



# **ATT-TP-76419**

## **Standard Twist and Tight Twist Distributing Frame Wire Standards for the AT&T LOCAL EXCHANGE companies**

### **Abstract**

**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.**

**Audience:** 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.

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## 1. Copyright Page

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## 2. Reasons for Reissue

Issue 2 contains the following updates:

Issue 2, Section 5: Twist Length(pair lay) for Violet/Red Hi-CAP(T-1/HDSL) Tight Twist distributing frame wires changed from 0.625 inch to 0.750 inch.

Issue 2, Section 5: New requirements stated for splices, shiners, and tangling of all frame wires.

Issue 3 contains the following updates:

Issue 3, All Sections: Standard Twist Distributing Frame Wire is added to this AT&T standard document.

Issue 3, Section 5: States requirements that do not allow any splices, whatsoever, and to allow for transport of 1.544Mb/s and higher signals.

Issue 3, Section 10: Contact names are updated.

### 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

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
- 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.

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 – 3.0 lbs for 22 AWG and 2.5 lbs for 24 AWG non-cross linked PVC  
4.0 lbs for 22 AWG and 3.5 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 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.

Insulation Imperfections – Insulation will meet the requirement for ultraviolet light resistance when testing is performed in accordance to ASTM G 53-95.

Insulation Surface Friction – Completed frame wire will meet the requirements for insulation friction resistance per Appendix A of GR-136-CORE, Issue 1, October 1995.

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 manufacturers 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.sbc.com>.

The external web site is: <https://ebiznet.sbc.com/sbcnebs/>

Telcordia documents may be obtained directly from Telcordia Technologies Inc.

### 9A. 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-76306     | AT&T-Firestopping (non-workmanship & processes)      | Current |
| ATT-TP-76400     | AT&T-Detail Engineer 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-76412     | AT&T-Telco Electrical and Optical Ethernet Standards | Current |
| ATT-TP-76413     | AT&T-Connecting Block Standards (89-MDF type)        | Current |
| ATT-TP-76416     | AT&T-Bonding & Grounding                             | Current |
| ATT-TP-76419     | AT&T-Tight-Twist Distributing Frame Wire Standards   | 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-002-531-050  | Frame: LFO-In: Central Office Frame Wire Standards   | Current |

## 9B. Telcordia Documents

|              |   |         |
|--------------|---|---------|
| 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 |

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