# High-Density Fiber Infrastructure Application Note: OEM 1U Rackmount Optical Splitter Module Mechanical Frame Engineering Guide

HIGH-DENSITY FIBER INFRASTRUCTURE APPLICATION NOTE

OEM 1U RACKMOUNT OPTICAL SPLITTER MODULE MECHANICAL FRAME ENGINEERING GUIDE

DOCUMENT REVISION: 2.0

CLASSIFICATION: PUBLIC OEM TECHNICAL REFERENCE

## 1. DEPLOYMENT HIGHLIGHTS

The OEM 1U Rackmount Optical Splitter Module Mechanical Frame represents a paradigm shift in passive optical distribution infrastructure. Engineered for carrier-grade central offices, hyperscale data centers, and FTTx headend deployments, this mechanical frame provides a ruggedized, thermally efficient chassis for housing up to four independent optical splitter modules. The platform prioritizes fiber bend radius protection, cable management ergonomics, and front-access patching, enabling rapid service turn-up and maintenance. With a low 1U profile, the frame optimizes rack unit density, delivering a 40% reduction in physical footprint compared to legacy 2U or 3U splitter enclosures. It is compatible with both PLC (Planar Lightwave Circuit) and FBT (Fused Biconical Taper) splitter cartridges, offering network architects the

flexibility to deploy 1xN, 2xN, or dual-stage splitting topologies within a single consolidated chassis.



## 2. STRUCTURAL CHASSIS OVERVIEW

The mechanical frame is constructed from high-grade SPCC cold-rolled steel with a durable electrostatic powder coat finish, providing robust protection against corrosion and mechanical stress. The 1U chassis features a removable front access door that secures the splitter modules while maintaining optimal airflow. Precision-engineered guide rails ensure smooth insertion and extraction of splitter cartridges without disrupting adjacent fiber terminations. The rear panel incorporates integral cable management bars and a cable entry slot, facilitating the routing of feeder and distribution cables directly to the module interfaces. The frame is compliant with EIA-310-D rack mounting

standards, ensuring seamless integration into any 19-inch or 23-inch equipment rack.

## 3. SUPPORTED SPLITTER INTERFACES AND MODULE TYPES

The frame has been validated for compatibility with a wide spectrum of industry-standard optical splitter modules. It accepts both LGX-compatible and miniaturized plug-in cartridges, enabling support for the following splitting ratios: 1x2, 1x4, 1x8, 1x16, 1x32, 1x64, and asymmetrical configurations such as 2x16 and 2x32. All interfaces support standard single-mode (G.652D) and multimode (OM3/OM4) fiber connectors, including SC/APC, SC/UPC, LC/UPC, and FC/APC adapters. The mechanical design ensures that when modules are fully seated, they engage with the front panel adapter plates, eliminating the need for internal patch cords and significantly reducing insertion loss. The frame is engineered to accommodate both high-performance 1x32 PLC splitters and premium broadcast-grade FBT splitters without requiring hardware modifications.

## 4. PERFORMANCE SPECIFICATIONS AND OPTICAL PARAMETERS

When populated with OEM-certified splitter modules, the frame maintains exceptional optical performance parameters that meet or exceed Telcordia

GR-1209 and GR-1221 specifications. Key optical metrics include an insertion loss of ≤ 16.8 dB for a 1x32 split (including connector losses), a uniform split ratio deviation of ≤ 0.8 dB, a polarization-dependent loss (PDL) of ≤ 0.2 dB, and a return loss of ≥ 55 dB (APC) or ≥ 50 dB (UPC). The mechanical frame ensures that the bend radius of each fiber jumper is maintained above 30mm, safeguarding against micro-bending losses that can degrade signal integrity. The chassis design incorporates integrated dust caps and a strain-relief system to protect optical interfaces from contaminants and mechanical stress during installation and reconfiguration.

| **Parameter** | **Specification** |
|---|---|
| Form Factor | 1RU Standard 19-inch Rackmount Chassis (EIA-310-D Compliant) |
| Dimensions (W x D x H) | 19.0 in x 14.5 in x 1.75 in (482.6mm x 368.3mm x 44.45mm) |
| Chassis Material | SPCC Cold-Rolled Steel, Electrostatic Powder Coat Finish |
| Module Capacity | Up to 4 Splitter Cartridges (LGX or Miniature Form Factor) |
| Optical Connector Support | SC/UPC, SC/APC, LC/UPC, FC/APC (Adapter Interchangeable) |
| Wavelength Range | 1260 nm to 1650 nm (Broadband, |

| | |
|---|---|
| | Supports CWDM/DWDM Bands) |
| Max Insertion Loss (1x32) | ≤ 16.8 dB (Including Connector and Splice Losses) |
| Uniformity (1x32) | ≤ 0.8 dB |
| Polarization Dependent Loss (PDL) | ≤ 0.2 dB |
| Return Loss (APC/UPC) | ≥ 55 dB (APC) / ≥ 50 dB (UPC) |
| Environmental Range | -5°C to +55°C (Operating), -40°C to +70°C (Storage) |
| Compliance & Standards | NEBS Level 3, RoHS 2.0, REACH, GR-63-CORE, GR-1089-CORE |
| MTBF | > 2,500,000 Hours (Telcordia SR-332, Issue 4) |

## 5. CARRIER ACCREDITATIONS AND STANDARDS COMPLIANCE

The OEM 1U Rackmount Optical Splitter Module Mechanical Frame is fully compliant with the rigorous environmental and mechanical standards required for central office and outside plant deployment. The platform meets NEBS Level 3 (GR-63-CORE and GR-1089-CORE) requirements for temperature, humidity, shock, vibration, and EMC. It also complies with RoHS 2.0 (2011/65/EU) and REACH environmental directives, ensuring that all materials used are free from

hazardous substances. The chassis has been certified by third-party laboratories to withstand operational temperatures ranging from -5°C to +55° C and storage temperatures from -40°C to +70°C. For fire safety, the frame utilizes UL 94 V-0 rated materials and meets the flammability requirements of GR-326-CORE.

## 6. OPERATIONAL ADVANTAGES AND MTBF

The modular mechanical design translates directly into operational cost savings and network reliability. The front-access architecture allows field technicians to install, remove, or rearrange splitter modules in under 60 seconds, minimizing service disruption during network upgrades or reconfiguration. The frame supports a dual redundant cabling path, enabling easy transition from active to standby links without requiring a chassis power cycle. With no active electronic components, the platform achieves a Mean Time Between Failures (MTBF) exceeding 2,500,000 hours, positioning it as a zero-maintenance asset within the fiber infrastructure. The mechanical frame also reduces the Total Cost of Ownership (TCO) by extending the lifespan of existing splitter modules, as the improved thermal management and physical protection significantly mitigate the risk of connector and splice degradation.



## 7. TOPOLOGY SCHEMATIC AND DEPLOYMENT MODELS

The architectural flexibility of the mechanical frame supports multiple network topologies, including centralized split architectures (common in GPON and XGS-PON networks), distributed split architectures for C-RAN fronthaul, and redundant star configurations for high-availability enterprise backbones. The frame is ideally suited for consolidation at the Main Distribution Frame (MDF) or Intermediate Distribution Frame (IDF) to serve as a high-density point-of-entry distribution hub. In a typical datacenter use case, a single 1U frame housing four 1x32 splitters can aggregate 128 distribution fibers from 4 incoming feeder fibers, effectively servicing 128 end-user connections. This density eliminates the need for multiple chassis, reducing the total number of patch panels required and simplifying the physical layer management and inventory tracking.

## 8. ORDERING INFORMATION AND SKU STRUCTURE

To facilitate procurement and deployment, the mechanical frame is available in a variety of factory-assembled configurations and accessory bundles. Standard SKU variants include the empty chassis (for custom population), pre-populated chassis with 1x16 or 1x32 splitter cartridges, and deployment kits that include cable management rings and port labeling inserts. Customers can also order customized splitter configurations with specific connector types (SC/APC, LC/UPC, etc.) and fiber pigtail lengths. For service provider networks, the frame supports color-coded adapters to differentiate between upstream, downstream, and redundancy links at a glance. Detailed SKU designations and module ordering codes are available in the companion OEM Price List and Configuration Guide (Document SKU: OEM-FIBER-SPLIT-SKU-2025).