



ATT-TP-76419

Common Systems: Standard Twist and Tight Twist Distributing Frame Wire Standards for the AT&T LOCAL EXCHANGE Companies

Presented in this document are the standards for the manufacturing and installation of Standard Twist and Tight Twist Distributing Frame Wires within AT&T central offices and remote terminals.

To: The primary audience for this document are AT&T Communications Inc subsidiaries in the following disciplines: Local Field Organization (LFO-IN), Special Services (LFO-OUT), Switch Capacity Planner/Engineer, Equipment Engineer, Digital Transport Engineer (DTE), Maintenance Engineer, Space Planner, Frame Planner, Long Range Technical Planners, Outside Plant, and Fundamental Network Planners. This document is to be used both within and outside AT&T LOCAL EXCHANGE companies and their Authorized Vendors.

Effective Date: August 28, 2006

Issue Date: Issue 2, 02/01/08

Expires On: Expires upon reissue

Related Documents: See Reference Section

Canceled Documents: All previous issues of ATT-TP-76419

Business Unit: Network

Points Of Contact: See Contact List .

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1. Copyright

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Publisher:

Network Planning & Engineering – Common Systems and Transport Standards
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2. Reason for Reissue

Issue 2 - Updated standards and testing procedures

3. Introduction

Standard twist distributing frame wire products allow for the deployment of lower speed service circuits such as POTS, and Sub -T1(1.544 Mb/s) within the distributing frames of AT&T central offices. These standard twist distributing frame wire products may be manufactured in the following colors: White/Blue/Red/Green(4 conductor), White/Orange(2 conductor), White/Blue(2 conductor), White/Red(2 conductor), Yellow/Blue/Red/Green(4 conductor), Yellow/Orange(2 conductor), Yellow/Blue(2 conductor), and Yellow/Red(2 conductor). Tight twist, two(2) conductor, distributing frame wire products allow for the deployment of both xDSL and HI-CAP (T-1/HDSL) circuits within the distributing frames of AT&T central offices. The xDSL frame wire product is colored Violet/Blue, while the HI-CAP (T-1/HDSL) frame wire product is colored Violet/Red. These frame wire products are manufactured with a tight twist in order to minimize the impacts of electromagnetic interferences within the indoor environment that may lead to a disruption of either xDSL, HI-CAP (T-1/HDSL) or both services within AT&T central offices. xDSL represents the family of DSL services except for HDSL. Typical types of xDSL that are represented: ADSL, CDSL, SDSL, VDSL, etc. HDSL is exclusive to T-1/DS-1

services and is very disruptive to the rest of the xDSL family of services.

4. Description

Standard twist and tight twist distributing frame wire products are manufactured in both 22 gauge and 24 gauge sizes. The 22 gauge product is intended for use on the Main Distributing Frame (Conventional type), while the 24 gauge product is intended for use on the COSMIC (Modular) Distributing Frame. The wire must meet the AT&T mechanical and transmission performance specifications for twisted pair, standard twist and tight twist, distributing frame wires. These frame wires must conform to both Telcordia GR-136 and be UL listed as a communications wire/cable. The wire nickname used on distributing frames is "Jumper Wire".

5. Construction and Packaging

- Conductors: 22 AWG and 24 AWG solid tinned annealed copper
- Conductors and sheaths will be continuous without splices of any kind
- Insulation: flame retardant semi-rigid Polyvinyl Chloride (PVC), 90 degrees C, Nominal Thickness 0.008"
- Pairing: Twisting sufficient to meet electrical characteristics requirements as follows:
22 AWG and 24 AWG Standard Twist distributing frame wires will both have a maximum pair lay of 3.00 inches. Transport speeds carried over these standard twist products are expected to be under 1.544Mb/s.
22 AWG and 24 AWG Violet/Blue xDSL distributing frame wires will both have a pair lay of 1.00 inch
22 AWG and 24 AWG Violet/Red HI-CAP (T-1/HDSL) distributing frame wires will both have a pair lay of 0.750 inch. Transport speeds carried over these tight-twist products are expected to be at 1.544Mb/s and higher.
Twist lengths for Violet/Blue and Violet/Red tight-twist products are different to minimize possible spectrum interference to xDSL services by HI-CAP services.
- Insulation Color Coding(Standard Twist): White/Blue/Red/Green and Yellow/Blue/Red/Green for 3-Wire and 4-wire Specials, White/Orange and Yellow/Orange for Cutover Frame Wire, White/Blue and Yellow/Blue for POTS, and White/Red and Yellow/Red for 2-Wire Specials. Note: The "White" insulation color indicates use on the Main Distributing Frame with 22 AWG Standard Twist Frame Wires, while the "Yellow" insulation color indicates use on the COSMIC Distributing Frame with 24 AWG Standard Twist Frame Wires .
- Insulation Color Coding(Tight Twist): Violet/Blue for xDSL and Violet/Red for HI-CAP (T-1/HDSL)
- Shielding: None
- Drain Wire: None
- Ripcord: None
- Outer Jacket: None
- Splices: None allowed for both continuity and non-continuity type splices
- Shiners: None allowed and must have a feedback mechanism to shut down the production line in case a shiner, bare copper under insulated wire, is detected
- Tangling: None allowed and must have a feedback mechanism to shut down the production line in case a tangled frame wire is detected
- Packaging: Available on black-plastic tapered reels and on coils

6. Electrical Characteristics and Operating Temperature

- Electrical characteristics are defined at 20 degrees C.
- Continuity and Shorts: All finished frame wire will meet the requirements of Telcordia Document GR-492-CORE, Section 7.1.
- Voltage Breakdown: Any length of the conductor must be capable of withstanding a minimum of 2,500 Volts AC (RMS) or 3,500 Volts DC. Voltage to be applied for at least one second between each conductor and all other conductors to be electrically connected.
- Insulation Resistance: Wet: 300,000 mega ohm feet minimum from the conductor to water
- DC Conductor Resistance:
22 AWG – 18.0 Ohms/1000 ft, maximum
24 AWG - 28.6 Ohms/1000 ft, maximum
- Coaxial Capacitance:
22 AWG - 0.150 Microfarads/kft @ 1KHz, nominal
24 AWG - 0.125 Microfarads/kft @ 1KHz, nominal
24 AWG - 28.6 Ohms/1000 ft, maximum
- Characteristic Impedance:
22 AWG – 100 Ohms @ 1MHz, nominal
24 AWG – 100 Ohms @ 1MHz, nominal
- Operating Temperature: 85 degrees C, maximum

7. Additional Design Requirements

Conductors:

Factory joints, elongation and tin finish will all meet the requirements of GR-492-CORE; sections 2.3, 2.4 and 2.5, respectively. Note: maximum elongation for 22 AWG conductor shall be 30% and maximum elongation for 24 AWG conductor shall be 26%.

Breaking Strength – for 22 AWG conductors, 14 lbf (62 N) and for 24 AWG conductors, 9 lbf (40N).

Insulation:

Eccentricity – Insulated conductors will meet the requirements of GR-492-CORE, Section 4.2.

Porosity – When examined under 5X magnification, no porosity will be observed.

Tensile Strength – Minimum of 2,000 psi (13.8 MPa).

Ultimate Elongation – Minimum value of 150% for non-cross linked PVC; Minimum value of 100% for cross-linked PVC

Compression Resistance – Minimum value of 300 lbf for both 22 AWG and 24 AWG non-Cross Linked PVC; Minimum

value of 900 pounds for 22 AWG and 750 pounds for 24 AWG cross-linked PVC

Shrink Back – Not to exceed 3/16 inch, for both ends of a tested sample

Cut-Through Resistance – 4.0 lbs for 22 AWG and 3.5 lbs for 24 AWG non-cross linked PVC; 5.0 lbs for 22 AWG and 4.5 lbs for 24 AWG cross-linked PVC

Solder Heat Resistance – Minimum average resistance of 1.0 seconds for non-cross inked PVC and 1.5 seconds for cross-linked PVC

Resistance to Heat Aging – At a temperature of 100+/- 2 degrees C, the insulation will be able to retain 70% of its pre-tested elongation. The insulation will be capable of meeting its Munsell color characteristics when subjected to heat aging.

Heat Shock – When a sample is wrapped for six (6) turns around a steel mandrel, whose diameter is no greater than the diameter of the completed frame wire, and heated for one (1) hour at 70 degrees C, the sample shall retain 70% of its pre- tested elongation.

Adhesion – A maximum force of 4 lbs, and 3 lbs will be needed to remove insulation from the 22 AWG and 24 AWG conductors, respectively.

Cold Bend – Samples will be tested according to GR-492-CORE, Section 4.4.9, except that the test temperature will be -20 +/- 2 degrees C.

Insulation Scrape Abrasion – Samples of both standard twist and tight twist frame wires will be tested using a NOVA 600 Scrape Abrasion Tester, or equivalent device, using a 1000 gram (2.2 pound) load-weight in conjunction with a 1/16 inch diameter, ground hardened steel, cylindrical scrape head rod. The loaded scrape head will move back and forth along a stroke length of 3/8 inch of the sample under test and will replicate this motion at a rate of 60 cycles per minute. One cycle consists of one(1) forward and one(1) backward motion. Paired frame wires will have the “tip” portion of the insulated wire and “ring” portion of the insulated wire “separately” tested as samples. When the scrape rod exposes the bare, tinned copper, wire underneath the scraped-off insulation, the scrape abrasion tester will automatically stop and the number of cycles will be recorded on a digital counter. The minimum number of cycles for a “passing” insulation scrape abrasion test will be as follows: 22 AWG frame wire (each separate color of tip and ring) – 30 cycles; 24 AWG frame wire (each separate color of tip and ring) – 25 cycles.

Insulation Flammability – Insulated conductors will meet the fire resistance requirements of the latest issue of TR-NWT-000063, Network Equipment – Building System (NEBS) Generic Equipment Requirements, Sections 4.3 and 5.3. In addition, a maximum of two (2) of ten sample specimens may burn when tested at 28% oxygen level for a maximum of three (3) minutes of time, when tested in accordance with ASTM D2863-77.

Color Coding Requirements – Frame wire colors will meet the standards contained per ASTM D 1535-89, Standard Test Method for Specifying Color by the Munsell System under the North Sky Daylight equivalent of having a correlated color temperature of 7400 degree Kelvin.

8. Testing and Validation

All production samples of manufactured standard twist and tight twist distributing frame wires must pass the testing requirements contained within this document before potential purchase by AT&T is contemplated. At the request of AT&T technical staff, random samples will be forwarded to AT&T or a third party for validation at the wire manufac-

turer's cost.

9. References

For further information or electronic copies of this document and related information, AT&T employees may visit the internal AT&T LOCAL EXCHANGE companies Web site: <http://apex.att.com>.

The external web site is: <https://ebiznet.att.com/attnebs/>

Telcordia documents may be obtained directly from Telcordia Technologies Inc.

9.1. *AT&T Documents*

Document Number	Document Description	Issue
ATT-TP-76200	AT&T Network Equipment Building Systems	Current
ATT-TP-76300	AT&T Installation Guide Within the Central Office	Current
ATT-TP-76305	AT&T Cable Installation & Removal	Current
ATT-TP-76305-001	AT&T SNFA Cable Installation & Removal	Current
ATT-TP-76305-002	AT&T 48V DC Power Single Line Diagrams	Current
ATT-TP-76400	AT&T Firestopping (non-workmanship & process)	Current
ATT-TP-76400	AT&T Detail Engineering Requirements for the C.O.	Current
ATT-TP-76401	AT&T Space Planning	Current
ATT-TP-76401-001	AT&T Floor Loading Considerations	Current
ATT-TP-76407	AT&T Equipment Framework	Current
ATT-TP-76408	AT&T Equipment Superstructure	Current
ATT-TP-76410	AT&T Raised Floors	Current
ATT-TP-76212	AT&T Telco Electrical and Optical Ethernet Standards	Current
ATT-TP-76413	AT&T Connecting block Standards	Current
ATT-TP-76416	AT&T Bonding and Grounding	Current
ATT-TP-76430	AT&T Synchronization Standards	Current
ATT-TP-76450	AT&T Common Systems Standards Overview	Current
ATT-TP-76450-001	AT&T Common Systems Checklist	Current
ATT-TP-76450-002	AT&T Common Systems Exception & Evaluation Request	Current
ATT-TP-76460	AT&T Fiber Optic Protection in the Central Office	Current
ATT-TP-76461	AT&T Fiber Optic Connector Cleaning	Current
ATT-TP-76461-002-531-050	AT&T LFO-In Central Office Wire Standards	Current

9.2. Telcordia Documents

Document Number	Document Description	Issue
GR-136-CORE	Telcordia - Generic Requirements for Distributing Frame Wire	Current
GR-137-CORE	Telcordia - Generic Requirements for Central Office Cable	Current
GR-518-CORE	Telcordia – Generic Switch Synchronization	Current
GR-253-CORE	Telcordia – SONET Synchronization for the Network	Current
GR-436-CORE	Telcordia – Digital Synchronization Plan	Current
GR-1209-CORE	Telcordia – Generic Requirements for Fiber optic Branching Components	Current
GR-449-CORE	Telcordia – Generic Requirements for Fiber Distributing Frames	Current
GR-1421-CORE	Telcordia – Generic Requirements for ESD-Protective Circuit Packet Containers	Current

10. Key Words/Search Words

These are the words and phrases that users will search on:

- Common Systems
- NP&E
- Tight Twist
- Jumpers
- Cross-Connect
- xDSL
- T1

- DS1
- Test parameters
- Electrical characteristics
- Design requirements
- 22 AWG
- 24 AWG
- wire

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Acronyms

A.1. Document Specific Acronyms

N/A

A.2. Network Acronyms Dictionary

[Refer to ATT-000-000-020, Network Acronyms Dictionary.](#)