



# ATT-TP-76412

## AT&T Customer Interface Standards for 100Mbps and Higher Excluding SONET Interfaces

### Abstract

Presented in this document are the AT&T Optical Standards, including customer interface standards for services with transmission speeds 100 Mbps and higher excluding SONET interfaces. This document incorporates the latest Optical connectivity standards within the telecommunications industry and provides the going-forward path for all AT&T Optical connectivity within the Central Office, the Non-Central Office IXC Carrier POP and the Customer Premise.

**Audience:** The primary audience for this document are AT&T LOCAL EXCHANGE companies in the following disciplines: Local Field Organization (LFO-IN), Special Services (LFO-OUT), Switch Capacity Planner/Engineer, Transport Equipment Engineer (TEE), Facility Equipment Engineer (FEE), 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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**Issuing Dept:** AT&T Services, Network Planning & Engineering (Common Systems & Transport)

**Business Unit:** Network

**Documents Coordinator:** Mike Yeilding – (925) 823-4747, E-Mail: [my1515@att.com](mailto:my1515@att.com)

### Author:

Mike Yeilding – (925) 823-4747, E-Mail: [my1515@att.com](mailto:my1515@att.com)

## Table of Contents

<b>1. COPYRIGHT PAGE.....</b>	<b>3</b>
<b>2. REASONS FOR REISSUE .....</b>	<b>4</b>
<b>3. INTRODUCTION .....</b>	<b>6</b>
<b>4. CENTRAL OFFICE FIBER DISTRIBUTION .....</b>	<b>6</b>
4.1 FIBER DISTRIBUTION FRAME (FDF) .....	6
4.2 FIBER PROTECTION SYSTEM .....	7
<b>5. OPTICAL TRANSMISSION STANDARDS .....</b>	<b>7</b>
5.1 GENERAL.....	7
<b>6. CONNECTOR/MODE .....</b>	<b>9</b>
6.1 CONNECTOR/MODE INTERFACE STANDARD .....	9
6.2 APPROVED TERMINATIONS .....	9
6.2.1 <i>Approved AT&amp;T Central Office Terminations</i> .....	9
6.2.2 <i>Approved Customer Premises Terminations</i> .....	9
6.2.3 <i>Approved Non-Central Office Point of Presence IXC (POP) Carrier Sites</i> .....	9
6.3 APPROVED APPLICATION SERVICES .....	10
6.3.1 <i>Approved AT&amp;T Central Office Terminations</i> .....	10
6.3.2 <i>Approved Customer Premises Terminations</i> .....	10
6.3.3 <i>Approved Non-Central Office Point of Presence IXC (POP) Carrier Sites</i> .....	11
<b>7. AT&amp;T STANDARDS .....</b>	<b>11</b>
7.1 EXPECTATIONS FOR ILEC AND CLEC CABLING .....	11
<b>8. DO'S AND DON'TS OF CABLE/JUMPER PLACEMENTS AND TERMINATIONS .....</b>	<b>11</b>
<b>9. REFERENCES .....</b>	<b>13</b>
<b>10. CONTACT LIST .....</b>	<b>14</b>

## 1. Copyright Page

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## 2. Reasons for Reissue

Issue 5, Section 8: Changed the last bullet item from “10 times the diameter” to “20 times the diameter”.

Issue 4, Section-All: Change title of document from “AT&T Ethernet Standards” to “AT&T Customer Interface Standards for 100Mbps and Higher Excluding SONET Interfaces”.

Issue 4, Section-All: Restructure Document to be In-line with Updated Technology for Customer Application.

Issue 4, Section 3: Introduction updated in its entirety.

Issue 4, Section 4: Replace in its entirety with new section 4 “Central Office Fiber Distribution”.

Issue 4, Section 5: Replace in its entirety with new section 5 “Optical Transmission Standards”.

Issue 4, Section 6: Replace in its entirety with new section 6 “Connector/Mode”.

Issue 4, Section 7: Replace in its entirety with new section 7 “AT&T Standards”.

Issue 4, Section 8: Replace in its entirety with new section 8 “Do’s and Don’ts of Cable/Jumper Replacements and Terminations”.

Issue 4, Section 9: Replace in its entirety with new section 9 “References”.

Issue 4, Section 10: Replace in its entirety with new section 10 “Contact List”.

Issue 4 Section 11: Remove in its entirety.

Issue 3, Section 1: Copyright page updated in its entirety.

Issue 3, Section 9: Title changed from Going-Forward Standard to AT&T Standard, with two paragraphs, first on the current standard and the second concerning the going-forward standard.

Issue 3, Section 10: Reference Section updated in its entirety.

Issue 2, Section-All: Changed title of document from “Ethernet Standards for the AT&T LOCAL EXCHANGE companies” to “AT&T Ethernet Standards”

Issue 2, Section 8, Testing: Updated in its entirety.

Issue 2, Section 8, Paragraph 3: Test Set Manufacturers updated in its entirety.

Issue 2, Section 8, Paragraph 4: Tests to Perform added.

Issue 2, Section 8, Paragraph 5: Non-Supported Features and Expectations have been added.

Issue 2, Section 8, Paragraph 6: Do’s and Don’ts for service provisioning added.

Issue 2, Section 8, Paragraph 7: Compensation for Circuit Loss Considerations added.

Issue 2, Section 9: The Going-Forward Plan has been added

Issue 2, Section 9 & 10: Renumbered to 10 & 11.

Issue 2, Section 10, Reference Section: Updated in its entirety.

### 3. Introduction

The Optical Architecture will run from the Fiber Distributing Frame located either on the AT&T LOCAL EXCHANGE companies Central Office or the primary entrance facility to the building or campus structure. The Fiber Distributing Frame (FDF) will serve as the primary interface between AT&T LOCAL EXCHANGE companies network element bay and the far end termination point receiving the optical signal within the central office or at a customer premise. The FDF provides a centralized point for the organization and administration of the facility and intrabuilding equipment cables and provides re-arrangeable connections between any two terminations or appearances. All optical circuits passing through AT&T LOCAL EXCHANGE companies Central Offices will require termination on the FDF.

Optical services will be transported via other OSI Model, Network Layer 2 services such as Synchronous Optical Network (SONET) rings or WDM rings (e.g. MON Ring). The signal will be a stand-alone optical circuit from the Network Equipment routed through the FDF to the next Network Equipment element expected to be owned and managed by the customer and/or CLEC. At some point on the drop side of the FDF toward the customer, the Demarcation Point will be placed depending upon the Demarcation rules established by the customer/building owner and the respective state Public Utility Regulations.

### 4. Central Office Fiber Distribution

#### 4.1 Fiber Distribution Frame (FDF)

The FDF is planned to be the primary interface and cross-connect point for all Fiber Optic products, cabling and equipment on the telecommunications horizon, including optical Ethernet services. This frame will continue to be the primary cross-connect point with Intelligent Network Elements such as Optical Multiplexers, DWDM, FTM, and Optical Amplifiers. *The FDF is the direct cable cross-connect point for all AT&T LOCAL EXCHANGE companies Network Elements to one another.*

Optical services will traverse this FDF system for cross-connects to other Network Elements and Outside Plant (OSP) facilities. The best approach for connectivity will be the use of Fiber optic jumpers between all connection points within the Central Office.

The only exception to the FDF cross-connect philosophy will be in the instance where Media Converters are used to extend the range of the Electrical Ethernet and thereby converting the signal to an optical path to the distant converter. It is expected that one Media Converter would be placed within or adjacent to the Telco Network Equipment location and the other in the Ethernet Distributing Frame (EDF). **This will be the only instance where an optical Ethernet signal will not pass through or cross connect at the FDF.**

The FDF shall be the primary hub for the Local Exchange Company Central Office. The Fiber Protection System will be the primary tool for fiber optic cabling on each floor. The FDF will be treated as the common cable entrance and cross-connect point. When there is a need for fiber optic cabling to equipment on another floor, a tie cable will be terminated in a shelf on the FDF and will be directly terminated on a new satellite FDF bay on that other floor using a FOT shelf. The Fiber Protection Shelf will be extended from the FDF's to the equipment involved within the Central Office.

## 4.2 Fiber Protection system

*The Fiber Protection System* represents a separate and unique fiber optic protection system used only for fiber optic patchcords between Transmission and Switch equipment and the FDF. All equipment which uses fiber optic connectivity will hub to the FDF for all connections. This protection system will provide both separation from all other cable racks and will provide a protection of the fiber optic patchcords from installation activity in a Central Office.

The Protection System will provide a diverse route capability for the paths for primary or working routes from the Transport/Switch equipment to the FDF. The fiber pairs will be cross-connected at the FDF to either diverse OSP facilities or to other intraoffice equipment. The Protection System will be provided to within 2 inches of the Fiber Distribution Frame (FDF) and located to the adjacent vertical trough and at the same level horizontally as the Transport/Switching equipment termination point on the primary route. The Protect jumper will be routed differently through a parallel Fiber Protection System to the FDF. **Fiber Optic Cables will not be placed in the raceway/duct work of the Fiber Protection System.**

Do not place any jumper slack or in-line attenuators in the Fiber Protection System. All attenuators will be affixed to the faceplate of FOT panels located within the FDF. All slack will be stored within the slack containment areas of the FDF.

## 5. Optical Transmission Standards

### 5.1 General

All fiber optic cables, jumpers and connectors will meet or exceed the standards set forth in this document, ATT-TP76412-000, **AT&T Customer Interface Standards for 100 Mbps and Higher Excluding SONET Interfaces** for the AT&T LOCAL EXCHANGE companies, Issue 4, dated April 15th, 2005. Only one of the two types of cable/connectors will be authorized for use with the SingleMode being the preferred type:

- SC-UPC, SingleMode 9 micron Fiber Cable/Jumpers, riser or plenum rated
- SC-UPC, MultiMode 50/125 micron Fiber Cable/Jumpers, riser or plenum rated (**May only be used at Customer Premises or Non-Central Office POP locations i.e. not allowed for Central Office or OSP use**)

The use of other types of cable and connectors may cause incompatibilities to be present with subsequent service degradation or outage as a result when connected to another cable/connector type. Factory manufactured jumpers are strongly recommended for any Telco Optical terminations. Fiber Cable connectors may be fused to one end of fiber cable or stubs on an exception basis. Special care must be taken on field fusing of connectors on MultiMode Fiber optic facilities due to their high loss characteristics. The following chart shows the standards for AT&T LOCAL EXCHANGE companies Optical Provisioning:

**AT&T Optical Operational Standards**

<b><i>Function</i></b>	<b><i>Applicability</i></b>	<b><i>Reason</i></b>
MM Fiber Cable type	50/125 micron (MM only)	Maximum Distance Reach & Transmission Speed
SM Fiber Cable Type	9 micron (SM only)	Suitability with Network
Connector	SC-UPC (Standard)	Interoperability
Operating Wavelengths (MM)	850 & 1300 nm	MultiMode as it exists today
Maximum Overall Attenuation (MM)	-3.75 dB/km at 850 nm -1.5 dB/km at 1300 nm	Loss per kilometer
Maximum Attenuation per connector	0.75 dB per pair of mated connectors using SC (or SFF)	Critical SM & MM signal limitations
Maximum Attenuation per Splice	0.3 dB per splice	Critical SM & MM signal limitations
Overall Distance Limitations (MM)	2,000 meters between the main FDF and any remote cross-connect element (MM only)	This is heavily dependent on the transceiver devices.
Cross-Connect Jumpers	Greater than 5 feet	Do not permit the placement of jumpers too short, may cause service issues.
When Terminated	All Fiber cable strands will be terminated at the time of original installation into established fiber panels	Termination protection
Customer Interface Standard	ATT-TP76412-000	Higher standard than TIA/EIA 568-B.3
Bend Radius	All Fiber Cables/Jumpers shall not bend more than 3-inches Dia. or 20 times the outer diameter of the cable/Jumper, whichever is greater.	Meets Telcordia & AT&T specifications that are more strict than TIA/EIA
Immediate Action	Do not permit kinks or short turns in the cable, or skinned cable due to a rough edge	Correct or replace cable after thorough testing
Ultimate Pass/Fail (MM)	Under no circumstances will the overall attenuation loss levels exceed 5.0 dB between Network Elements.	Testing is required

## 6. Connector/Mode

### 6.1 Connector/Mode Interface Standard

The AT&T standard for Fiber Optic terminations is the SC-UPC, SingleMode interface for customers, CLECs, carriers and internal users. This standard interface insures that network reliability is promoted through a standard network interface.

While SC-UPC is the AT&T standard, AT&T also allows LC-UPC SingleMode on the faceplate for small form factor connectors. In addition, limitations on the near-term deployment of analog Video services for Fiber-to-the-Home could necessitate the use of SC-APC, SingleMode (Angled) connectors. When the Video is converted to Digital, the connector type will revert to the SC-UPC, SingleMode. The use of SC connectors with a MultiMode method of transmission is authorized for general use at both the **Customer Premises and the Non-Central Office Point of Presence (POP) only, not the Central Office POP**. As other technological advancements occur AT&T may elect to introduce new connector/mode types.

The standard demarcation point for AT&T Communications Inc. facilities is the SC-UPC SingleMode termination with the alternative solution being the SC-UPC MultiMode termination at the Non-Central Office POP and Customer Premises. AT&T has no obligation to construct new demarcation facilities or modify their "**as is**" facilities except through regulated retail product offerings as specified by State and Federal tariffs as a result of the Telecommunication Act's current obligations and their interpretations by the court and the commissions. The demarcation for Access Services (regulated retail product offerings) is defined in the Demarcation Policy for Access Services Terminated at Other Carrier's Point of Presence (POP) Locations only. This demarcation policy allows some flexibility for the termination of FiberOptic facilities at Interexchange Carrier sites only; all other customer sites will receive the standard handoff connections specified by tariff.

### 6.2 Approved Terminations

#### 6.2.1 Approved AT&T Central Office Terminations

The standard arrangement will be the SC-UPC, SingleMode termination within the Central Office. There are exceptions based upon manufacturer small form factor needs.

#### 6.2.2 Approved Customer Premises Terminations

The standard arrangement will be the SC-UPC, SingleMode or the SC-UPC MultiMode terminations (using a specific service offering) at the Customer Premises as specified by tariff.

#### 6.2.3 Approved Non-Central Office Point of Presence IXC (POP) Carrier Sites

The standard arrangement will be the SC-UPC, SingleMode or the SC-UPC MultiMode terminations (using a specific service offering) at the IXC (POP) as specified by tariff. In addition,

the IXC (POP) locations may be provisioned through a transition jumper using a LC-UPC, SingleMode, ST-UPC, SingleMode or FC-UPC, SingleMode at the IXC's request. **Note: In cases where the POP is collocated in an AT&T CO, then only SM fiber and associated connectors will be provisioned.**

### 6.3 Approved Application Services

#### 6.3.1 Approved AT&T Central Office Terminations

FiberOptic Connector	Approved for Use	Application
Biconic	Only in existing embedded base conditions. Not to be used in new growth areas. New growth areas are to use current AT&T standard	Slow Speed up to 622.08 Mbps
ST-UPC, SingleMode	Only in existing embedded base conditions. Not to be used in new growth areas. New growth areas are to use current AT&T standard	High Speed/Manufacture Discontinued
SC-UPC, SingleMode	<b>Current AT&amp;T Standard</b>	ALL OPTICAL SERVICES INCLUDING ALL COLLOCATION/UNE'S
SC-APC, SingleMode	BPON using Analog Video Only	Fiber to the Home using Analog Video
<b>MultiMode (any connector type)</b>	<b>Not Approved for Use in the Central Office</b>	<b>Slow Speed, Short Distance Services</b>

#### 6.3.2 Approved Customer Premises Terminations

FiberOptic Connector	Approved for Use	Application
Biconic	Only in existing embedded base conditions. Not to be used in new growth areas. New growth areas are to use current AT&T standard	Slow Speed up to 622.08 Mbps
ST-UPC, SingleMode	Only in existing embedded base conditions. Not to be used in new growth areas. New growth areas are to use current AT&T standard	High Speed/Manufacture Discontinued
SC-UPC, SingleMode	<b>Current AT&amp;T Standard</b>	<a href="#">All Optical Services</a>
SC-UPC, MultiMode	Approved for Use with various Optical services	Short Distance Services

### 6.3.3 Approved Non-Central Office Point of Presence IXC (POP) Carrier Sites

<b>FiberOptic Connector</b>	<b>Approved for Use</b>	<b>Application</b>
Biconic	Only in existing embedded base conditions. Not to be used in new growth areas. New growth areas are to use current AT&T standard	Slow Speed up to 622.08 Mbps
ST-UPC, SingleMode	Only in existing embedded base conditions. Not to be used in new growth areas. New growth areas are to use current AT&T standard	High Speed/Manufacture Discontinued
<b>SC-UPC, SingleMode</b>	<b>Current AT&amp;T Standard</b>	<a href="#">All Optical Services</a>
SC-UPC, MultiMode	Approved for Use various Optical services	Short Distance Services

## 7 AT&T Standards

### 7.1 Expectations for ILEC and CLEC cabling

For any Optical cabling that is placed in AT&T Central Offices, the cable and connectors must meet the optical specifications and characteristics outlined within this document, ATT-TP-76412-000, **AT&T Customer Interface Standards for 100 Mbps and Higher Excluding SONET Interfaces** for the AT&T LOCAL EXCHANGE companies, Issue 4, dated April 15th, 2005. Whether the ILEC or CLEC installs the facilities and cable or not, the owner of that cable will be held responsible and accountable for non-compliance with these expectations and standards.

### 8. Dos and Don'ts of Cable/Jumper Placements and Terminations

- Don't have SingleMode or MultiMode jumpers bend tighter than 3.0 inches diameter or 20 times the diameter of the outer sheath of the cable, whichever is greater.
- Do not place fiber jumpers in any above or below floor rack systems without protection using protective tubing or Fiber Raceways. (Fiber Raceways are the only option within AT&T LOCAL EXCHANGE companies Central Offices.
- SingleMode Connectors will only be placed into matching connector sleeves with the same color. (SingleMode is blue, MultiMode is tan/gray).
- All fiber optic jumpers will be terminated at a cross-connect point in a panel intended for that purpose.

- Always validate the circuit to the demarcation point where a Demarcation device has been placed (or to the nearest accessible test point if a POT is not provided by the AT&T LOCAL EXCHANGE company).
- Optical cabling used within the AT&T LOCAL EXCHANGE companies Central Offices shall be preformed, manufactured double ended to specified lengths i.e. No field splicing of connectors in the Central Office.
- Optical cabling within the AT&T LOCAL EXCHANGE companies Customer Premises locations has the additional option to use field connectorized connectors that meet specifications.
- Jumper slack must be managed within the EDF/FDF only, not in the Fiber Raceway or Network Equipment locations.
- Don't splice or provide crimp connections to reattach or repair damaged cables/jumpers between the Network Equipment and the Demarcation Point. Always pull a new cable or jumper to correct the problem.
- Do not place cabling within 12-inches from all Electro-Magnetic sources such as light fixtures, fluorescent lights, motors, powered equipment and telecommunications equipment that is AC powered.
- Do not place cabling over any electrical cables, or place within 6-inches of any electrical cables.
- All cabling, electrical and optical, must not be any tighter bend than 3-inch diameter or 20 times the diameter of the cable of the outer sheath of the cable.

## 9. References

For further information or electronic copies of this document and related information, 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.

External Documents are shown below:

Document Number	Document Description	Issue
ATT-TP-76200	Network Equipment – Building Systems	Current
ATT-TP-76300	Installation Guide within the Central Office	Current
ATT-TP-76305	Cable Installation & Removal	Current
ATT-TP-76305-001	SNFA Cable Installation & Removal	Current
ATT-TP-76305-002	48V DC Power Single Line Diagrams	Current
ATT-TP-76306	Firestopping (non-workmanship & processes)	Current
ATT-TP-76400	Detail Engineer Requirements for the C.O.	Current
ATT-TP-76401	Space Planning	Current
ATT-TP-76401-001	Floor Loading Considerations	Current
ATT-TP-76407	Equipment Framework	Current
ATT-TP-76408	Equipment Superstructure	Current
ATT-TP-76410	Raised Floors	Current
ATT-TP-76412	Telco Electrical and Optical Ethernet Standards	Current
ATT-TP-76413	Connecting Block Standards (89-MDF type)	Current
ATT-TP-76416	Bonding & Grounding	Current
ATT-TP-76430	Synchronization Standards	Current
ATT-TP-76450	Common Systems Standards	Current
ATT-TP-76450-001	Common Systems Checklist	Current
ATT-TP-76450-002	Common Systems Exception & Evaluation Request	Current
ATT-TP-76460	Fiber optic Protection in the Central Office	Pending
ATT-TP-76461	Fiber optic Connector Cleaning	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. Contact List

Mike Yeilding, Area Manager- Network Planning & Engineering (Common Systems)  
(925) 823-4747, E-Mail: [my1515@camail.ATT.com](mailto:my1515@camail.ATT.com)

Wing Eng, Area Manager-Network Planning & Engineering (Common Systems)  
(925) 823-4616, E-Mail: [we2583@camail.ATT.com](mailto:we2583@camail.ATT.com)

Lynn Oslin, Area Manager-Central Office Transport (Network Operations)  
(214) 576-7540, E-Mail: [vo1793@txmail.ATT.com](mailto:vo1793@txmail.ATT.com)

Doug Florence, Area Manager-Network Planning & Engineering (Transport-Drawings)  
(925) 867-9951, E-Mail: [wo3696@camail.ATT.com](mailto:wo3696@camail.ATT.com)

Vish Ramamurti, Technical Staff-AT&T Laboratories  
(512) 372-5110: E-Mail: [vr7477@ATT.com](mailto:vr7477@ATT.com)

Booker Tyrone, Technical Staff-AT&T Laboratories  
(512) 372-5621: E-Mail: [bt7957@ATT.com](mailto:bt7957@ATT.com)

Patricia Matteson, Associate Director-Business Marketing  
(210) 886-3263: E-Mail: [pm9049@ATT.com](mailto:pm9049@ATT.com)

Jorey Pascasio, Associate Director-Business Marketing  
(210) 886-3113: E-Mail: [jp9351@ATT.com](mailto:jp9351@ATT.com)

Bernie Cross, Associate Director-Broadband Services  
(972) 569-5925: E-Mail: [bc6024@ATT.com](mailto:bc6024@ATT.com)

Terry McCarthy, Corporate Manager-Enterprise Technology Support  
(847) 248-5067: E-Mail: [tm2615@ATT.com](mailto:tm2615@ATT.com)

Bruce Jones, Associate Director- Network Planning & Engineering (Common Systems)  
(817) 338-6266, E-Mail: [bj3246@ATT.com](mailto:bj3246@ATT.com)

Mary Cerniglia, General Manager-Network Planning & Engineering (Common Systems & Transport) (925) 823-4280: E-Mail: [mc1856@camail.ATT.com](mailto:mc1856@camail.ATT.com)