Industrial Networking, Computing, and IP CCTV Solutions for Smarter Railways

- Onboard Communication Networks
- Wireless on Trains and Train-to-Ground
- IP Video Surveillance
- Data Acquisition and Condition Monitoring
- Signaling and Control
Passenger Information System for Helsinki’s Underground Trains

Delivering IP based content, such as data, voice, and video, to moving vehicles posed several challenges to Helsinki City Transport (HKL) engineers, who after surveying the available options, made two key decisions: (1) train to ground communication will be based on 802.11 wireless solutions, and (2) the communication infrastructure onboard the trains will rely on industrial Ethernet products.

Communication inside the trains is established using Moxa TN-5516 EN 50155 managed Ethernet switches. An Ethernet switch is mounted in every subway car, and connected through Moxa’s redundant Turbo Ring protocol for fast 20 ms recovery times. All other communication devices are connected to the Ethernet switches and separated into different VLANs. The network provides the passengers with both an information system and a free WLAN connection while travelling on the subway.
Onboard Video Surveillance in the Taipei Metro

The Taipei Rapid Transit Corporation (TRTC) was established in 1994 as the first company in Taiwan specifically responsible for the operation of a rapid transit system. To upgrade its video surveillance system, TRTC deployed Moxa’s TN-5516 series industrial Ethernet switches, VPort 364-M12 series video encoders, and MC-4615/V2406 series customized embedded computers to create Network Video Recording (NVR) systems onboard. In selecting a partner for this ambitious project, the TRTC found that Moxa meets their key selection criteria, which include the capability to provide a wide range of IEC 60571 compliant communication, computing, and video surveillance products for reliable operations, comprehensive project services, and customized “perfect fit” products.

Wireless Train-to-Ground Communications for the Brazilian Railway

In this project, industrial-grade WLANs are responsible for onboard video surveillance, passenger information systems, and train control, which are important components in ATO (Automatic Train Operations) and ATC (Automatic Train Control). Moxa’s wireless networks allow rail operators to share real-time information between trains, the OCC (Operation Control Center), and the station to provide immediate status updates and emergency controls. This network is located aboveground in a busy urban area, where there is a great deal of wireless interference. In response, Moxa’s AWK-5222 and AWK-6222 wireless AP/bridge/client devices come with dual-band operations to allow the simultaneous use of two distinct channels to prevent transmission interference.

Wide-Range Trackside Infrastructure Network in Australia

One of the world’s largest natural resource companies deployed Moxa’s EDS-505A/508A, and IKS-6726 series Ethernet switches to upgrade trackside communication networks covering more than 270 km in Western Australia. A new network with redundancy would maximize the safety, reliability, and efficiency of this almost 40-year-old network. Moxa’s Ethernet switches, which support breakthrough Turbo Chain™ flexible redundancy technology, free system builders from the costly limitations of conventional Ethernet ring redundancy architecture. Compared with conventional ring topologies, Turbo Chain eliminates the need for kilometers of extra cable and additional Ethernet ports to form ring coupling paths. In the event of a chain segment failure, Turbo Chain will activate the blocked path and self-heal the network within 20 milliseconds, ensuring that the network is highly available.
Future-proof Railway Automation

Proven Benefits of Migrating to IP Communications

Conventional train communication networks (TCN) have limited ability to support multiple services. To replace these inadequate technologies, train communication networks are now turning to IP-based Ethernet networks. System operators are beginning to recognize that IP technology offers a complete package that can meet escalating network demands, reduce operating costs, and deliver improved functionality. Moxa’s railway solutions have delivered the following benefits to customers worldwide.

High-bandwidth Ethernet Train Backbone

Ethernet train networks make it possible to integrate multiple data applications into the same backbone, and are easily upgraded to 1 Gbps speed when needed for future applications. In addition, Gigabit-speed or IEEE 802.11n WLAN communications can transmit live video surveillance images in real time to optimize response time during emergencies.

Constant Train-to-Ground Wireless Connectivity

Moxa’s proven wireless LAN technologies with secure 50 ms Turbo Roaming and high 802.11n data throughput for in-station services, CBTC (communications-based train control), ATC (automatic train control) systems, and inter-station connectivity ensure that signaling and control systems will run smoothly.

Rugged Onboard and Remote Video Surveillance

Moxa develops products that are fully compliant with EN 50155 standards and use the very latest video, storage and communications technologies to ensure the reliable and secure recording of high resolution images in harsh rolling stock environments.

Industrial Networking, Computing, and IP CCTV Solutions for the Railway Industry

Onboard Train Communications

- **TN Series**
  - M12 Ethernet Switches
  - Gigabit and PoE options available
  - High availability: network and power redundancy, and bypass relay
  - Wide power input range

- **ioLogik E1500 Series**
  - Rugged Remote I/O
  - EN 50155/50121 certified
  - -40 to 85°C operating temp.
  - Channel to channel isolation protection

- **ioPAC 8020 Series**
  - Modular RTU Controller
  - Report-by-exception active alarm
  - Daisy chain with relay-bypass protection
  - Hot-swappable I/O modules

Train-to-Ground Communications

- **AWK Series**
  - Wireless AP/Bridge/Client
  - 50 ms Turbo Roaming (AWK-RTG series)
  - IEEE802.11a/g and IEEE802.11n technology for reliable voice and video connectivity
  - Dual RF design supports AP-client connection

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EDS Series
Industrial Ethernet Switches
• Turbo Chain with recovery < 20 ms
• EN 50121-4 certified
• -40 to 75°C operating temp.

MXview
Industrial NMS
• Automatic topology visualization and mapping
• Real-time event notification
• Centralized configuration and firmware management

Onboard Video Surveillance
V2400 Series
Industrial Computers
• Two hot-swappable trays for 2.5" HDD/SSD
• User-defined programmable LEDs and API for storage management
• API Library for easy development and storage volume notification

VPort 16-M12 Series
EN 50155 IP Camera
• High video quality with Sony CCD sensor and 3D-deinterlace function
• Selectable lens from 3 to 16 mm
• IP66, -25 to 55°C hardened design

EDS Series
Industrial Ethernet Switches
Turbo Chain with recovery < 20 ms
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Network Management Software

Control Center
Fiber optic cable
Twisted pair cable
PoE connection
Serial
I/O Signal
CAN
VGA/DVI

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Industrial Ethernet Switches

Railway Automation

Product Overview

Extensive Selection of EN 50155 Ethernet Switches Designed for Onboard Train Communications

Moxa’s EN 50155 certified ToughNet Ethernet switches are specially designed to meet the onboard standard for electronic equipment, which encompasses not just EMC requirements but also shock, vibration, extended temperature range, humidity, and power supply variations. Over 100 models are available to let users choose a precise solution that fits their railway networks. The product line supports comprehensive features for next-generation train networks, including 10/100/1000 Mbps transmission rate, Power-over-Ethernet, Turbo Ring, bypass relay, and a variety of mounting options.

Rotary Switch for IP Address Configuration
- Easier maintenance
- Configure IP address without using a PC

Certified Industry Standards
- EN 50155
- EN 50121-4

M12 Connectors
- Robust vibration-proof connections
  - M12 connectors
  - M23 connector

Tough Design
- Withstands harsh environments
  - -40 to 75°C operating temp.
  - Die-cast metal housing
  - IP54/67 protection
  - Panel or DIN-Rail mounting
  - Fanless design

Gigabit Bandwidth
- For a higher level of passenger comfort and security
  - Gigabit TP ports with or without bypass relay function
  - Gigabit/Fast Ethernet FO ports with M12 connectors

Wide Power Input Range
- For universal applications
  - Supports 12/24/36/48 VDC, 72/96/110 VDC, 110/220 VDC/VAC
  - Redundant power inputs

EN 50155/EN 50121-4 Compliant Ethernet Switches

<table>
<thead>
<tr>
<th>Model Name</th>
<th>Gigabit Ethernet</th>
<th>Managed</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Gigabit TP ports</td>
<td>Gigabit/Fast Ethernet FO ports</td>
</tr>
<tr>
<td></td>
<td>with M12 connectors</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Model Name</th>
<th>No. of Ports</th>
<th>Power Input Range</th>
<th>IP Rating</th>
<th>Installation</th>
</tr>
</thead>
<tbody>
<tr>
<td>TN-5510</td>
<td>8 FE + 2 GE</td>
<td>12 to 110 VDC or 110 to 220 VDC/VAC</td>
<td>IP54</td>
<td>Panel or DIN-Rail Mounting</td>
</tr>
<tr>
<td>TN-5518</td>
<td>16 FE + 2 GE</td>
<td>up to 4 GE + 24 FE</td>
<td>IP30</td>
<td>Rack Mounting</td>
</tr>
<tr>
<td>PT-7828</td>
<td>up to 4 GE + 24 FE</td>
<td>24 VDC or 48 VDC or 110 to 220 VDC/VAC</td>
<td></td>
<td></td>
</tr>
<tr>
<td>PT-7728</td>
<td>up to 2 GE + 8 FE</td>
<td></td>
<td></td>
<td></td>
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<tr>
<td>PT-7710</td>
<td></td>
<td></td>
<td></td>
<td>Rack or Panel Mounting</td>
</tr>
</tbody>
</table>
Turbo Ring™ for Ring Redundancy

All of Moxa’s managed Ethernet switches support Turbo Ring™, which minimizes downtime caused by network failures by supporting super fast fault recovery of under 20 ms at a full load of 250 Ethernet switches. If a path in the network fails, the system will return to normal communication in under 20 ms.

Bypass Relay Function for Linear Topologies

In a linear topology, a failure in any of the upstream links will result in the failure of the downstream links as well. For railway communication systems with interconnected networks, such a failure will cause chaos. To prevent such failures, Moxa’s TN-5510/5518 series provides 2 optional Gigabit Ethernet ports with bypass relay functionality. If one of the Ethernet switches fails due to power loss, its ports are bypassed with the relay circuit, and the transmission lines will interconnect automatically to ensure continuous system operation.

### Future-proof Gigabit Solution Enables Next-generation Train Networks

Many new applications in the railway industry, such as video surveillance, emergency intercoms, and web-like entertainment, require large amounts of bandwidth. The Moxa TN-5518/5510 provides 2 Gigabit ports to allow video, audio, and data transmission over one single network.

### Power-over-Ethernet Simplifies Network Connections

All applications can benefit from the ToughNet series’ PoE function. Network builders can take advantage of Power-over-Ethernet technology to power networked devices in hard-to-reach locations and to simplify field wiring and reduce installation costs.

### Enable High Network Availability with Excellent Redundancy

#### Turbo Ring™ for Ring Redundancy

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### Table: Technical Specifications

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<th>Power Input Range</th>
<th>IP Rating</th>
<th>Installation</th>
</tr>
</thead>
<tbody>
<tr>
<td>TN-5510</td>
<td>8 FE</td>
<td>12 to 110 VDC or 110 to 220 VDC/VAC</td>
<td>IP54</td>
<td>Panel or DIN-Rail Mounting</td>
</tr>
<tr>
<td>TN-5516</td>
<td>16 FE</td>
<td>12 to 48 VDC or 72 to 110 VDC</td>
<td>IP40</td>
<td>Panel or DIN-Rail Mounting</td>
</tr>
<tr>
<td>TN-5308</td>
<td>8 FE</td>
<td>12 to 45 VDC or 18 to 30 VAC</td>
<td>IP67</td>
<td>Panel or DIN-Rail Mounting</td>
</tr>
<tr>
<td>TN-5305</td>
<td>5 FE</td>
<td>24 VDC or 48 VDC or 110 to 220 VDC/VAC</td>
<td>IP54</td>
<td>Panel or DIN-Rail Mounting</td>
</tr>
<tr>
<td>TN-5508-4PoE</td>
<td>4 FE + 4 PoE</td>
<td>48 VDC</td>
<td>IP40</td>
<td>Panel or DIN-Rail Mounting</td>
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<tr>
<td>TN-5516-8PoE</td>
<td>8 FE + 8 PoE</td>
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<td></td>
<td></td>
</tr>
<tr>
<td>TN-5308-4PoE</td>
<td>4 FE + 4 PoE</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Industrial Ethernet Switches

Compact Turbo Chain Switches Create Cost-effective and Reliable Connections for Trackside Networks

Trackside networks include critical signaling and security systems that simply cannot fail, and consequently ensuring uninterrupted network operations is a must for such mission-critical applications. Moxa offers compact, rugged DIN-Rail and high-port-density rackmount Ethernet switches with ultra-flexible redundant technology and EN 50121-4 approval, making them ideal for outdoor large-scale trackside networks.

Improved Flexibility and Advanced Redundancy

Turbo Chain
- Fast fault recovery < 20 ms
- Flexible, unlimited redundant network expansions
- Live node expansion without system interruption
- Seamless integration with other redundant technologies

Minimize Installation Costs

Moxa’s innovative Turbo Chain technology is a new self-healing technology that dramatically simplifies the construction of trackside networks. Unlike traditional coupling technology, Turbo Chain’s extraordinary interoperability and topological flexibility delivers significant savings in development costs, time, effort, cabling, and required Ethernet devices. Moxa’s industrial managed Ethernet switches that support Turbo Chain and multiple fiber connections are a perfect fit for widely distributed networks.

Built for Harsh Trackside Environments

With EN50121-4 certification, Moxa’s industrial Ethernet switches can overcome the extreme surge and emissions hazards of railway environments. Elements of a reliable, rugged design include:

- EN 50121-4 compliance
- Compact size with -40 to 75°C operating temp. for outdoor space-constraint cabinets
- Fiber connections for long-haul transmission and EMI immunity
- Vibration and shock resistance
- IP30 housing, fanless, and high MTBF
- Redundant dual power inputs

Easier Management with Industrial NMS

Moxa’s MXview industrial NMS is built on a totally integrated architecture that offers topology mapping, automated discovery of Moxa’s managed Ethernet switches, device alerts, reports, and device configuration. With Moxa’s iNMS, network operators can easily monitor and troubleshoot their network, and maintain complete awareness of network and device status over a wide-ranging track.

EN 50121-4 Compliant Industrial Ethernet Switches

<table>
<thead>
<tr>
<th>Managed Switches</th>
<th>Unmanaged Switches</th>
</tr>
</thead>
<tbody>
<tr>
<td>EDS-608/611/616/619</td>
<td>EDS-G509</td>
</tr>
<tr>
<td>8 FE, 8 FE + 3 GE, 16 FE, 16 FE + 3 GE</td>
<td>9 GE</td>
</tr>
<tr>
<td>EDS-408A</td>
<td>IKS-6524/6526</td>
</tr>
<tr>
<td>8 FE</td>
<td>24 FE or 24 FE + 2 GE</td>
</tr>
<tr>
<td>EDS-205A/208A</td>
<td></td>
</tr>
<tr>
<td>5 FE or 8 FE</td>
<td></td>
</tr>
</tbody>
</table>
EN 50155 IP Video for Rolling Stock Surveillance Applications

Security for passenger trains and railway stations has become a critical priority for many governments. Using WLANs or satellite networks to connect IP video surveillance solutions on trains makes remote monitoring possible where traditional CCTV systems cannot be installed, and gives passengers a greater sense of security. In addition, the IP video surveillance solutions can be deployed at railway stations and all other critical points. EN 50155 is a specific standard that certifies the reliability of onboard electronic equipment subjected to constant EMC, shock, vibration, extreme temperatures, and humidity. Moxa’s EN 50155 IP video solutions, which include the VPort 16-M12 IP camera and MxNVR-M04 digital video recorder, are designed to meet these stringent requirements.

Rugged Design for Rolling Stock
Moxa’s EN 50155 IP camera and DVR are built with tough M12 or DB9 connectors, and incorporate an HDD anti-vibration kit to withstand continued vibration in buses and trains. The wide operating temperature range and high EMC and surge protection are designed for critical outdoor conditions.

Easy and Stable Installation
Mounting devices on buses and trains is a challenge for operators, and to answer this challenge, the VPort 16-M12 IP camera supports both surface and flush mounting, as well as PAN and TILT functions for positioning the lens manually. The camera also supports Power-over-Ethernet to make installation quick and easy in trains where local electrical outlets are not available.

High Performance Video Streams
Both H.264 and MJPEG video streams are supported by Moxa’s EN 50155 IP camera and DVR to optimize bandwidth efficiency and image quality based on the compression level, frame rate, and video resolution. For example, the IP camera supports up to 30 frames per second at SVGA (800x600) resolution.

Free Software Development Kit (SDK)
www.moxa.com/support

For Third-party Video Software and System Integrators
- URL commands with HTML programming for web systems
- ActiveX Control SDK using Microsoft COM technology and VPort Video Gadget, a coding-free programming tool that integrates easily with browsers and SCADA automation systems
- API SDK with C Library for customizing software and systems

VPort 16-M12 Series
EN 50155 compliant, compact IP cameras with high CCD image quality
- Meets EN 50155 criteria for rolling stock applications
- 1/3” CCD camera with maximum resolution of 800 x 600
- Up to three H.264 and MJPEG video streams
- DHCP Opt 66/67 for auto-configuration
- DynaStream™ for auto frame rate adjustments

MxNVR-M04 Series
EN 50155 compliant, 4-channel H.264/MJPEG industrial video recorders
- 4-channel H.264 and MJPEG video recording and streaming
- Recorded videos can be downloaded for playback over an IP network
- One SATA interface for 2.5” hard disk or SSD (solid state disk)
- One 10/100 Mbps Ethernet port with M12 connector for anti-vibration
- Two DB9 connectors for audio (1 input, 1 output), 4 digital inputs, and 1 relay output
- -40 to 75°C wide operating temperature model available—does not have a fan or heater (SSD required)
- Meets EN 50155 vibration criteria with 2.5” hard disk

For More Information:
www.moxa.com/support
Absolutely Reliable Wireless LAN Ensures Constant Connectivity for Train-to-Ground Communications

WLAN solutions have become an excellent solution for train-to-ground communication networks due to the improved advantages of wider coverage, higher throughput, and greater bandwidth. Moxa designed the industrial-grade AWK series to be compliant with IEEE 802.11a/b/g/n, and in particular to meet higher EN 50155 and EN 50121-1/-4 standards to withstand harsh rail environments.

In order to deliver reliable real-time data transmission and passenger safety, Moxa provides 50 ms Turbo Roaming and 802.11n solutions for greater availability of rail infrastructure.

Real-Time Wireless Train-to-Ground Communications

Railway wireless networks must offer mobility, deployment flexibility, and security for expansion and migration, and be tough enough to provide continuous, reliable, long-standing operations between the ground and the train. With increased reliability and bandwidth, WLAN is also tapped to support on-board video surveillance, passenger-related information systems, and train control. These networks allow rail operators to share real-time information between trains, the operating control center (OCC), and stations to provide immediate status updates and emergency controls.

Benefits

- Reliable and flexible train-to-ground and carriage-to-carriage connectivity
- 802.11n with up to 300 Mbps data rate for demanding video surveillance
- 2.4 GHz and/or 5 GHz band dual-RF design supports flexible and cost-efficient installation with AP-client connection mode
- Compliant with EN50155, EN50121-1/-4 for railway standards

The AWK-5222 with dual RF design can be configured in AP-client connection mode.
Upgrade to Industry-leading WLAN Solutions

Wireless communications is a natural fit for railway applications, especially train-to-ground connections and rolling stock. The quality and rugged design of Moxa’s products give them the endurance needed for severe railway operating conditions. Features include IP68 rating for waterproof and dustproof containment, and extended operating temperatures of -40 to 75°C. Moxa provides a complete portfolio of key wireless solutions that deliver superior performance for the operation and maintenance of railway communications.

Wireless Redundancy for High Availability

Moxa’s AWK-6222 and AWK-5222 feature dual independent RF modules with 2.4 or 5 GHz dual-band operation to enhance redundancy and frequency range. Both products can be configured in AP-client connection mode or redundant wireless connection mode to provide application flexibility. This reliable wireless LAN link gives the railway industry a reliable and real-time data communications solution for flexible deployment on moving trains to maximize overall passenger safety.

802.11n to Optimize Throughput and Bandwidth

Moxa’s new AWK-3131 and AWK-4131 devices are both 3-in-1 industrial wireless AP/Bridge/Client products that will support the 802.11n standard with a data rate of up to 300 Mbps, and wireless communications in the 40 MHz channel bandwidth. Moxa’s 802.11n solutions not only extend the wireless coverage range, but achieve real-time data transmissions for critical tasks such as VoIP communications, video streaming, and high density data transfer in the rail industry.

Product Features

- Industrial wireless AP/Bridge/Client with IEEE802.11a/b/g and IEEE 802.11a/b/g/n
- Rapid Turbo Roaming for seamless wireless connections
- Dual-RF design to overcome RF interference
- -40 to 75°C operating temperature range
- Dual DC power inputs and PoE for easy deployment
EN 50155 Embedded Computers for Train-to-Ground Communications and Onboard Recording and Computing

As the main part of a railway system, rolling stock presents some unique hardware design and protocol integration challenges, and requires a steady, reliable, and consistent platform. Major subsystems include monitoring of key components such as speed control, the brake safety system, mileage counter, door and window control, vehicle route monitoring, and power electronics response. Rolling stock applications include three major systems, each of which should be automatically monitored by the control center: Mobility Control Unit, Passenger Information System, and Network Video Recorder.

What Sets Moxa Apart?
- Wide temperature models for extremely harsh environments
- Many interfaces for versatile device connectivity—serial ports, Ethernet ports, switch ports, digital input/output channels, CANbus ports, USB hosts, CF/SD sockets, hard disk drive support, and M12 connectors for robust and reliable connections
- Wide range of power input options to satisfy the specific power requirements of different field sites
- Flexible and modular design for easy future expansion

MDM API (Moxa Device Manager Application Program Interface)

API Library for Easy Development
- Provides developers with a framework to write code to manage Moxa embedded computers remotely
- Integrated with users’ applications
- A 3-tier system architecture to support Internet access
- MDM Agent functions created with the MDM API are dynamically linked and loaded to provide the functions in real time

Rcore Software Platform

Mobility Control Unit
This system includes a display panel to allow the conductor to monitor vehicle status. A powerful computing platform is used to connect various devices, such as analog/digital I/O units, GPS modules, audio devices, and wireless modules. Fast hand-over times from access point to access point enable immediate status updates to better control the railway system and keep passengers well-informed in all phases of the journey while still accommodating the mobile nature of ground-to-train communications.

V2426 x86-based Atom embedded computer
- Rugged high-grade Intel Atom N270 1.6 GHz x86 processor
- Dual Independent displays (VGA + DVI-I)
- 4 serial ports, 6 Dis + 2 DOs, 3 USB 2.0 ports (Type A x 2, M12 x 1)
- 2 10/100 Mbps Ethernet ports with M12 connector
- 2 expansion slots module for further system integration: WiFi/3.5G/GPS module, Mini PCIe adaptor (for customer’s cellular modules)
**Innovative Hard Disk Anti-vibration and Anti-shock Technology (Patent Pending)**

Moxa has developed an innovative anti-vibration and antishock bracket specifically designed for the hard disk. The bracket works by absorbing vibrational energy, and balances the hard disk to avoid extra vibration or shock. This bracket acts as a seesaw that cushions the hard disk. By intentionally avoiding a symmetric size and height, Moxa’s design absorbs vibrational energy and effectively reduces vibration. With this technology, Moxa’s industrial computers easily meet EN 50155 certification for use in industrial applications such as trains and vehicles.

<table>
<thead>
<tr>
<th>Module</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>EPM-3337</td>
<td>HSDPA, GPS, WLAN (11a/b/g/n), -25 to 55°C operating temperature</td>
</tr>
<tr>
<td>EPM-3112</td>
<td>2 isolated CAN ports with DB9 connectors, -25 to 55°C operating temperature</td>
</tr>
<tr>
<td>EPM-3438</td>
<td>8+8 DI/DO with 3 KV digital isolation protection, 2 KHz counter, -40 to 70°C operating temperature</td>
</tr>
<tr>
<td>EPM-3032</td>
<td>2 isolated RS-232/422/485 ports with DB9 connectors, -40 to 70°C operating temperature</td>
</tr>
<tr>
<td>EPM-3552</td>
<td>VGA or DVI-I display module, -25 to 55°C operating temperature</td>
</tr>
<tr>
<td>EPM-DK01</td>
<td>Mini PCI and Mini PCIe expansion module, -40 to 70°C operating temperature</td>
</tr>
<tr>
<td>EPM-DK02</td>
<td>2-slot Mini PCIe expansion module, -25 to 55°C operating temperature</td>
</tr>
</tbody>
</table>

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**Network Video Recorder**

A reliable network video recording system is responsible for performing efficient and real-time video monitoring. With an industrial-grade PoE switch, it is easier to install VoIP phones and IP cameras on a platform where a power supply is not readily available. The nodes at the front and rear of the train need a higher level of performance in order to support NVR playback, but entry-level embedded computers with built-in storage expansion is enough to record video in the individual train carriages.

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<td>EPM-DK02</td>
<td>2-slot Mini PCIe expansion module</td>
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</table>

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**Passenger Information System**

This system needs a powerful computing unit to quickly show information on the connected display. An industrial switch is also used for communications with the Ethernet network, and the system can be further expanded with passenger entertainment features.

- **V2406**
  - x86-based Atom embedded computer
  - Rugged high-grade Intel Atom N270 1.6 GHz x86 processor
  - Dual independent displays (VGA, DVI-I, and LVDS selectable)
  - 4 serial ports, 6 DIs + 2 DOs, 3 USB 2.0 ports (Type A x 2, M12 x 1)
  - 2 10/100 Mbps Ethernet ports with M12 connectors

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**V2616**

- x86-based Core 2 Duo embedded computer
- Dual 10/100/1000 Mbps Ethernet ports with screw-type RJ45 connector
- 3 USB 2.0 ports (Type A x 2, M12 x 1), 8 DI channels, 2 serial ports
- M23 tightened power connector
- Dual independent displays (VGA + DVI)
- 3 SATA-150 connectors for hard disk drive expansion

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**V2416**

- x86-based Atom embedded computer
- Rugged high-grade Intel Atom N270 1.6 GHz x86 processor
- Dual Independent displays (VGA + DVI-I)
- 4 serial ports, 6 DIs + 2 DOs, 3 USB, (Type A x 2, M12 x 1) and 2 10/100 Mbps Ethernet ports with M12 connector
- 2 SATA-150 connectors for hard drive disk expansion
Manage Your Railway Monitoring with a Ready-to-Run RTU Controllers

Mighty RTU Controller
The ioPAC 8020 is a robust RTU controller designed for front-end data acquisition and monitoring applications. It supports hot-swappable I/O and power module slots for redundant power inputs and sensor signals, allowing users to choose from a variety of I/O modules to access sensor signals. With the aluminum housing and wide temperature range design, this rugged platform provides highly stable operation in harsh environments.

Click&Go™ Code-free Local Intelligence
Click&Go™ is a programming free I/O control and configuration tool that uses intuitive IF-THEN-ELSE control logic. With this easy-to-use but powerful tool, the ioPAC 8020 RTU is able to execute local control logic and alarm notification based on the configured settings. The menu-configured front-end intelligence allows the ioPAC RTU to identify unusual events and send exception messages with real-time stamp via UDP, TCP, email, and SNMP trap. The independent operation of I/O control and handling is particularly critical for fast-moving railroad vehicles, unmanned trackside signaling, and control cabinet applications.

Industrial-grade C Programming Capabilities
The ioPAC 8020-C delivers the necessary flexibility for users to create customized control systems that can be uploaded to the product. The embedded platform with ToolChain development tools not only supports the most standard C programming, but also facilitates easier and more precise I/O access and control compared with other embedded systems. With the flexible C programming capabilities, users can now define their own communications protocols that use proprietary, complex math formulas to gather data from various railway trackside assets to make remote monitoring more efficient.
Enhance Your Railway Maintenance Efficiency with Robust Ethernet I/Os

Full EN 50155 Compliance
The ioLogik E1500 Ethernet I/O product has a ruggedized aluminum housing and is fully compliant with EN 50155 and EN 50121 standards, both of which are essential for electronic equipment used in rolling stock applications. The rugged ioLogik E1500 platform adheres to strict EN conformities, which encompass not only EMC requirements but also shock, vibration, extended temperature range, humidity, and power supply variations.

Channel to Channel Isolation Protection
With this topology, I/O channels on the ioLogik E1500 are individually isolated from one another to ensure that data communication is highly stable. For example, a lightning strike that affects one channel will not affect devices connected to other channels on the same ioLogik. This is an important factor to consider when choosing an Ethernet I/O solution, since safety is always the top priority for railway applications.

Seamless SCADA connectivity with Active OPC technology
Moxa’s patented active OPC server Lite is a software package that operates as an OPC driver for an HMI or SCADA system. Active OPC server supports active communications, which enables the ioLogik E1500 to communicate with the SCADA system only when necessary. Using event-driven communication provides instant I/O status and reduces network bandwidth by at least 80%.

*Available in Q3, 2011 (product image for reference only)

Anti-Vibration Rugged Features

ioLogik E1500 Series
- EN 50155/50121 certified
- Wide operating temperature range (-40 to 85°C)
- Channel to channel isolation protection
- Built-in 2-port Ethernet switch for daisy-chain topologies
- Supports event-driven Active OPC technology

*Product specifications are subject to change without notice.
For the latest information, visit our website at www.moxa.com.
Trusted Business Partnership with Moxa

Trusted Solution Provider
• Comprehensive source of industrial networking, wireless, computing, and automation solutions
• Consistent value from custom-made and standards-based solutions

Trusted Partnership
• 24 years of proven experience in industrial networking
• Key clients: Ansaldo, Bombardier, Caterpillar, Siemens, Tenova, Thales, Yokogawa, Kyosan, Insigma

Trusted Quality
• 5-year warranty
• Strict 24-hour dynamic burn-in policy
• Certifications: C1D2/Zone 2 for oil and gas, DNV/GL for marine, IEC 61850-3/IEEE1613 for substation, and EN50155/EN50121/EN50121-4 for rail industries

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