FORTEC US Application Note

Railway Box PC Power Solution

Summary

Railway box PCs require ruggedized power architectures capable of operating in harsh environments with extreme EMC exposure, elevated ambient temperatures, and strict space constraints. These systems must deliver reliable, maintenance-free operation while meeting railway-specific standards and tight project timelines.

Target Application

Railway Box PC

Typical deployment environments include:
• Rolling stock onboard systems
• Trackside control units
• Signaling and communication systems
• Passenger information systems
• Surveillance and data logging platforms

These systems operate in electrically noisy, vibration-prone environments and must ensure continuous, fail-safe operation.

System Design Challenges

1. Extreme EMC Requirements

Railway environments present significant electromagnetic interference challenges due to:
• High-voltage switching systems
• Traction drives and inverters
• Long cable runs acting as antennas

Key concerns:
• Compliance with EN50155 / EN50121 standards
• Immunity to conducted and radiated disturbances
• Minimization of emissions affecting nearby systems

---

2. Limited Installation Space

Railway box PCs are often installed in compact enclosures with:
• High component density
• Limited airflow paths
• Custom connector layouts

Power solutions must:
• Fit within tight mechanical envelopes
• Allow flexible connection configurations
• Support modular system architectures

---

3. High Ambient Temperatures & Passive Cooling

Typical operating conditions include:
• Elevated ambient temperatures inside sealed enclosures
• No forced-air cooling

Design implications:
• High efficiency to minimize heat generation
• Robust thermal design for conduction cooling
• Stable operation without derating across temperature range

---

4. Customization & Fast Time-to-Market

Rail OEMs often require:
• Application-specific electrical interfaces
• Mechanical adaptation to proprietary enclosures
• Rapid prototyping and validation

Meeting aggressive project timelines is critical for system deployment.

Key Benefits for Railway System Designers

Wide Input Voltage Range

• Supports multiple railway power rails (24 V, 48 V, 72 V, 96 V, 110 V)
• Simplifies system design across global platforms
• Ensures stable operation under voltage fluctuations

High EMC Robustness

• Designed for railway EMC environments
• Supports compliance with EN50121 requirements
• Optimized layout and filtering reduce emissions and improve immunity

---

True Passive Cooling Capability

• High efficiency minimizes thermal losses
• Designed for conduction cooling via system chassis
• Reliable operation at high ambient temperatures
• No derating required under specified conditions

Compact Open-Frame Design

• Enables maximum flexibility in mechanical integration
• Ideal for space-constrained box PC architectures
• Supports custom connector positioning and cabling

Rapid Customization & Prototyping

• Tailored to exact OEM electrical and mechanical requirements
• Accelerates development and certification timelines
• Supports fast iteration and validation cycles

System-Level Integration Support from FORTEC US

FORTEC US provides comprehensive engineering support for railway applications:

Engineering Support

• EMC optimization and filtering strategies
• Thermal management and conduction cooling design
• Input protection and transient suppression guidance
• Support for railway compliance testing

Mechanical Integration Guidance

Recommended implementation:
• Direct mounting to thermally conductive chassis surfaces

• Use of thermal interface materials (TIMs)
• Careful routing of high-current and sensitive signal paths
• Validation under worst-case thermal and EMC conditions

Our engineering team collaborates closely with OEMs to reduce design complexity and ensure compliance with railway standards.

Conclusion

For railway box PC applications requiring:
✔ Compact, space-efficient power design
✔ High EMC immunity and low emissions
✔ Reliable operation in high-temperature environments
✔ Passive, maintenance-free cooling
✔ Fast customization and deployment

FORTEC US, in collaboration with Autronic, delivers a **custom 60W DC/DC converter platform** optimized for railway box PC applications.

Solution Highlights

• Wide input range: 24 V to 110 V DC
• Regulated 12 V output
• Open-frame design for flexible integration
• Fully tailored to OEM specifications
• No derating across specified operating conditions
• Functional samples available in as little as 5 weeks

This platform enables rapid design validation while meeting the demanding electrical, thermal, and mechanical requirements of railway environments.

Why Partner with FORTEC US?

• Deep expertise in railway power applications
• Strong customization capabilities
• Fast prototyping and time-to-market support
• End-to-end engineering assistance
• Long-term product availability and lifecycle support

FORTEC US helps railway OEMs reduce risk, accelerate development, and deliver reliable systems in demanding environments.

For technical evaluation support or design consultation, call us at (631) 648-6400 or visit:
https://fortec.us/