Upgraded version of passive optical devices for railway communication



Overview

For the railway industry, we offer a wide-ranging portfolio of reliable, high-quality components for all types of railway trans-portation, as well as for infrastructure applications.

Key Takeaways

Next-generation railway optical devices, such as fgOTN-based MS-OTN platforms and fiber-optic sensors, provide higher bandwidth, lower latency, and enhanced reliability for modern rail networks.

Next-

Generation Optical Communication

Modern railway communication networks are evolving from traditional SDH systems to fine-grain Optical Transport Network (fgOTN) solutions, which are implemented on platforms like Huawei's MS-OTN. These upgraded devices offer: Bandwidth Upgrade: fgOTN supports line-side bandwidths over ten times that of SDH, with capabilities extending from 100G to 800G per wavelength, accommodating future traffic growth for 10–15 years. Transmission Efficiency: Smaller service granularity (10 Mbit/s steps) allows efficient transport of E1, PDH, SDH, Ethernet, MPLS-TP, and OTN services, reducing mapping layers from 3–5 to 1–3 and lowering latency.

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Enhanced O&

M: Intelligent network management enables visualization of resources, link status, and one-click fault location, while maintaining SDH-like operational familiarity. Clock Synchronization: Channel-associated clock adjustment ensures consistent timing without network-wide synchronization. These upgrades make passive optical devices more suitable for high-speed, high-density railway networks, supporting the transition from GSM-R to FRMCS for wireless train control.

Fiber-

Optic Monitoring Systems

Upgraded optical devices also include fiber-optic sensors and measurement systems for railway infrastructure monitoring. Key features include: High Sensitivity and Robustness: Fiber-optic sensors detect strain, temperature, and vibration, resistant to electromagnetic interference and harsh environmental conditions.

Autonomous Long-

Term Monitoring: Capable of continuous monitoring over long distances, enabling early detection of rail misalignments, track degradation, or overhead contact system issues. Integration with AI: Data from optical sensors can be processed using artificial intelligence for predictive maintenance, reducing downtime and improving safety.

Ethernet and Fiber Integration

Modern railway networks also leverage fiber backhaul and Ethernet switching to replace legacy copper systems. Upgraded devices provide: High Reliability: DIN rail Ethernet switches and fiber backbones ensure self-healing, mission-critical connectivity for Positive Train Control (PTC) and SCADA systems.

Multi-

Interface Support: Integration of analog, serial, and Ethernet interfaces allows seamless communication between trains, wayside devices, and control centers. Traffic Protection: Redundant paths and direct transfer trip (DTT) mechanisms maintain service continuity even during network failures.

Summary

Upgraded passive optical devices for railway communication combine fgOTN-based high-bandwidth transmission, fiber-optic sensing, and advanced Ethernet/fiber integration. These technologies enhance network capacity, reliability, latency, and operational efficiency, while supporting predictive maintenance and future-ready wireless train control systems. They represent a significant evolution from conventional SDH and copper-based systems, enabling railways to meet the demands of digitalization and high-speed operations.

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Article Content

Digital Transformation in Train and Railway Communications

LTE-R (LTE for Railways): Specifically designed for rail networks, LTE-R enhances connectivity. This means that LTE-R enables high-speed wireless voice and data communications inside trains,

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We successfully carried out Europe''s first 5G-ready railway trial in an operational environment by combining a passive wavelength-agnostic WDM for optical transport and 60 GHz millimeter-wave for

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Abstract: This letter investigates a multi-intelligent refracting surface (IRS) aided high-speed railway communication system that can provide cooperative passive beamforming gains without incurring

Railway Optical Communication Solution | Huawei Enterprise

A series of MS-OTN transmission equipment that supports TDM, packet, and OTN services over a metro or campus optical network, providing cost-effective transport solutions for power, medical, Storage

WS Railway-Components

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Railway infrastructures necessitate the inspection of various elements to ensure operational safety. This study concentrates on five key components: rail, sleepers and ballast, track geometry,

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The application of the new fgOTN standard will accelerate the digital upgrade of the next-generation railway communication bearer network. This will help achieve sustainable and high

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With its new Premium Vision gateway, Premium PSU offers a breakthrough solution: a modular communication module that brings modern connectivity to legacy railway systems.

A new platform for rail communications – adopting 5G for railways

These will include a mixture of advanced microwave, IP, Optical, Next Generation Passive Optical Network (PON), and Wireless Mesh relay technologies, all updated to transport 5G traffic securely

InnoTrans 2024: Huawei launches industry''s first railway optical ...

During the InnoTrans 2024, Berlin, event themed “The future of mobility”, Huawei released the industry''s first railway optical communication network solution that supports the fine-grain OTN

Brochure: Railway Solutions

With CommScope railway communication solutions, speed and safety are always onboard. CommScope provides solutions designed and built to meet the communication challenges specific to railways

Passive Optical Device

Abstract Passive devices and circuits are the bedrock and framework of integrated photonic chips. They route, integrate, and interfere with optical signals, forming the basis for all of the functionalities

Application of optical access network technology in railway ...

The emergence of optical access network technology meets people''s needs. This paper makes an in-depth analysis of optical access network technology in railway communication, aiming at laying a

Huawei Launches Industry''s First Railway Optical Communication

InnoTrans 2024, themed "The future of mobility", kicked off in Berlin. During the event, Huawei released the industry''s first railway optical communication network solution that supports the

Roadmap on optical communications

The optical communications area has become increasingly diverse, covering research in fundamental physics and materials science, high-speed electronics and photonics, signal processing

Passive Optical Networks Progress: A Tutorial

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For many years, passive optical networks (PONs) have received a considerable amount of attraction regarding their potential for providing broadband connectivity to almost every citizen,

MARKET UPDATE The Future of Passive Optical Networking is Here

Introduction As Internet usage continues to evolve, subscriber demand for bandwidth is skyrocketing . A key driver is the availability of a wide variety of increasingly sophisticated connected devices, such as

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