Product Brief

In-Vehicle Fanless Computer

ACO-6000-CML Series

Key Features

Railway Certification
EN50155 & EN50121-3-2

Wide Voltage Input
9~48VDC & 48~110VDC

Shock & Vibration
50G Shock & 5Grms Vibration Resistant

Multi-Core CPUs
Intel 10th Gen CML & XEON-W Processors

Rich I/O
16x RJ45/M12 GbE/PoE Ports

Key Markets

- Railway Signaling
- Railway Traffic Systems
- Railway NVR Surveillance
- Vehicle Fleet Telematics
- Autonomous Driving

The evolution of Intelligent Transportation Systems (ITS) has become much more prominent as technological advancement continues to expand, and new applications are making their way into railway and automobile systems. Digitizing the transportation systems and introducing autonomy has become the competitive advantage for enterprises to lead the path toward a more connected and data-driven future. Furthermore, the development of the Internet of Things (IoT), ultra-fast wireless and wired technologies, Artificial Intelligence models, and robust performance accelerators have been pushing forward various applications to the next level, such as autonomous driving, intelligent surveillance, advanced telematics, and much more.

ACO-6000-CML-1E-16PM12

Must Have Standards and Certifications

Strict standards and certifications (e.g., EN50155 and E-Mark) govern electronic equipment for rolling stock and railway deployments. For example, embedded computers must comply with key factors to ensure safety and reliability amid the harshest settings involved in railway applications. The ACO-6000-CML Series In-Vehicle Computer is purpose-built and validated to pass certifications that enable performance, safety, and mission-critical redundancy.

Why is the EN -50155 Certification Important for Railway Equipment?

EN-50155 is an international railway certification for electronic equipment installed in railway and rolling stock trains. The certification requires compliance for wide temperatures, shock/vibration resistance, wide range power inputs, and electromagnetic compatibility (EMC).

ACO-6000-CML Compliance with EN50155

1. Power Supply:
   9~48V DC and optional 48~110V DC
2. 50G Shock and 5Grms Vibration Resistance
3. Wide Operating Temperature: -25°C ~ 70°C
4. EMC Conformity: EN50121-3-2, EN50121-4
5. Other Certifications:
   IS402, E-Mark, CE, FCC class A

Checklist for EN 50155 Compliance

- ☑ Visual inspection
- ☑ Performance test
- ☑ Low temperature operation test
  (minimum operating temperature for 2 hours)
- ☑ Dry heat test
  (maximum operating temperature for 6 hours)
- ☑ Confirmation of operation over the full input voltage range
- ☑ Surge, ESD and transient tests
- ☑ Electrical insulation test
- ☑ Vibration, shock and bump test
- ☑ EMC Test

The Importance of EN50155 Railway Certification for Rolling Stock Applications

EN50155 Emark CE FC

What is EN50155?

EN50155 is an international certification covering computers used on rolling stock for railway applications. Designing computers for railways poses some unique challenges, such as power supply fluctuations, constant vibrations, and limited space availability. In order to address safety and reliability concerns for systems used on railways, the four critical elements of EN50155 are:

Power Protection Rating

A wide range of voltage standards is used on rolling stock from 24, 48, 72, 96, to 110VDC. Therefore, electronic equipment used in trains must support these standards and be protected against unexpected power fluctuations. The ACO-6000-CML can support both 9~48VDC and 48~110VDC power supply voltages with OVP (Over Voltage Protection) and OCP (Over Current Protection).

Shock and Vibration Rating

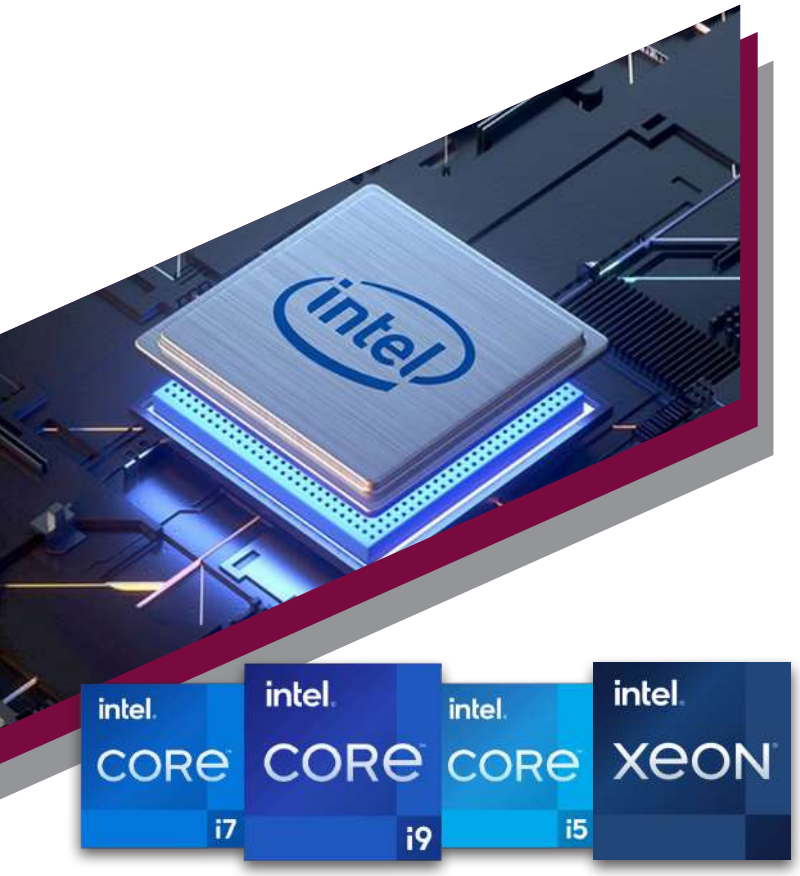
For systems installed on trains, protection against shock and vibration is critical due to the constant vibrational stress generated by a moving train. The ACO-6000-CML can withstand 50G shock and 5Grms vibration, complying with the military standard MIL-STD-810G.

Operational Temperature Rating

The system must be operational over a wide range of temperatures. The ACO-6000-CML can operate in extreme environments with temperatures ranging from -25°C ~ 70°C. This prevents the unit from overheating when installed in a confined space with limited or restricted ambient airflow.

Electromagnetic Compatibility Rating

Due to the limited space available on a train, multiple units may be installed that are very close to each other. To prevent electromagnetic interference (EMI) between all the systems, the unit must be certified to meet strict EMC criteria. The ACO-6000-CML computers are certified with EN50121-3-2 and EN50121-4 for EMC conformity.



ACO-6000-CML Series In-Vehicle Fanless Computers

The ACO-6000-CML Series are high-performance in-vehicle computers that can process a massive influx of data coming from various sensors and IoT devices while maintaining their reliability amid rugged edge deployments. The ACO-6000-CML In-Vehicle Computer leverages rich performance enhancements provided by W480E Chipset to support 10th Gen Intel CML S Processors or optional Intel XEON W-1290TE processors for server-grade performance.

LAN/POE

M12

Expand and Customize I/O Modular 16x Port Expansions

The ACO-6000-CML Series is configurable with additional 4x universal I/O brackets. The 4x universal I/O expansion slots support up to 16x I/O ports, which deliver immense performance and modularity. The 16x port expansions can be configured into 16x LAN, 16x M12, or 16x USB ports, with optional PoE configurations. PoE supplies power and data to peripherals via a single ethernet cable. Optional locking M12 connectors ensure secure coupling in moving, volatile environments. Combined with a high-performance CPU, the ACO-6000-CML can handle up to 16x PoE devices such as smart security cameras for an NVR solution in rolling stock and railway surveillance.

16x RJ45 GbE/PoE Module

16x USB 3.2 Gen 1 Module

16x M12 GbE/PoE Module

Key Technologies for Intelligent Transportation Applications

CAN Bus Transportation Protocol

The ACO-6000-CML Series supports a two-channel, two-pin CAN Bus I/O and Protocol embedded on the motherboard. The CAN Bus support allows the computer to leverage vehicle telematics data and provide real-time analytics for intelligent transportation systems, fleet management, process analytics, and system optimization.

Built-in Embedded CAN Bus

Power Ignition Management

The power ignition management feature delays the system shutdown after engine shutoff for a pre-determined, programmable interval to ensure that no data corruption occurs due to a sudden and abrupt shutdown. Configurable for both 12V and 24V systems, this feature ensures that applications close properly, avoiding data loss or corruption.

Performance Accelerators with PCI Express Slots

The ACO-6000-CML Series can be configured with a PCIe 3.0 slot or an optional PCI slot. The PCIe x16 slot can support various high-speed performance accelerators such as image capture cards, M.2 VPUs, or M.2 TPUs. The 16Gbps configuration allows the computer to supercharge its intelligent in-vehicle applications.

Data Storage Redundancy

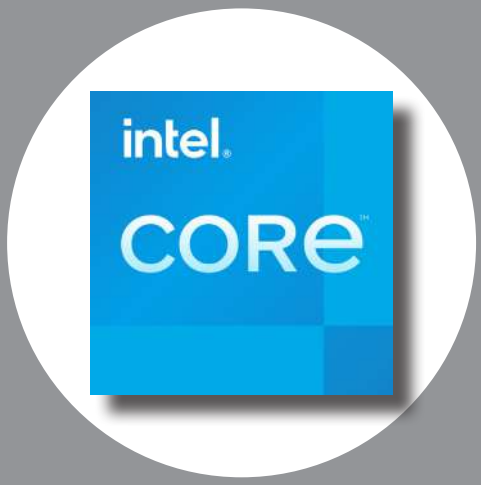
The In-Vehicle computer comes with both software and hardware RAID, offering RAID 0, 1, 5, 6, and 10. Configuring your system with a dedicated RAID controller can boost the performance of your system by offloading RAID functions from the host system's CPU to the RAID controller. Offloading RAID functions to a dedicated RAID controller allows the CPU to focus on running enterprise applications.

CAN Bus Transportation Protocol

Data Storage Redundancy

Power Ignition Management

Performance Accelerators with PCI Express



INTEL 10TH GENERATION CORE & XEON-W PROCESSORS WITH W480E CHIPSET

Robust Multi-Core Processing for The Intelligent Edge

The ACO-6000-CML In-Vehicle Computer leverages rich performance enhancements provided by 10th Generation Intel CML S Processors and W480E Chipset support. Intel technology enables 16-way multitasking through hyperthreading of all ten cores. The processor supports DDR4 RAM for up to 64GB of memory and 2933 MT/s transfer speed, while UHD graphics offer rich visual output for many applications using optical data.

The LGA1200 socket design is combined with Intel's W480E chipset to deliver augmented peripheral performance for low latency edge responsiveness. Gigabit wireless speeds, PCIe 3.0 lanes, SATA ports, and high-speed USB 3.2 Gen 2 enable the ACO-6000-CML In-Vehicle Computers with excellent I/ O integration options for transmitting data to and from sensory devices sitting at the edge.

Another key feature of the In-Vehicle Computers is their ability to support Intel XEON processors for server-grade performance in an embedded thermal profile. The Intel XEON W-1290TE is a 35W TDP processor that delivers 10 cores for multitasking through hyperthreading and even supports error correction code (ECC) memory for data redundancy. Implementing Intel XEON processors ensures powerful and reliable performance benchmarks amid the most computing-intensive applications for data acquisition and telemetry.

Connecting from the Rugged Edge

Steady Wireless Connectivity

The ACO-6000-CML Series enables seamless wireless connectivity for remote and mobile edge deployments. Systems feature both Wi-Fi 6 and Bluetooth 5 technologies to reliably connect to sensors and network systems through a wireless IoT enterprise. Additionally, systems can be configured with Dual External SIM sockets, providing 4G/LTE cellular connectivity for remote and mobile edge deployments. The ACO-6000-CML Series are also 5G ready through a modular add-in card, providing edge deployments, vastly greater cellular speeds, and more granular network slicing options.

Workload Consolidation Ready at the Rugged Edge

The based model of ACO-6000-CML Series supports two universal I/O brackets expansion to enable high-speed connections with low-latency data transmission for advanced industrial applications at the rugged edge. With the diverse modular daughterboards' configurations, the computer's I/O flexibility allows workload consolidation for handling various digital and analog sensors.

4x USB 3.2 Gen 1 Module

4x RJ45 GbE/PoE Module

4x M12 GbE/PoE Module

Dual 10GbE RJ45 Module

Dual-SIM 5G Module

We Design, Manufacture, and Service customers around the world

NEW

ACO-6000-CML SERIES

ACO-6000-CML

ACO-6000-CML-1

Processor	Support 10th Gen Intel® CML S Processor (LGA 1200, 65W/35W TDP) or Optional Intel XEON-W Processors	
Memory	2x 260-Pin DDR4 2666 /2933MHz SODIMM. Max. up to 64GB (ECC and Non-ECC)	
Display	1x DVI-I, 2x DisplayPort	
SATA Storageay	2x External SIM socket (Mini PCIE attached), 1x Internal 2.5" SATA/SSD HDD Bay (support H=9mm) 2x Removable 2.5" SATA HDD Bay (support H=7mm, Hot-swappable) Support RAID 0, 1, 5	
Internal Expansion Slot	2x Full-size Mini PCIe	
I/O	6x USB 3.2 Gen 2, 3x USB 3.2 Gen 1 (1x Internal), 2x USB 2.0 header (internal), 8x RS-232/422/485 (6x internal), 16x isolated digital I/O, 2x GbE RJ45 (Support Wake-on-LAN and PXE)	
Power	9~48 VDC, 5-pin Terminal Block or 48~110 VDC, 3-pin Terminal Block (Optional), AT/ATX Select	
Operating Temperature	-25°C to 70°C (35W/65W CPU)	
PCI & PCI Express		• 1x PCIe x16 (Model ACO-6000-CML-1E) • 1x PCI (Model ACO-6000-CML-1I, Optional)
Certification	CE, FCC Class A E-Mark, EMC Conformity with EN50155 & EN50121-3-2	
Proprietary Module Expansion	Up to 2x Module • DTB-M2BK (Support 1x Universal Slot Only) • DTB-D10G • DTB-4U3 • DTB-4ETH • DTB-4ETH-PWR • DTB-4ETH-M12 • DTB-4ETH-M12-PWR	Up to 4x Module • DTB-4U3 • DTB-4ETH • DTB-4ETH-PWR • DTB-4ETH-M12 • DTB-4ETH-M12-PWR