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 Network Equipment Space, the Non-Network Equipment Space IXC Carrier POP and the Customer Premise.

Audience:

The primary audience for this document are AT&T personnel in the following disciplines, Network Planning, Implementation Engineering, Advanced Technical Support, COLD Planning, Outside Plant, Network Operations, New Technology Introduction, LABS and Quality Assurance and all contracted vendors doing Engineering and Installation work for AT&T. This document is authorized for use only within AT&T and by its Authorized Vendors.

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To view updated content in a document, look for the green ‘NEW/UPDATED’ indicators. Use the arrows to navigate to the previous or next NEW/UPDATED indicators, if they exist. Authors making content changes may choose not to use the indicator for updates, e.g., spelling corrections.

1. Reasons for Reissue

Issue 5, Section - All: Incorporate changes to the language referencing Central Office space to Network Equipment Space as defined in ATT-TELCO-812-000-155 and removes references to SBC.

Issue 4, Section - All: Change title of document from “SBC Ethernet Standards” to “SBC 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 “SBC 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”.

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2. Introduction

Presented in this document are the standards to implement Optical Ethernet components that will meet Ethernet Specifications. The Optical Architecture will run from the Fiber Distributing Frame located either at the AT&T Network Equipment Space 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’s network element bay and the far end termination point receiving the optical signal within the Network Equipment space 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 Network Equipment Space 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.

3. Network Equipment Space Fiber Distribution

3.1. 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 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 Network Equipment Space.

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 Equip-
ment 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 Network Equipment Space. The Fiber Protec-
tion 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 Network Equipment Space.

3.2. 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 Network Equipment Space.

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.

4. Optical Transmission Standards

4.1. General

All AT&T fiber optic cables, jumpers and connectors will meet or exceed the standards set forth in this document. 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-Network Equipment Space POP locations i.e. not allowed for Network Equipment Space 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 Optical Provisioning:

### AT&T Optical Operational Standards

<table>
<thead>
<tr>
<th>Function</th>
<th>Applicability</th>
<th>Reason</th>
</tr>
</thead>
<tbody>
<tr>
<td>MM Fiber Cable type</td>
<td>50/125 micron (MM only)</td>
<td>Maximum Distance Reach &amp; Transmission Speed</td>
</tr>
<tr>
<td>SM Fiber Cable Type</td>
<td>9 micron (SM only)</td>
<td>Suitability with Network</td>
</tr>
<tr>
<td>Connector</td>
<td>SC-UPC (Standard)</td>
<td>Interoperability</td>
</tr>
<tr>
<td>Operating Wavelengths (MM)</td>
<td>850 &amp; 1300 nm</td>
<td>MultiMode as it exists today</td>
</tr>
<tr>
<td>Maximum Overall Attenuation (MM)</td>
<td>-3.75 dB/km at 850 nm -1.5 dB/km at 1300 nm</td>
<td>Loss per kilometer</td>
</tr>
<tr>
<td>Maximum Attenuation per connector</td>
<td>0.75 dB per pair of mated connectors using SC (or SFF)</td>
<td>Critical SM &amp; MM signal limitations</td>
</tr>
<tr>
<td>Maximum Attenuation per Splice</td>
<td>0.3 dB per splice</td>
<td>Critical SM &amp; MM signal limitations</td>
</tr>
<tr>
<td>Overall Distance Limitations (MM)</td>
<td>2,000 meters between the main FDF and any remote cross-connect element (MM only)</td>
<td>This is heavily dependent on the transceiver devices.</td>
</tr>
<tr>
<td>Cross-Connect Jumpers</td>
<td>Greater than 5 feet</td>
<td>Do not permit the placement of jumpers too short, may cause service issues.</td>
</tr>
<tr>
<td>When Terminated</td>
<td>All Fiber cable strands will be terminated at the time of original installation into established fiber panels</td>
<td>Termination protection</td>
</tr>
<tr>
<td>Customer Interface Standard</td>
<td>ATT-TP-76412</td>
<td>Higher standard than TIA/EIA 568-B.3</td>
</tr>
<tr>
<td>Bend Radius</td>
<td>Fiber Cables/Jumpers shall not bend more than 3-inches Dia, or 20 times the outer diameter of the cable/Jumper, whichever is greater.</td>
<td>Meets Telcordia &amp; AT&amp;T specifications that are more strict than TIA/EIA</td>
</tr>
</tbody>
</table>
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 |

### 5. Connector/Mode

#### 5.1. 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-Network Equipment Space Point of Presence (POP) only, not the Network Equipment Space 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-Network Equipment Space 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.

#### 5.2. Approved Terminations
5.2.1. Approved AT&T Network Equipment Space Terminations

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

5.2.2. 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.

5.2.3. Approved Non-Network Equipment Space 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 Network Equipment space, then only SM fiber and associated connectors will be provisioned.**

5.3. Approved Application Services

5.3.1. Approved AT&T Network Equipment Space Terminations

<table>
<thead>
<tr>
<th>FiberOptic Connector</th>
<th>Approved for Use</th>
<th>Application</th>
</tr>
</thead>
<tbody>
<tr>
<td>Biconic</td>
<td>Only in existing embedded base conditions. Not to be used in new growth areas.</td>
<td>Slow Speed up to 622.08 Mbps</td>
</tr>
<tr>
<td></td>
<td>New growth areas to use current AT&amp;T standard</td>
<td></td>
</tr>
<tr>
<td>ST-UPC, SingleMode</td>
<td>Only in existing embedded base conditions. Not to be used in new growth areas.</td>
<td>High Speed/Manufacture Discontinued</td>
</tr>
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areas. New growth areas are to use current AT&T standard

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</tr>
<tr>
<td>SC-UPC, SingleMode</td>
<td>Current AT&amp;T Standard</td>
<td>All Optical Services</td>
</tr>
<tr>
<td>SC-UPC, MultiMode</td>
<td>Approved for Use with various Optical services</td>
<td>Short Distance Services</td>
</tr>
</tbody>
</table>

5.3.3. Approved Non-Network Equipment Space Point of Presence IXC (POP) Carrier Sites
### 6. AT&T Standards

#### 6.1. Expectations for ILEC and CLEC cabling

For any Optical cabling that is placed in AT&T Network Equipment Space, the cable and connectors must meet the optical specifications and characteristics outlined within this document. 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.

#### 7. 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 Network Equipment Space.

- SingleMode Connectors will only be placed into matching connector sleeves with the same color.

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<th>Application</th>
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<tr>
<td>Biconic</td>
<td>Only in existing embedded base conditions. Not to be used in new growth areas. New growth areas are to use current AT&amp;T standard</td>
<td>Slow Speed up to 622.08 Mbps</td>
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<tr>
<td>ST-UPC, SingleMode</td>
<td>Only in existing embedded base conditions. Not to be used in new growth areas. New growth areas are to use current AT&amp;T standard</td>
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<tr>
<td>SC-UPC, SingleMode</td>
<td>Current AT&amp;T Standard</td>
<td>All Optical Services</td>
</tr>
<tr>
<td>SC-UPC, MultiMode</td>
<td>Approved for Use various Optical services</td>
<td>Short Distance Services</td>
</tr>
</tbody>
</table>
• 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 AT&T.

• Optical cabling used within AT&T Network Equipment Space shall be preformed, manufactured double ended to specified lengths i.e. No field splicing of connectors in the Network Equipment Space.

• Optical cabling within AT&T's 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.

8. References

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<td>Installation Guide within the Network Equipment Space</td>
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<td>Cable Installation &amp; Removal</td>
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Connecting Block Standards (89-MDF type)
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### ATT-TP-76416
Bonding & Grounding
Current

### ATT-TP-76430
Synchronization Standards
Current

### ATT-TP-76450
Common Systems Standards
Current

### ATT-TP-76460
Fiber optic Protection in the Network Equipment Space
Current

### ATT-TP-76461
Fiber optic Connector Cleaning
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### GR-137-CORE
Telcordia-Generic Requirements for Network Equipment Space 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

### 9. Contact List

Mike Yeilding, NP&E - GES Principal - Product Development Engineer (858) 886-0015, E-Mail: my1515@att.com

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