Rugged communications for railways

Complete connectivity solutions for today and tomorrow
The highest level of safety, availability, capacity and regulatory compliance – sustainable rail communications systems demand nothing less.

Siemens onboard and wayside communications systems cover transit, freight, commuter, industrial and mining applications and deliver safe, robust, reliable and cost-effective solutions for rail operators, with significant operational and performance benefits.

To keep pace with the changing needs of the rail industry, our research and development teams work in close partnership with our customers to identify their specific requirements and to develop products and systems that precisely meet their needs. We also work closely with industry bodies to ensure that our systems adhere to specified national and international standards.

Modernizing your legacy infrastructure with Siemens solutions can significantly increase your operational efficiency and help you manage costs through best-in-class warranty programs, and simplified upgrades.

Siemens offers:
- Communication platform for mission-critical wired and wireless applications
- Smart train-to-wayside radio link for end-to-end mobility
- Rugged design to withstand electromagnetic interference, high shock and vibration, power fluctuations and wide operating temperature
- Our rail components meet all the relevant requirements of EN 50155, EN 50121, and NEMA TS 2
- Long operating lifetime and product availability
- Investment protection with standard five-year warranty for Siemens RUGGEDCOM products

Legendary reliability. Outstanding support. That’s how Siemens keeps the rail industry moving.
Rugged communications that keep you moving

**Rail – reliable, critical, the backbone of the world’s transportation infrastructure**

Siemens has a wide array of communication products and technologies, purpose-built to provide rail operators with the tools they need to keep their systems running smoothly. From integration with legacy infrastructure, to long-haul fiber backbones and widespread wireless connectivity for mobile and stationary applications - Siemens solutions have you covered. With global reach, Siemens has the knowledge, experience and solutions to be the complete end-to-end communications provider for the rail industry.

**Timely data – stay on track**

Reliable network communications are a necessity for monitoring and managing increasingly complex transportation infrastructures. Knowing what is happening and where: from tracking trains on their routes, to locating and addressing issues along the track, to connecting operators with important information about safety and rail conditions – effective rail system management demands both know-how and solutions that are built to last.

With a combined portfolio of RUGGEDCOM and SCALANCE, Siemens is taking a leading role in the transformation of modern transportation networks around the world. Able to withstand the harshest conditions, Siemens provides best-in-class, end-to-end networking solutions for road and rail. Customers that demand mobility, efficiency, safety and sustainability – select Siemens.

**Siemens solutions include:**
- Onboard communications
- Wayside communications
- Mobile radio
Onboard communications

Keeping passengers informed, maintaining safety onboard, managing and monitoring vehicle controls – all of these complex and critical functions require a robust network to keep information flowing. Railway operators face a unique challenge of maintaining a real-time awareness of what’s going on inside the train and of any factors that impact train operation.

In many cases today, networks for passenger information systems, vehicle control and management systems are maintained separately. With Siemens, these networks can be seamlessly integrated to share information, and to provide operators with a complete picture. Siemens’ comprehensive network solutions provide rail operators an opportunity to embrace network convergence and unify important streams of data to achieve greater operational efficiencies.

With a Siemens onboard Ethernet network, the possibilities are virtually endless, from services for passenger information to mission-critical operational data. Rail operators can also rest easy, knowing that Siemens products seamlessly integrate with legacy devices, allowing operators to leverage their existing network investments.

End-to-end communication systems reliably link everything from passenger information to mission-critical operational data – ensuring seamless data flow.
Siemens onboard communications systems include various networking components and solutions for onboard and onboard-to-wayside connectivity. The cost-effective products for MVB (multifunction vehicle bus), Ethernet, cellular, Industrial Wireless LAN and WiMAX communications are designed for ease of installation, replacement, maintenance and operation.

**Networks for vehicle control and management systems:**
Siemens provides solutions for managing and monitoring different train operational systems, like controls, propulsion, braking, power systems, doors, fire and smoke detection, climate control, diagnostic data or multifunction vehicle bus (MVB) functions, train control management system (TCMS), driverless or other automated safe stopping systems. We know how to protect our customers against cyber attacks, and help them securely segregate different traffic types and users. Siemens offers extreme reliability, high availability and fast network restoration.

**Networks for passenger information systems:**
Siemens networks for passenger information systems include CCTV over an Ethernet infrastructure, with the ability to feed information from the mobile DVR to driver displays or central control center. We also enable onboard screens for entertainment, timetables for information and advertisements, Wireless LAN for passengers and data access to operational panels and clocks.

**Highlights:**
- Layer 2 or layer 3 switching with highest environmental ratings
- M12 line modules with controlled bypass relays and array of coding options
- Extended L3/Security feature set
- Embedded data processing platform to enable service gateways, remote analytics, monitoring and control applications
- Integrated power supply design and passive cooling – no fans required
- Minimized risk of technical obsolescence due to modular configuration and hot-swap ability for easy field replacement

Siemens offers rail organizations an ability to:
- Expand onboard networks without making significant modifications to the train
- Provide high quality service in mission-critical applications
- Easily implement and manage CCTV security systems
- Offer Wireless LAN services for passengers
- Outfit trains with systems supporting proactive maintenance and adaptive algorithms
Wayside communications

For rail operators around the world, the ability to provide seamless communications between geographically dispersed field elements along railway tracks is crucial. This includes wayside signaling and interlocking systems, people safety systems and the communication to and from railway operation and control centers. Effective wayside communications and supporting systems prevent collisions between trains and road traffic, and ensure a safe, reliable and on-time operation of trains. Operational processes like train separation, collision avoidance, line speed enforcement, temporary restrictions, rail wayside safety, and other processes, ensuring trains run safely, require a robust and integrated network infrastructure.

Safeguarding the railways investment is at the heart of Siemens’ strategy, based upon a long term support and development of railway communications infrastructure. Siemens has led some of the largest deployments of communications solutions for rail operators in the world, and is recognized globally for its customer support excellence, and for designing solutions that guarantee high performance and low total cost of ownership.

Complete communication infrastructure all along the track, through to the railway control center – ensuring reliable data flow.
Siemens wayside communication networks:
- Best-in-class, reliable communication networks for signaling, distributed interlocking systems and rail electrification
- Robust, high-performance networks to support bandwidth-intensive CCTV, wayside crossing protection, passenger safety and information systems
- Proven remote maintenance and automation capabilities, allowing remote monitoring of geographically dispersed network components and optimized predictive maintenance
- High availability, fast network restoration, and an easy upgrade path when requirements change

Highlights:
- Multi-service backbone with 10-GigE uplinks, advanced layer 3 and MPLS routing services
- Migration of legacy copper cabling to support broadband Ethernet speeds
- Networking with zero failover time through HSR (High-availability Seamless Redundancy) and PRP (Parallel Redundancy Protocol)
- Failover connection to field elements using a mobile communication network
- Advanced features for protection against cyber attacks
- Meets and exceeds railway-specific certifications for harsh environments, such as electromagnetic compatibility, temperature, humidity, shock and vibration

Siemens offers:
- Reliable communications infrastructure across geographically dispersed, remote elements
- Seamless visibility into the safety and integrity of the track and trains
- Dependable reliability and performance
In today's demanding, high-speed world, passengers and cargo customers expect nothing less than perfection from a railway operator. In a business where even a five-minute delay can cause major problems, railway operators need to ensure that every designated member of their staff has access to the real-time operational information so they can make decisions to ensure train efficiency, safety and on-time performance.

Siemens' high-performance mobile radio provides the basis for interconnected onboard and wayside applications. To extend Ethernet and IP networks over large distances, Siemens delivers reliable wireless solutions with broadband data rates, supporting real-time data, video, voice communications and mission-critical signaling or monitoring information between rail cars and the control center. Siemens' network solutions help rail operators prevent delays by running predictive maintenance to avoid problems before they occur. Cargo and freight operators benefit from real-time awareness of where cargo is along the route at all times, allowing operators to accurately determine arrival times.
Using mobile radio solutions from Siemens, rail operators have access to a robust network that not only supports features, which add to the comfort and enjoyment of their passengers, but helps to manage the safety and security of the train. Siemens communications systems provide reliable mobile radio infrastructure, while maximizing the utilization of resources and delivering a network that offers ease of maintenance and a low total cost of ownership.

Operators also have additional requirements for IWLAN, such as minimizing the number of access points along the route and avoiding overlapping radio channels. Using an industry-specific extension, the iREF (industrial Range Extension Function), it is possible to cover three different radio areas within a cell with the three connected antennas. Consequently, the area served by an access point becomes larger.

Siemens mobile radio:
- A wide array of wireless solutions to keep data flowing in harsh environments of railway operation
- Broadband wireless WiMAX product portfolio designed for private networks, delivering the benefits of carrier-grade 4G technology to critical infrastructure applications
- Industrial Wireless LAN with data rates of up to 450 Mbps according to IEEE 802.11n standard, using MIMO technology to serve even the most demanding applications, such as streaming high-definition video
- Cellular solutions for connectivity to public networks with field-proven performance and reliability

Fully integrated, reliable wireless solutions offer broadband data rates for real-time data access.

Minimizing the number of IWLAN access points along the route with iREF (industrial Range Extension Function).
Improved mobility, efficiency, safety and sustainability

As a company, Siemens focuses on listening and understanding our customers’ requirements, then delivering results with careful attention to detail at every stage and paying close attention to operational realities. Siemens is fully committed to the successful achievement of our rail customers’ project objectives, delivering cost-effective solutions, that allow our customers to maximize their return on investment and drive efficiencies.

Preferred by industry leaders worldwide, Siemens is a proven supplier of communications solutions supporting the unique challenges of the rail industry.

Siemens offers a wide array of communications products and technologies, specifically designed to provide rail operators with the tools they need to keep their systems running smoothly.

From integration into legacy devices, to long-haul fiber backbones and widespread wireless connectivity for mobile and stationary applications, Siemens has the knowledge and experience to be the complete end-to-end solution provider for rail operators.

Siemens products and systems are backed by our global sales and technical support network. Operating regionally in cities around the world, the level and quality of our support services match the consistent quality standards of our products.

**Featured products**

<table>
<thead>
<tr>
<th>Model</th>
<th>Description</th>
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<tbody>
<tr>
<td>RUGGEDCOM RS900GP</td>
<td>10-port utility-grade, fully managed Ethernet switch, providing dual fiber-optical Gigabit Ethernet ports and eight fast Ethernet copper ports, full 802.3AT, 30 watts per port PoE, designed to operate reliably in harsh environments. Operating temperature range of –40°C to +85°C.</td>
</tr>
<tr>
<td>RUGGEDCOM RS950G</td>
<td>An IEC 62439-3 Redundancy Box (RedBox), supporting both High Availability Seamless Redundancy (HSR) and Parallel Redundancy Protocol (PRP). The RS950G provides the ultimate in network reliability from any network fault. This is achieved by simultaneously transmitting duplicate packets on independent routes through the network to provide complete path redundancy at the data link layer.</td>
</tr>
<tr>
<td>RUGGEDCOM RSG2488, RS969</td>
<td>A variety of M12 Gigabit and Fast Ethernet switches, available in different form factors for onboard applications, e.g. RSG2488 with non-blocking 28 Gigabit ports with hot-swappable dual redundant power supplies or RS969, a fully managed IP 67 Ethernet switch, providing dual fiber-optical Ethernet ports and eight M12 Fast Ethernet copper ports.</td>
</tr>
<tr>
<td>RUGGEDCOM RX1510, RX1500</td>
<td>Utility-grade multi-service platform layer 2 and layer 3 switch and router, available in different form factors, rugged and modular, ideally suited for onboard and wayside traffic and rail control systems, electric power utilities and the industrial plant floor.</td>
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</tbody>
</table>
Our fully integrated arsenal of RUGGEDCOM and SCALANCE intelligent communication solutions includes:

- Long-haul optics for maximum connectivity
- Ethernet over VDSL to help you reuse existing copper infrastructure
- Layer 3 switching in the field with 10-GigE uplinks to handle large amounts of video traffic
- Secure Industrial Wireless LAN (SCALANCE W), WiMAX (RUGGEDCOM WIN) and cellular technologies to help enhance and extend total network coverage for competitive advantage

<table>
<thead>
<tr>
<th>RUGGEDCOM RX5000</th>
<th>RUGGEDCOM EoVDSL</th>
<th>RUGGEDCOM WIN</th>
<th>SCALANCE W</th>
</tr>
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<tbody>
<tr>
<td>Modular, high-port-density Ethernet routing and switching platform with 10 Gigabit uplink ports, designed to operate in harsh environments, that can withstand high levels of electromagnetic interference, radio frequency interference and a wide temperature range of -40° C to +85° C.</td>
<td>Using existing legacy infrastructure of standard communication-grade copper cabling, EoVDSL links up to five kilometers can be established with additional serial, Ethernet and fiber connectivity options to meet all application needs in CCTV, adaptive signaling and other transportation-related applications.</td>
<td>The first broadband wireless product portfolio designed for private networks, delivering the benefits of carrier-grade 4G technology to critical infrastructure applications in harsh environments.</td>
<td>The SCALANCE W products offer reliable and secure wireless communication even in the harshest industrial environments. Following the IEEE 802.11n standard, SCALANCE W products can offer data rates of up to 450 Mbps to serve even the most demanding applications such as streaming high-definition video.</td>
</tr>
</tbody>
</table>

Siemens provides best-in-class, end-to-end networking solutions for the rail industry, able to withstand the harshest conditions.
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› More about SCALANCE:
siemens.com/scalance

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Subject to change without prior notice
Article No.: E20001-A763-P820-X-7600
Dispo 06366
Printed in Germany
WU/66102 WS 02151.0
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For the secure operation of Siemens products and solutions, it is necessary to take suitable preventive action (e.g. cell protection concept) and integrate each component into a holistic, state-of-the-art industrial security concept. Third-party products that may be in use should also be considered.

For more information about industrial security, visit:
www.siemens.com/industrialsecurity