interface maintain acceptable performance for the life of the connection. Panduit 28 AWG patch cord plugs meet IEC 60352-6 requirements.

Power over Ethernet

TSB-184, “Guidelines for Supporting Power Delivery Over Balanced Twisted-Pair Cabling” is a technical service bulletin published by TIA. TSB-184 recommends a maximum temperature increase of 15 degrees for a bundle of cables operating at full PoE or PoE+ power. Panduit, as well as typical 24 AWG Category 6 and Category 5e patch cords, meet this requirement for bundles up to 100 cables. Panduit 28 AWG patch cords meet the temperature rise recommendation for bundles up to 40 cables.

Value Proposition

The table below provides a comparison of several important parameters for Panduit 28 AWG and Panduit 24 AWG patch cords.

Table 1 - Comparison of Panduit 28 AWG and 24 AWG Patch Cords

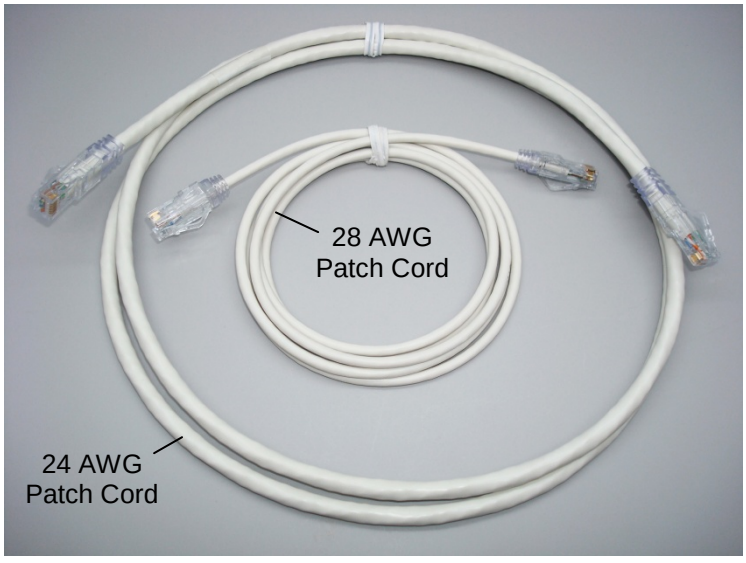
Parameter	Panduit 28 AWG Category 6 and Category 5e Patch Cords	Panduit 24 AWG Category 6 and Category 5e Patch Cords
Cable diameter	0.15 in (3.8mm)	0.20-0.23 in (5-5.8mm)
Cable cross sectional area	0.017 in2 (11.0 mm2)	0.042 in2 (27.1 mm2)
Cable capacity of PRVF6 vertical manager – 35% fill	749	305
Recommended bend radius	0.60 in (15mm)	1.00 in (25mm)
Attenuation de-rating factor	1.9	1.2
Maximum channel length with 10 meters of patch cords	93 meters	100 meters
Maximum patch cord length used with 90m PL	6 meters	10 meters
PoE/PoE+ use	Yes. Up to 40 cables per bundle	Yes. Up to 100 cables per bundle
Exceeds applicable ANSI/TIA-568-C.2 and ISO 11801 Edition 2.1 patch cord requirements	Yes (de-rated for 28 AWG conductors)	Yes
100% performance tested for wire map, NEXT, and return loss	Yes	Yes
Plug exceeds IEC 60603-7 and IEC 60352-6 specifications.	Yes	Yes
The plug is centered within the ANSI/TIA-568-C.2 range.	Yes	Yes
Plug contacts plated with 50 micro inches of gold and rated for 2500 cycles	Yes	Yes
Part of Panduit Certification plus warranty	Yes	Yes

Space Saving

Panduit 28 AWG Category 6 and Category 5e patch cords offer a significant space saving benefit over traditional 24 AWG patch cords. Figure 1 illustrates the space savings realized when Panduit 28 AWG patch cords are routed to 48-port switch line cards. Figure 2 illustrates the physical differences between Panduit 28 AWG and traditional 24 AWG patch cords of equal length.

Figure 1 – 24 AWG Patch cords (white) vs. 28 AWG patch cords (blue)

Figure 2 – 7 ft Category 6 patch cords, 24 AWG vs. 28 AWG



Length Guidelines

The maximum length of a channel depends on the de-rating factor of the cabling components within the channel (patch cords, zone cords, and horizontal cabling). Panduit horizontal cable has a de-rating factor of 1. Panduit 24 AWG patch cords have a de-rating factor of 1.2. Panduit 28 AWG patch cords have a de-rating factor of 1.9. The maximum length of a channel (in meters) is calculated by:

*(De-rating of horizontal) * (Horizontal Length) + (De-rating of patch)*(Patch Length) ≤ 102 m.*

This equation supports the following channel lengths and configurations for Panduit 28 AWG patch cords.

Channel length with a 90 meter permanent link

- 90 meters of total horizontal cable length
- 6 meters of total 28 AWG patch cord length
- 96 meter channel length

Channel length with 10 meters of 28 AWG patch cords

- 83 meters of total horizontal cable length
- 10 meters of total 28 AWG patch cord length
- 93 meter channel length

100 meter channel length

- 98 meters of total horizontal cable length*
- 2 meters of total 28 AWG patch cord length
- 100 meter channel length
  * Note that 98 meters will not pass Category 6 Permanent Link testing with a field tester; however, the total channel will pass channel testing and Ethernet traffic.

These channel configurations employing Panduit 28 AWG patch cords will exceed all performance requirements defined in ANSI/TIA-568-C.2 and ISO11801 Edition 2.1.

Table 2 - Summary of total patch cord length vs. maximum channel length.

Total 28 AWG Patch Cord Length		Maximum Total Horizontal Cable		Maximum Total Channel Length	
Meters	Feet	Meters	Feet	Meters	Feet
2	7	98	321	100	328
3	10	96.3	316	99.3	326
4	13	94.4	310	98.4	323
5	16	92.5	303	97.5	320
6	20	90	295	96	315
7	23	88.7	291	95.7	314
8	26	86.8	285	94.8	311
9	30	84.9	278	93.9	308
10	33	83	272	93	305
20	66	64	210	84	276
30	99	45	148	75	246
40	131	26	85	66	216
50	164	7	23	57	187
53	174	N/A	N/A	53	174

Summary

Panduit 28 AWG Category 6 and Category 5e patch cords offer a variety of benefits to the end user such as utilizing less space, improving airflow and the potential for reduced operating costs. The improved flexibility saves time on moves, adds, and changes, while the tight bend radius enables improved cable routing and management in high density applications. Panduit 28 AWG patch cords provide a unique and useful cable management solution for today's data centers.

Panduit 28 AWG Patch Cord Ordering Guide		
Category	**Part Number**	**Suffix**
Category 6	UTP28SP**xx	** = length
Category 5e	UTP28CH**xx	xx = color code^
^ blank = off white, BU = blue, BL = black, GR = green, OR = orange, RD = red, VL = violet, YL = yellow		
UTP28SP7 = Category 6, 7-ft, off-white UTP28CH3MYL = Category 5e, 3-meter, yellow		