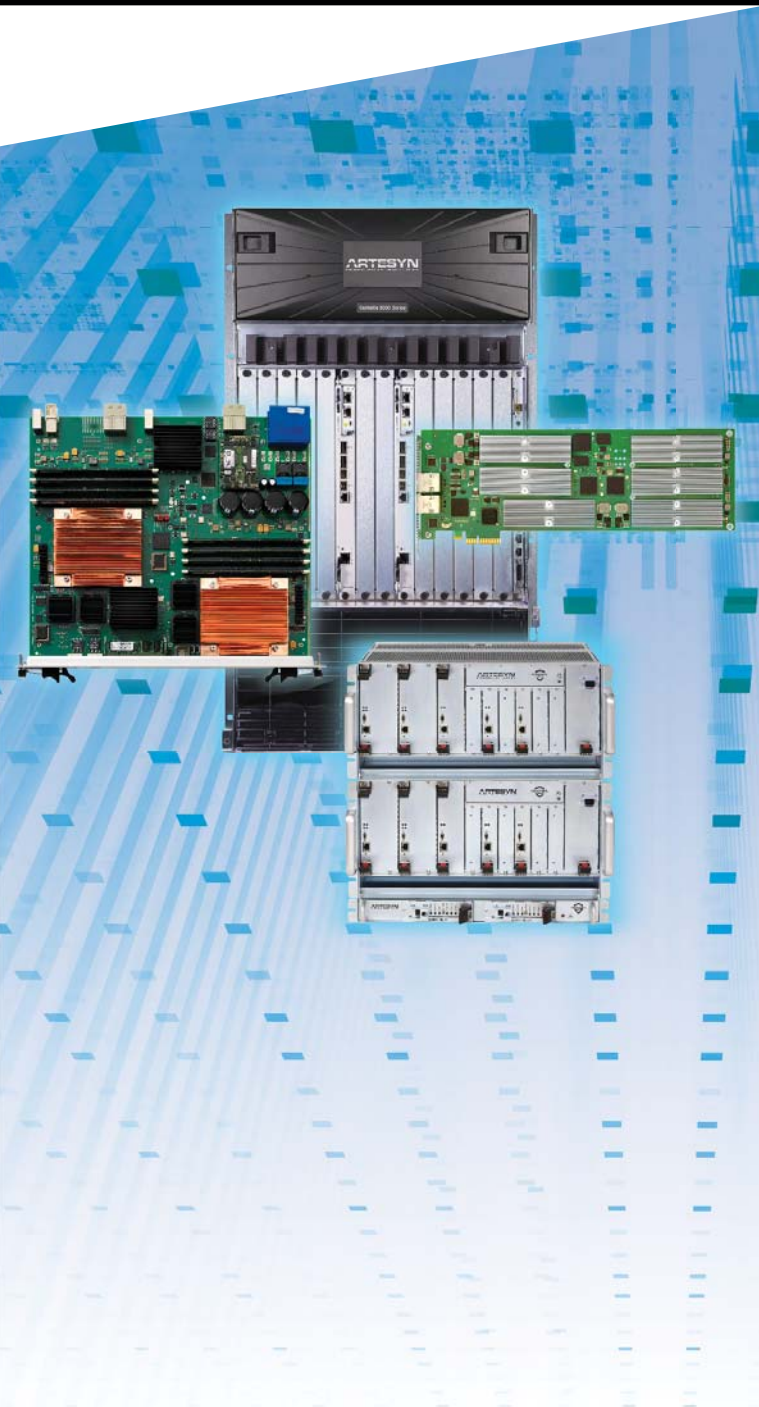# ARTESYN™
EMBEDDED TECHNOLOGIES

Embedded **COMPUTING**
Product Guide

ARTESYN™
EMBEDDED TECHNOLOGIES

Artesyn Embedded Technologies is a leading global provider of embedded computing solutions based on open standards such as ATCA®, VMEbus™, PCI Express and computer-on-module. Our expertise enables OEMs in a wide range of industries to develop better products quickly, cost effectively and with less risk.

Artesyn Embedded Technologies is a global leader in the design and manufacture of highly reliable power conversion and embedded computing solutions for a wide range of industries including communications, computing, healthcare, military, aerospace and industrial automation.

For more than 40 years, customers have trusted Artesyn to help them accelerate time-to-market and reduce risk with cost-effective advanced network computing and power conversion solutions.

Building on the acquired heritage of industry leaders such as Motorola Computer Group and Force Computers, Artesyn's Embedded Computing business is a recognized leading provider of advanced network computing solutions ranging from application-ready platforms, single board computers, enclosures, blades and modules to enabling software and professional services.

Artesyn's engineering and technical support is backed by world-class manufacturing that can significantly reduce time-to-market and help customers gain a clear competitive edge.

Let Artesyn help your business improve time-to-market and shift development efforts to the deployment of new, value-add features and services that build market share.

Contents

"This business has the DNA that includes Motorola's embedded computing business, Artesyn, Force Computers, Heurikon, Blue Wave Systems, Mizar, Prolog, NetPlane and Spider Software! The combined strength and experience of these companies, fused with pedigrees of quality, innovation and a deep understanding of our customers' needs, position Artesyn Embedded Technologies for continued growth and leadership in the embedded computing markets."

Stephen Dow
President

Local Support

Our regional sales offices are ready to provide expert local applications and sales support. In addition, an extensive network of manufacturers' representatives and distributors bring our products to you. Please call for locations of sales offices near you or visit our website at **Artesyn.com/computing**.

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ControlSafe™ Platform

Delivering fail-safe systems for critical rail safety applications

Leveraging over 30 years of expertise in developing highly reliable and available embedded computer systems, Artesyn Embedded Technologies is a premier supplier of commercial off-the-shelf (COTS) fail-safe computer systems to rail system integrators and rail application providers.

Rail transportation is top priority for investment

By helping to significantly cut carbon emissions and by reducing human dependence on automobiles and fossil fuels, rail transportation is widely viewed as one of the most sustainable means of transporting passengers and goods.

Virtually all countries are focused on finding more efficient and sustainable ways to move people. Developed economies are upgrading their existing mass transit infrastructures while emerging ones are building new systems.

So, as the fundamental growth drivers for rail continue to remain positive and the requirement for rail systems is high, it is clear that investing in railway transportation will remain a top priority for governments worldwide in the coming decades.

Meeting the highest industry safety standards

The enormous capital expenditure on rail infrastructure is not only for building larger railway networks, but also for meeting the more stringent requirements on highly safe and reliable operations.

More countries are embracing Safety Integrity Level 4 (SIL4) standards to ensure their railroad operations meet the highest safety standards. According to the Union of the European Rail Industries (UNIFE) World Rail Market Study, Train Control and Rail Signaling play an increasingly important role in the overall rail infrastructure and the market will reach $16-18 billion per year between 2014-2017.

- Highly integrated COTS solution designed to be certified to SIL4 safety standards
- Designed to deliver system availability as high as six nines (99.9999%)
- Modular and scalable for deployment in many rail applications
- Innovative data lock-step architecture allows seamless technology upgrades
- Hardware-based voting mechanism maximizes application software transparency
- 15 years planned product life and 25 years of extended support and service
- Backed up by a global service organization
- Rugged design compliant with EN 50155
- Growing product portfolio to enable future rolling stock and trackside deployment

For complete product specifications, go to **www.Artesyn.com/computing**

Protecting rail infrastructure

Artesyn Embedded Technologies has over 30 years of experience in developing highly reliable and available embedded computer systems. We are a premier supplier of commercial off-the-shelf (COTS) fail-safe computer systems to rail system integrators and rail application providers.

With all safety-related software designed to be certified to EN50128 SIL4 and all reliability, availability, maintainability and safety (RAMS) processes to EN50126, and hardware to EN50129 SIL4, Artesyn's ControlSafe™ Platform (CSP) can be deployed in safety application environments to protect investment in rail infrastructure.

Accelerating time-to-market for SIL4 certification

Based on open standards, Artesyn's ControlSafe™ Platform (CSP) is a cost-effective solution that enables all rail application developers and system integrators to substantially accelerate time-to-market without being deterred by the potentially high costs and risks associated with the stringent SIL4 system development and certification process.

Artesyn is committed to building long-term partnerships with our customers, based on proven and reliable systems with consistent performance. The ControlSafe Platform further strengthens this commitment by providing rail industry customers with an unmatched, highly reliable platform with 15 years of planned product life and 25 years of extended support and service.

Best-in-class availability

Artesyn's ControlSafe Platform is designed to deliver best-in-class system availability as high as 99.9999%, which means that system downtime is limited to less than a few seconds per year.

Artesyn has successfully completed extensive modeling and analysis by its team of highly qualified staff throughout the development and testing stages. As a result, Artesyn's ControlSafe Platform meets all the functional safety, reliability and availability requirements mandated by rail standards and specifications.

Allowing customers to focus development on system differentiation

Adhering to Artesyn's future-proof development philosophy, the ControlSafe Platform is modular, scalable and designed to seamlessly accommodate additional I/O interfaces as well as upgraded processors that will be required throughout the product life cycle. Within the ControlSafe Platform, application processing is carried out on a modern Freescale QorIQ™ processor, delivering high performance, energy efficient processing and supporting the extended life required by rail equipment. The field proven VxWorks 653 operating system from Wind River provides safe partitions for customer applications.

The ControlSafe Platform's data lock-step architecture, which supports high performance modern processors, makes it possible to upgrade processors over time while retaining the same I/O.
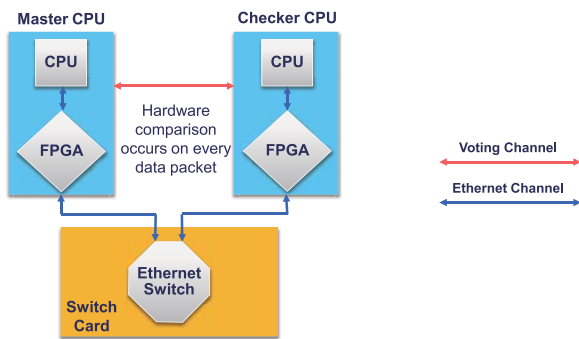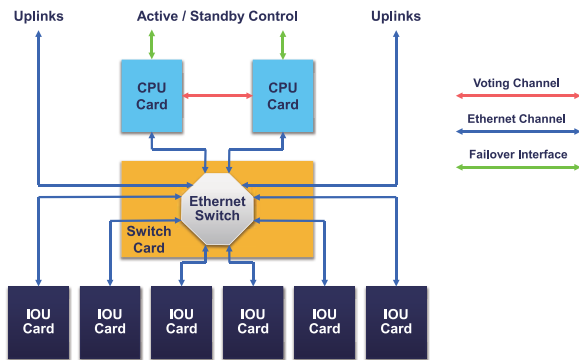
Having implemented the 2oo2 voting facilities in hardware allows application developers to migrate existing application software with minimal modifications. An extensive set of well documented application programming interfaces (APIs) that provides access to system parameters and management facilities makes it easy for application developers and system integrators to monitor and control the system.

Artesyn is focused on continued platform development to build a comprehensive product line. A new initiative is the development of a discrete I/O expansion box which enables customers to seamlessly integrate our ControlSafe Platform in a variety of rail signaling applications. Our ultimate goal is to enhance customers' competitive position by allowing them to focus their development efforts on differentiating end applications.

ControlSafe™ Computer Architecture

At the core of each ControlSafe Computer (CSC) are two identical CPU boards that run in data lockstep mode and implement a two-out-of-two (2oo2) voting mechanism. In the data lockstep mode, a deterministic boundary is created at the data fabric interface of the two CPUs. All transactions that are about to cross this deterministic boundary are compared to confirm correct operation of the two CPUs. As opposed to a hard lockstep mode, where the processor clocks are synchronized and the deterministic boundary is created at the address and data buses of the processors, the data lockstep mode can be implemented using modern high-performance processors.


Comparison of the data fabric bound transactions is done using a 2oo2 voting mechanism, where any discrepancy between these two CPUs is considered a failure and causes the CSC to enter a fail-safe mode. In the fail-safe mode, by default all output ports are driven to their safe/silent state, eliminating any possibility of setting external equipment to a wrong state.

The ControlSafe Platform's data lock-step architecture makes it possible to upgrade processors over time while retaining the same I/O. Having implemented the 2oo2 voting facilities in hardware allows application developers to migrate existing application software with minimal modifications.

I/O modules provide interfaces to a range of communication protocols such as CAN, Ethernet, Ethernet Ring, UART, and MVB. All I/O modules have a common architecture based on the same Freescale CPU and the same WindRiver VxWorks 653 operating system, thus simplifying the software development environment. All I/O modules are accessed over Ethernet allowing a seamless distributed programming model. All modules support remote on-line software and firmware upgrade without risk of rendering a system inoperable. All I/O ports are user programmable as safety-relevant or non-safety relevant. In addition, the Switch Module provides 8 10/100/1000Base-T ports via its rear transition module (RTM), for direct Ethernet/IP access to other processing nodes in the application's network, and/or to the peer CSC.

ControlSafe™ Platform Architecture
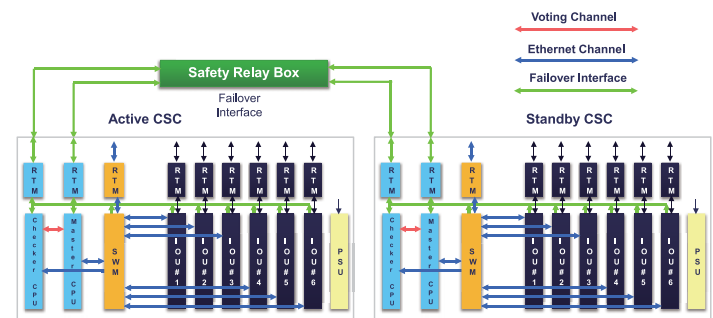
Artesyn's ControlSafe Platform consists of two redundant CSCs, each of which delivers fail-safe operations. They are linked by a Safety Relay Box (SRB) or Direct Connect Algorithm (DCA) that monitors the health of the two CSCs and designates one of them as 'active' and the other as 'standby'. The user application running on the active CSC has full control of all I/O ports, while the same user application running on the standby CSC can monitor safety-relevant input ports (except for Ethernet I/O) and all interference free ports, but by default has no ability to drive any output port. When the active CSC fails, its safety-relevant outputs are quiesced, and it signals its state to the SRB, which in turn causes the standby CSC to become active and begin driving its outputs. The unhealthy CSC is taken out of operation and, once it has been repaired by service personnel, can be brought back into service. Monitoring the health state of the two CSCs and controlling fail-over operation between them provides a fail-safe computing system.

Active/Standby Control

Artesyn's ControlSafe Platform supports two modes of Active/ Standby control: the Safety Relay Box option and the Direct Connect option.

Safety Relay Box

The SRB selects the active CSC and transfers control to the standby CSC when the active CSC fails. The SRB consists of dual redundant Safety Relay Field Replaceable Units (FRUs), cables, and power feeds ensuring continuous availability. Each CSC is connected to one of the two Safety Relay FRUs.

When power is applied, the SRB selects the first CSC that signals that both CPUs are healthy to be the active CSC. The other CSC enters standby mode. If the active CSC detects a failure, it signals its unhealthy state to the SRB. Provided that the standby CSC is healthy, the SRB signals it to become active. The SRB is designed so that only one CSC can be active at a time, and that an unhealthy CSC cannot be made active.

Artesyn's SRB supports online service and repair at the Safety Relay FRU level to maximize uptime of the ControlSafe Platform. Service mode is selected via a manual 2 position switch on each Safety Relay FRU.When the switch is moved from Auto to Service, the connected CSC goes to standby mode.


Direct Connect

The direct connect option uses a patented algorithm and special cables to link the two CSCs. Health status is exchanged and tracked in state machines running on all the CPU modules to control the active and standby roles. When power is applied, the first CSC that has healthy signals from both CPUs goes active. As in the SRB the Direct Connect Algorithm (DCA) is designed so that only one CSC can be active at a time, and that only a healthy CSC can be active.

Operating System

All modules in the ControlSafe Platform support Wind River's VxWorks 653 operating system. It provides both resource management and a partitioning environment that permits multiple independent applications of different criticality levels to run on a single target platform under protected conditions. At the heart of VxWorks 653 is the Core OS. The Core OS component uses the features of the

target architecture to enforce isolation between applications residing in separate partitions. The partitions can contain application software that is supported by one of three interface layers: VxWorks-based APIs, APEX Interface (ARINC 653 Interface), or POSIX APIs. These interface layers provide various levels of scheduling and thread management to the application. In addition to controlling partition memory and CPU time usage, the Core OS also provides services to manage system resources, such as I/O.
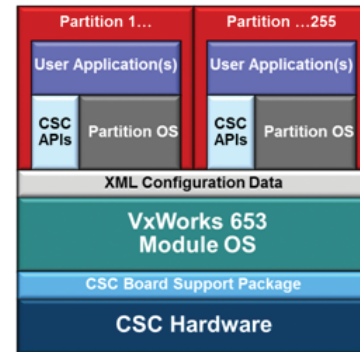
The Core OS implements a partition scheduler using a statically defined configuration table that allocates CPU cycles to each partition and specifies the order of partition execution. The Core OS manages all shared resources on behalf of the application partitions including system time and memory. The Core OS ensures that resources required by an application partition are available to it after a partition switch, and prevents applications from corrupting each other. Communications between partitions, and between partitions and the Core OS, are only performed if appropriate communication channels are used, and if they are permitted by the system configuration table.

The VxWorks 653 Health Monitor (HM) provides a framework to raise and handle events such as alarms or messages in an Integrated Modular Avionics (IMA) system. The framework supports the ARINC API, and includes a standalone API. The HM functions at three levels: module, partition and process. Fault responses and recovery actions are table-driven at the partition and module level, while application actions are driven at the process level. Partition or module level handlers can communicate information to other partitions by notifying them of given events. For instance, one partition handler can tell another about an event that caused it to restart the partition.

Application Development Environment

The VxWorks 653 Platform includes Wind River Workbench, which is an Eclipse-based collection of tools that provide an end-to-end software-development suite. Workbench supports establishing and managing host-target communications, and developing, running, debugging, monitoring, analyzing, testing, and managing VxWorks 653 modules. Workbench includes a full project facility, advanced source-code analysis, simultaneous management of multiple targets, and a debugger that can manage multiple processes or threads on a single target or on multiple targets. Included in Workbench are configuration and build tools that support a combination of XML-based and component-based configuration and build of VxWorks 653 modules. Moreover, certified command line tools are provided to build projects, configure using XML and components, or monitor and debug a running system if developers choose not to use a graphical interface.

A VxWorks 653 simulator is also included which provides the capability to create VxWorks 653 applications and test them on a Windows platform without need for specific reference hardware. The VxWorks 653 environment supports the WTX (Wind River tool exchange) protocol that lets host applications communicate with the target server residing on the host computer. WTX can also be used to connect third-party applications to the Workbench GUI.

Application Programming Interfaces

A library of Application Programming Interfaces (APIs) is provided to ease the process of building a safety application. These provide functions that can query the state of the safety logic, aid with the communications between the layers and monitor health of vital components like the system memory. In addition there are a range of control and status APIs giving the safety application full control down to the level of watchdog timer, I/O port control and physical health monitoring. The following is the list of APIs:

- Control/Status
- DRAM Scrubber
- Firmware Header Info
- Firmware Upgrade
- IP Addressing

- Link Health Check
- Module Management
- PRP/HSR Switch Management
- Run Time Diagnostics
- Safety Layer

- System Logging
- Switch Management
- Vital Product Data (VPD)
- Voting Logic
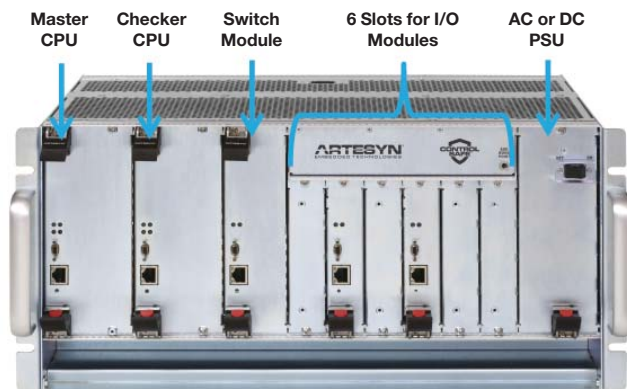
SIL4 Certification Evidence

Artesyn's ControlSafe Platform strictly adheres to all industry specifications and standards required to deliver a highly reliable and available platform for modern safety applications. Artesyn provides customers with a complete Certification Evidence Package to facilitate the certification process on their integrated systems. The Certification Evidence Package includes:

- Safety Case
  - Definition of system
  - Quality management report
  - Safety management report
  - Technical safety report
  - Safety assessment report
- Safety Manual
  - Specifies user's actions required to enable the integration of Artesyn's ControlSafe Platform into a safety-relevant system
- SIL4 Safety Certificate issued by a certification body

System Chassis

Front View

Master CPU · Checker CPU · Switch Module · 6 Slots for I/O Modules · AC or DC PSU

Rear View

AC or DC PSU · 6 Slots for I/O Modules · Switch Module · Checker CPU · Master CPU
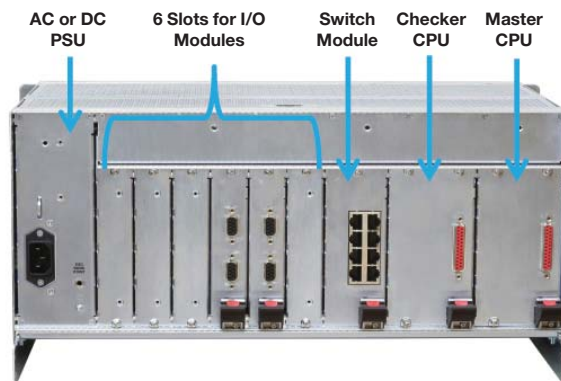
CSC Dimensions (unit: mm)

448

353

40

146

7

221

483
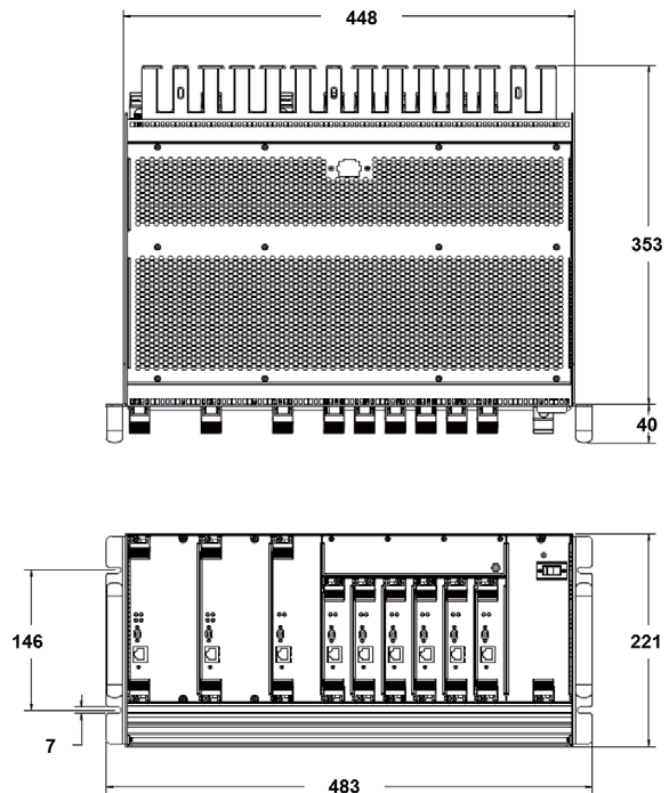
System Rack Mounting Examples

AC Baffle – 1U

CSC #1 – 5U

CSC #2 – 5U

SRB – 1U

AC Baffle – 1U

Single CSC – 5U

AdvancedTCA® Products
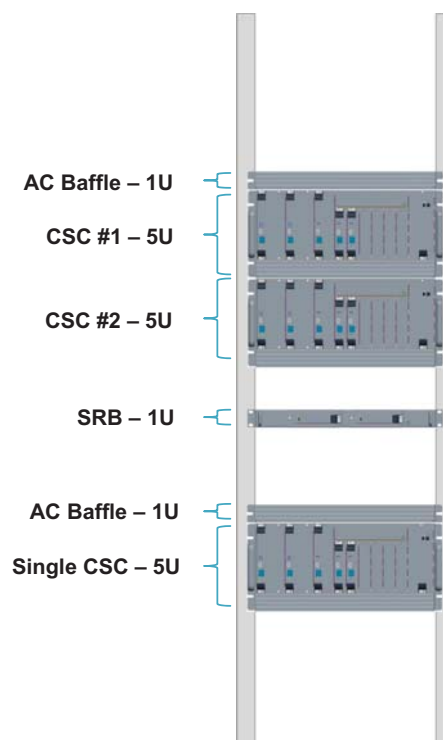
Artesyn Embedded Technologies' products complying with AdvancedTCA® standards are designed to address applications requiring high performance, high reliability and long life cycles. The telecommunications industry was quick to recognize the fit with its carrier-grade requirements. Applications include control plane and packet and media processing infrastructure for wireless networks, IP Multimedia Subsystem (IMS), IPTV, other central office applications and network data center environments. ATCA® products have also been deployed in a range of military, aerospace and industrial automation applications such as C4ISR and batch processing control.

Artesyn offers a comprehensive portfolio of 10G and 40G ATCA products including shelf, switch blade and payload blade products. Payload blade options include high performance server, flexible I/O, packet processing and storage blades. Multiple business engagement models are designed to suit almost any customer – from purchasing ATCA products separately and integrating them yourself, to detailed integration and custom packaging services from our dedicated Solution Services group.

Advanced TCA®

AdvancedTCA® Platform Cores

Artesyn's Centellis® series consist of application-ready platform cores which include a chassis with shelf management, cooling and power distribution integrated with redundant switch blades and a range of payload blade and software options. Centellis platform cores are designed to be NEBS & ETSI ready and some configurations come "pre-certified" for NEBS, saving time-to-market and cost. For unique configurations, Artesyn is certified to do NEBS testing in-house and we offer a range of testing and certification services. Further enhancing the Centellis platform is our System Services Framework (SSF) software, designed to provide you with full monitoring and management access to the system, including diagnostics software options to debug issues quickly. Our FlowPilot™ load balancing software enhances the packet flow efficiency without the need to add a separate appliance.

Centellis® 8000 Series
14-Slot 40G ATCA System with Power and Cooling of up to 600W per slot

- Architected for high availability applications
- 14-slots with rear transition module capability for each slot
- Base platform includes two 40G ATCA switches and shelf management
- Wide range of server, packet processing and media processing payload available
- Advanced platform management software and load balancing software options
- Cooling and power for up to 600W per slot
- AC and DC power variants
- Popular configurations pre-certified for NEBS Level 3
- PICMG® 3.0 ATCA mechanical form factor with enhanced power & cooling
- PICMG® 3.1 ATCA high performance switch fabric capable of 1, 10 and 40Gbps operation

Centellis® 4440
14-Slot 40G ATCA System – Broadly Deployed and Proven Performance

- Architected for high availability applications
- 14-slots with rear transition module capability for each slot
- Base platform includes two 40G ATCA switches and shelf management
- Wide range of server, packet processing and media processing payload available
- Advanced platform management software and load balancing software options
- Cooling and power for up to 350W per slot and CP-TA B.4 compliance
- NEBS certification services available
- PICMG® 3.0 ATCA mechanical form factor with enhanced power and cooling
- PICMG® 3.1 ATCA high performance switch fabric capable of 1, 10 and 40Gbps operation

Centellis® 4410
14-Slot 10G ATCA System – Broadly Deployed and Proven Performance

- Architected for high availability applications
- 14-slots with rear transition module capability for each slot
- Base platform includes two 10G ATCA switches and shelf management
- Wide range of server, packet processing and media processing payload available
- Switch management and protocol software
- Cooling and power for up to 350W per slot and CP-TA B.4 compliance
- NEBS certification services available
- PICMG® 3.0 ATCA mechanical form factor with enhanced power and cooling
- PICMG® 3.1 ATCA high performance switch fabric capable of 1, 10Gbps operation
- Designed for NEBS/ETSI compliance

![Advanced TCA® logo]

AdvancedTCA® Shelves

Artesyn offers a complete suite of ATCA shelf products including 2-slot, 6-slot, 14-slot and 16-slot shelf form factors with both 10G and 40G capable backplanes.

All ATCA compliant Artesyn shelf products have superior power and cooling characteristics; high power budget per slot, front-to-rear cooling architecture and CP-TA B.4 compliant or better cooling performance. Shelf Management functionality is integrated into each ATCA shelf and all, redundant field replaceable units (FRUs) are included.

Centellis® 2000
2-Slot 40G ATCA System – Low-Profile with Front-to-Rear Cooling

- Architected for high availability applications
- 2-slots with rear transition module capability for each slot
- Integrated shelf management
- Direct cross-connect circuitry for the 1, 10, and 40G backplane fabric
- Wide range of server, packet processing and media processing payload available
- Advanced platform management software options
- Front to rear cooling
- Cooling & power for up to 350W per slot and CP-TA B.4 compliance
- AC and DC power configurations available
- 2 user slots for OEM customization
- NEBS certification services available
- PICMG® 3.0 ATCA mechanical formfactor with enhanced power & cooling
- PICMG® 3.1 ATCA high performance switch fabric capable of 1, 10 and 40Gbps operation

AXP640
40G ATCA Shelf

- 6-slot, 7U, 19" form factor
- AC and DC power input options
- All redundant field replaceable units (FRUs)
- Integrated Telco Alarm functionality
- Front and rear cable management
- CP-TA B.4 compliant thermal performance
- Up to 350 Watts/blade power distribution
- RoHS (6 of 6) compliant
- Designed for NEBS/ETSI compliance (DC variants only)

AdvancedTCA® Switch Blades

A variety of switch blades are available with flexible options for processor AMCs, local storage and Telco clocking. Switch blade products include 10G and 40G variants to satisfy different performance and price points depending on application requirements.

ATCA-F140
40G Switch Blade

- PICMG® 3.0 compliant base interface switch
- PICMG 3.1, Option 1, 9 fabric interface switch (1G/10G)
- PICMG 3.1 R2 for 40G fabric support
- Single AMC site
- Optional SATA HDD
- Optional Telecom clocking support
- Integrated software package
- Designed for NEBS/ETSI compliance
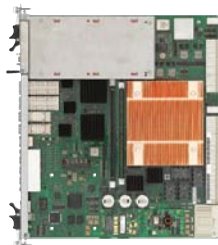
ATCA-F125
10G Switch Blade

- PICMG® 3.0 compliant base interface switch
- PICMG 3.1, Option 1, 9 fabric interface switch (1G/10G)
- Single AMC site
- Optional SATA HDD or SSD
- Optional Telecom clocking support
- Integrated software package
- Designed for NEBS/ETSI compliance

PrAMC-7311
Advanced Mezzanine Cards

- Single Intel® Core™ i7 processor running at 2.2 GHz
- 4GB and 16GB memory options, ECC protected, DDR3
- Complete Basic Blade Software package including Wind River Linux operating system
- AMC front panel support for USB, 10/100/1000 Ethernet and serial console port
- 8MB of BIOS flash, dual-bank architecture
- AMC mid-size form factor
- AMC.0, 1, 2, 3 compliant
- Designed for NEBS/ETSI compliance

*For complete product specifications, go to **www.Artesyn.com/computing***

AdvancedTCA® IA Server Blades

Artesyn is committed to closely following the Intel® Embedded Platform Roadmap for ATCA® server blades. Look for Artesyn to deliver best-in-class performance featuring high-end dual Intel® Xeon® processors, and extreme memory capacity for demanding applications like subscriber databases and video-on-demand servers. Additional features such as hot-swappable hard drives and telecom clock synchronization are also provided. All of the server blades work with a range of available rear transition modules (RTM) supporting hot- swappable hard disks with flexible choice of storage options and RAID 0/1 functionality. Unless otherwise stated, the ATCA fabric interface on each blade is PICMG® 3.1 Option 1, 9 compliant.

ATCA-7370
10G ATCA Server Blade

- Two 8-core Intel® Xeon® processors, E5-2648L, 1.8 GHz
- Up to 128GB main memory
- Redundant PICMG® 3.1, Option 9, Option 1 ATCA fabric interface
- Powerful hardware off-loading functions for en/decryption, compression, based on an Intel Communications Chipset 8920 (optional)
- Multiple 1 and 10Gbps network and storage I/O connectivity options
- Hot-swappable hard disk with flexible choice of storage options
- RAID 0/1 support
- Multiple software packages including operating systems
- Designed for NEBS and ETSI compliance

ATCA-7368
10G ATCA Server Blade

- Designed to meet cost-sensitive applications
- One 6-core Intel® Xeon® processor L5638 (2.0 GHz)
- Up to 48GB main memory
- One mid-size AMC site supporting offload, storage and I/O
- Cost-effective on-board SATA drive option
- Hot-swappable hard disk with flexible choice of storage options via RTM
- RAID 0/1 support
- Multiple storage and I/O connectivity
- PICMG® 3.1 Option 1, 9 (1/10GbE) ATCA fabric interface
- Designed for NEBS and ETSI compliance
- Multiple software packages including operating systems

ATCA-7367
10G ATCA Server Blade

- One 6-core Intel® Xeon® processor L5638 (2.0 GHz)
- Up to 48GB main memory
- One mid-size AMC site with telecom clock support
- Cost-effective on-board SATA drive option
- Fully supported by the ATCA-736x RTM family
- Hot-swappable hard disk with flexible choice of storage options via RTM
- RAID 0/1 support
- Multiple network and storage I/O connectivity
- PICMG® 3.1 Option 1, 9 (1/10GbE) ATCA fabric interface
- Designed for NEBS and ETSI compliance
- Multiple software packages including operating systems

ATCA-7365
10G ATCA Server Blade

- High performance Intel® Architecture processor blade
- Two 6-core Intel® Xeon® processors L5638 (2.0 GHz)
- Up to 192GB main memory
- Hot-swappable hard disk with flexible choice of storage options
- RAID 0/1 support
- Multiple network and storage I/O connectivity
- Option 9 (1/10GbE) ATCA fabric interface
- Designed for NEBS and ETSI compliance
- Multiple software packages including operating systems
- Wind River Network Acceleration Platform

ATCA-7360
10G ATCA Server Blade

- Two quad-core Intel® Xeon® processors L5518 (2.13 GHz)
- Up to 80GB main memory
- Hot-swappable hard disk with flexible choice of storage options
- RAID 0/1 support
- Multiple network and storage I/O connectivity
- Option 9 (1/10GbE) ATCA fabric interface
- Designed for NEBS and ETSI compliance
- Multiple software packages including operating system

AdvancedTCA® Packet and Media Processing Blades

Artesyn packet processing blades are optimized for data plane or signal plane processing in telecommunications or data communications applications. Our family of Cavium OCTEON and Intel® Xeon® processing blades is designed for IP packet processing in applications such as packet gateways, 4G wireless gateways, deep packet inspection applications, and network security.

Artesyn packet processing blades support a wide variety of performance and bandwidth options. On-board Ethernet switches support flexible data paths. Integrated into Artesyn 10GbE and 40GbE board and system core products, the Artesyn packet processor products offer application-ready platforms for signaling and call control, network gateway and edge functions, deep packet inspection and security processing.

ATCA-7470

40G Packet Processing/Server Blade

- Two 8-core Intel® Xeon® processors, E5-2658, 2.1 or E5-2648L, 1.8 GHz
- Up to 128GB main memory
- Redundant 40G (KR4), 10G (KR) and PICMG® 3.1, Option 9, Option 1 ATCA fabric interface
- Powerful hardware off-loading functions for en/decryption and compression based on two Intel® Communications Chipset 8920 (optional)
- Multiple 1 and 10Gbps network and storage I/O connectivity options
- Hot-swappable hard disk with flexible choice of storage options
- RAID 0/1 support
- Multiple software packages including operating systems
- Designed for NEBS and ETSI compliance

ATCA-7475

Packet Processing / Server Blade

- Two 10-core Intel® Xeon® processors, E5-2658 v2, 2.4 or E5-2648L v2, 1.9 GHz
- Up to 128GB main memory
- Redundant 40G (KR4), 10G (KR) and PICMG® 3.1, Option 9, Option 1 ATCA fabric interface
- Powerful hardware off-loading functions for en/decryption and compression, based on two Intel® Communications Chipset 8920 (optional)
- Multiple 1 and 10Gbps network and storage I/O connectivity options
- Hot-swappable hard disk on optional RTM with flexible choice of storage options and RAID 0/1 support
- Multiple software packages including operating systems
- Designed for NEBS and ETSI compliance
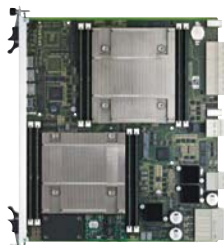
ATCA-9405

10G ATCA Packet Processing Blade

- Two Cavium OCTEON II CN6880 multi-core MIPS64 processors with up to 128GB DRAM
- Support for Wind River PNE 4.x OS, Cavium SDK and 6WIND 6WINDGate
- Ethernet switch connecting all rear I/O, backplane I/O and OCTEON processors with L2 and L3 switch management software
- Local Freescale QorIQ™ dual-core blade management processor
- Rear transition module with 8x 10GbE plus 2x 40GbE I/O connectivity
- Zone 3 PCI Express ports enable the design of custom RTMs withmass storage
- Designed for NEBS and ETSI compliance in a CP-TA B.4 class enclosure

ATCA-9305

10G ATCA Packet Processing Blade

- Two Cavium OCTEON 16-core CN5860 processors operating at 800 MHz
- ATCA-9305-NSP version with 256MB RLDRAM for optimized deep packet inspection performance
- Cost-optimized ATCA-9305-SCP configuration without RLDRAM support
- Freescale MPC8548 PowerQuicc III integrated communications processor
- Hardware acceleration with thread pinning, security, de-/compression, regular expression processing, packet queuing and scheduling functions
- Broadcom BCM56802 10 Gigabit Ethernet (GbE) multilayer switch
- Easy access front panel Ethernet and serial management ports
- Designed to deliver telco-grade reliability
- Full hot swap support
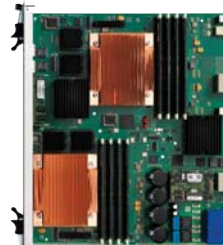
ATCA-8320
AdvancedTCA DSP Blade

- Up to 24 Octasic OCT2224M DSPs on two mezzanine sites
- Comprehensive voice and video processing firmware and programmers interface
- Dual core Intel® Core™ i7 processor for local control and management application
- 8 core Freescale QorIQ™ P4080 for blade management plus packet processing and load balancing of IP streams
- Local Ethernet switching network with full switch management utilities
- Rear transition module supports 10G + 4 x 1G Ethernet cable terminations
- Designed for NEBS Level 3 and ETSI telecom standards compliance in a CP-TA B.4 class ATCA enclosure

ATCA-8310
AdvancedTCA DSP Blade

- Up to 30 Texas Instruments TMS320TCI6486 6-core DSPs
- 8-core Freescale QorIQ™ P4080 for packet processing and load balancing in the IP I/O path
- Pre-installed Linux on P4080 with utilities for blade configuration, switch management and DSP setup
- Local Ethernet switch connecting all DSPs, CPUs, ATCA networks and I/O IP RTM supporting 10Gigabit Ethernet
- Designed for NEBS and ETSI compliance in a CP-TA B.4 class enclosure
- Red Hat RHEL certified

Commercial ATCA™ Bladed Servers and Blades

Designed for deployment outside of the telecommunications central office, the commercial ATCA systems are optimized for applications which value the enhanced reliability, serviceability and longevity of AdvancedTCA® technology, without the need to meet the NEBS requirement of operating at elevated ambient temperatures (up to 55 °C). In these cases, the enhanced cooling of Artesyn systems conforming to ATCA specifications can be used to deliver higher levels of performance than traditional AdvancedTCA systems.
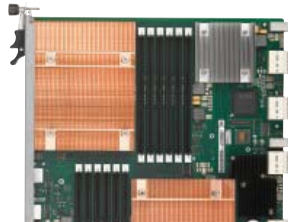
ATCA-7365-CE
10G ATCA Network Datacenter Server Blade

- Two 6-core Intel® Xeon® processors, E5645 (2.4 GHz)
- Up to 96GB main memory
- Fully supported by the ATCA-736X RTM family
- Hot-swappable hard disk with flexible choice of storage options
- RAID 0/1 support
- Multiple network and storage I/O connectivity
- 10GbE ATCA fabric interface, PICMG® 3.1 Option 1, 9
- Designed for temperature controlled environment
- Multiple software packages including operating systems

ATCA-7368-CE
10G ATCA Network Datacenter Server Blade

- One 4- or 6-core Intel® Xeon® processor, E5620 or E5645 (2.4 GHz)
- Up to 48GB main memory
- Cost-effective on-board SATA drive option
- One mid-size AMC site supporting offload, storage and I/O
- Hot-swappable hard disk with flexible choice of storage options via RTM
- RAID 0/1 support
- Multiple storage and I/O connectivity
- PICMG® 3.1 Option 1, 9 (1/10GbE) ATCA fabric interface
- Designed for Commercial ATCA in a temperature controlled environment
- Multiple software packages including operating systems

AdvancedTCA® Software

System Services Framework (SSF)

ATCA System Management Software and Framework

System Services Framework (SSF) is a centralized management system to configure and monitor software and hardware components in a single shelf or complex system of multiple AdvancedTCA® (ATCA®) shelves. SSF is optimized to work with Artesyn Embedded Technologies' range of application-ready Centellis® ATCA systems, which cover 2-slot, 6-slot and 14-slot variants that are designed to meet the needs of both telecom central office and network data center environments. SSF introduces an out-the-box paradigm to ATCA systems and further improves time-to-market for network element design, and ease of operation for in-field systems.

SSF provides easy access to Artesyn's ViewCheck™ software, an in-service and out-of-service diagnostic suite specifically developed for the Artesyn range of ATCA payload and switch cards.

ViewCheck™

Diagnostics Software for ATCA Platforms

ViewCheck™ is an optional in-service and out-of-service diagnostic suite specifically developed for the Artesyn range of ATCA® payload and switch blades. ViewCheck can be used to diagnose and monitor ATCA blades, as part of a wider system management policy enabled by Artesyn's SSF ATCA system management software framework. The diagnostic utilities of ViewCheck help in identifying, detecting, and locating failures on a blade. ViewCheck also provides a mechanism to monitor the status of devices such as CPU, storage, Ethernet counters and errors.

The ViewCheck software can be used locally as standalone diagnostics software using CLI and XML interfaces or it can be accessed remotely as part of the software framework.
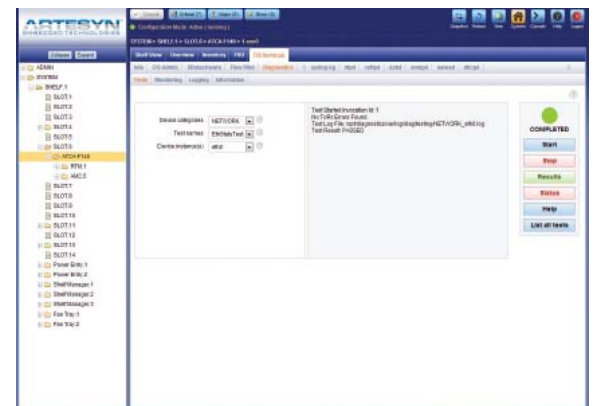
FlowPilot™

Packet Balancing Software for ATCA Platforms

FlowPilot™ software enables line rate traffic flow separation and load balancing to ATCA platforms. Rapidly increasing network bandwidths typically require system architectures with multiple packet processing engines to process the packet stream in parallel - while still maintaining the context of a subscriber/provider communication flow. Standard networking protocols only partially address such packet distribution in a scalable and highly available environment with fail-over scenarios.

FlowPilot installed on the ATCA hub blade adds in as the platform's central packet dispatcher managing the switching hardware to achieve lowest latency, full wire speed, and flow-context aware packet distribution to and from all processing blades in the system.

In combination with the ATCA-F140 hub blade, FlowPilot enables the following functions:

- Balance traffic to multiple ATCA blades for packet monitoring and processing
- Maintain flow context and packet sequence
- Fully transparent for external network elements
- Separate traffic into application groups
- Redundant 160G external Ethernet connectivity
- 480Gbit/s internal bandwidth for packet processing
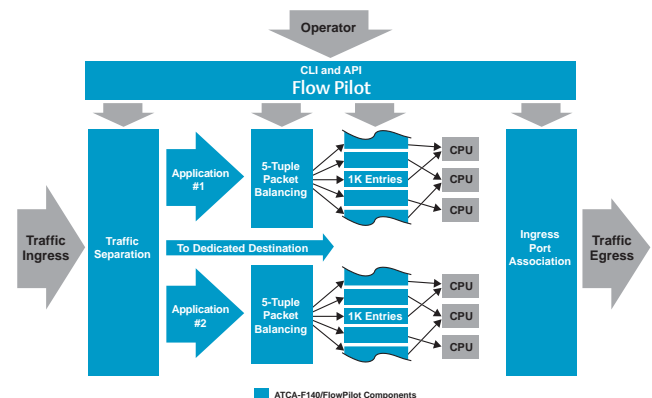
SRstackware™ Switching and Routing Software

The Artesyn SRstackware™ switching and routing software suite was developed to fulfill the ever-increasing Layer 2 and Layer 3 networking requirements of telecom and non-telecom network elements. SRstackware software suites support a wide range of defined standards and protocols and enable easy integration with customer applications. SRstackware softare suites are available on all ATCA switch blades and select ATCA payload blade products.

Basic SRstackware software includes all required network functions, switch management and commonly used Layer 2 protocols combined into a single product. Enhanced SRstackware is a series of specific protocol modules that can be purchased separately depending on application requirements.

Basic SRstackware software suites features:

Switch Management
- Command Line Interface (CLI)
- Simple Network Management Protocol (SNMPv2) - RFC 1901, 2271
- Simple Network Management Protocol (SNMPv3) - RFC 3414, 3411
- Broadcast storm recovery
- Flow control - IEEE 802.3x
- Application Programming Interface (API) access

Layer 2 Switching
- Spanning Tree Protocol (STP) - IEEE 802.1d
- Rapid Spanning Tree Protocol (RSTP) - IEEE 802.1w
- Multiple Spanning Tree Protocol (MSTP) - IEEE 802.1
- Virtual LAN (VLAN) Tagging - IEEE 802.1q
- Link Aggregation Control Protocol (LACP) - IEEE 802.3ad
- VLAN Classification by Protocol and Port - IEEE 802.1v
- Class of Service (CoS) - IEEE 802.1p
- Link Aggregation Control Protocol (LACP) - IEEE 802.3ad
- Generic Attribute Registration Protocol (GARP) - IEEE 802.1q
- GARP Multicast Registration Protocol (GMRP) - IEEE 802.1q
- GARP VLAN Registration Protocol (GVRP) - IEEE 802.1q
- VLAN Stacking (Q-in-Q) - IEEE 802.1ad
- Static Filtering (ACL)
- Enhanced Load Balancing (by TCP/UDP port)
- Enhanced SRstackware features:

Layer 3 Routing
- IPv4 Routing
  – Internet Group Management Protocol (IGMP v1) - RFC 1112
  – Internet Group Management Protocol (IGMP v2) - RFC 2236
  – Internet Group Management Protocol (IGMP v3) - RFC 3376
  – IGMP Snooping/Proxy - RFC 4541
  – Routing Information Protocol (RIPv2) - RFC 2453
  – Open Shortest Path First (OSPFv2) - RFC 2328
  – Virtual Router Redundant Protocol (VRRP) - RFC 3768

- IPv6 Routing
  – RIP Next generation (RIPng) - RFC 2080

Artesyn AdvancedTCA® software improves time-to-market for network element design, and ease of operation for in-field systems.

PCIE Server Accelerators

Artesyn PCIE accelerators employ highly scalable voice and video processing for network applications, while using less space, less power and at a lower cost than the alternative of adding more servers or constraining application performance.

The "Sharp" portfolio of accelerators serves the needs of media processing applications in the communications infrastructure as well as video processing applications in the broadcast and communication service provider networks, in standard PCI Express form factors.

All of the solutions in the Sharp portfolio achieve maximum density/RU with multi-vendor interoperability, so applications can scale easily with less CAPEX and OPEX spending as application densities rise.
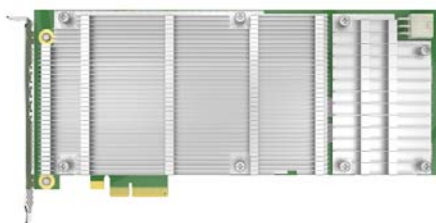
SharpStreamer™ PCIE-7207
High-Density Video Accelerator

- Multi-purpose video processing add-on card
- Highest H.264/AVC and H.265/HEVC transcoding density in smallest footprint
- Standard server compatible – no dedicated appliance needed


SharpMedia™ Platform
Dense Media Processing Communications Platform

- Serves Session Border Controller, Media Gateway and VoLTE WebRTC applications
- 2U NEBS Server with single or dual processor Xeon processors
- Multiple media accelerator add-on cards to scale up density

SharpCaster™ PCIE-8205
Broadcast Video Accelerator

- Full-height, half-length PCI Express card
- Complete software and hardware encoding/transcoding solution for broadcast applications, including linear and multiscreen formats, DSNG and live event contribution, and Ingest and play-out servers
- MPEG-2 and H.264 encoding and transcoding with support for optional SDI inputs
- High video quality motion estimation features
- Real-life video coding features such as fade, flash, skin tone detection, noise filtering and pre-deblocking
- Multi-channel Dolby Digital Pro,
- AAC-LC, HE-AAC and MPEG-1 layer II audio support
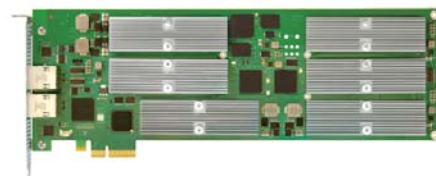
SharpMedia™ PCIE-8120
Media Processing Accelerator

- Single slot full length full height PCI Express card with x4 interface
- High performance media processing core based on power-efficient DSPs
- Optional 2 x GbE ports (RJ45) with NAT function for direct network attachment providing server offload
- Comprehensive voice and video processing firmware and programmers interface included
- Support for 720p and 1080p video conferencing
- Designed for NEBS Level 3 and ETSI telecom standards compliance when used in a suitable carrier grade enclosure
- Now supports Opus (used by WebRTC) and SILK (used by Skype) audio codecs

Artesyn's PCIE server accelerators maximize the density of your network through voice and video media acceleration designed for standard servers and appliances.

Computer-on-Module (COM)

Artesyn is fast becoming the Computer-on-Module (COM) supplier of choice for a broad range of industries including medical, retail, automation, test and measurement, transportation and renewable energy. Based on long-life embedded silicon, Artesyn's high quality, stable COM are delivered from outstanding manufacturing facilities and are backed by our global service presence.

COMs are highly integrated single-board computers that provide the core functionality of a system, allowing application-specific features to be designed onto a carrier board creating a semi-custom embedded PC solution. Artesyn COM products feature the latest Freescale QorIQ™ processors.

COMX-P40x0-ENP2
Ruggedized Freescale QorIQ™ Modules
- Freescale QorIQ P4040 or P4080 processor at 1.2GHz
- 2 or 4 GB of soldered-down DDR3-1333 ECC memory
- 95 mm x 125 mm COM Express Basic footprint
- -40 °C to +71 °C operating temperature range
- Shock and vibration hardened
- 16 configurable SERDES lanes available for maximum flexibility

COMX-P4080
Freescale QorIQ™ P4040 or P4080 Modules
- Freescale QorIQ P4040 or P4080 processors
- Four or eight Power Architecture cores running at 1.5 GHz
- Supports two channels of 2GB DDR3-1333 ECC SO-UDIMM (4GB max.)
- 95 mm x 125 mm COM Express Basic footprint
- 12 configurable SERDES lanes available for maximum flexibility

COMX-P2020
Freescale QorIQ™ P2020 Module
- Freescale QorIQ P2020 processor
- Two e500 Power Architecture cores running at 1.2 GHz
- On-board XGI Z11M Graphics Processor Unit (GPU)
- Supports up to 2GB DDR3 ECC SO-UDIMM
- 95 mm x 95 mm compact footprint
- MicroSD card slot for on-board storage

COMX-P1022
Freescale QorIQ™ P1022 Module
- Freescale dual-core QorIQ P1022 processor
- Two cores running at 1.067 GHz
- Supports up to 2GB DDR3 SO-DIMM
- 95 mm x 95 mm compact footprint
- DVI and LVDS Video output
- I2C Audio
- Ultra low power processing module (< 7 W)

VME™ Products

As part of the group of innovative companies that invented the VMEbus technology nearly 30 years ago, Artesyn has consistently worked to enhance and extend VMEbus technology. This process continues with VXS and 2eSST technologies which boosts the performance and capability of VMEbus technology while maintaining compatibility with existing systems over long product life cycles. Multi-core processors in our latest VME boards and ruggedized, extended temperature boards are just two of the other ways in which we are continuing to push the boundaries of performance and flexibility.

Artesyn products compliant with VME standards are supported by our industry alliance members–specialist companies that can tailor VME-based solutions to fit your application. This ecosystem, together with a worldwide sales and support network, helps to rapidly integrate the optimum solutions into customer end applications. For example, special features including extended temperature, conformal coating and ruggedized variants are options for select VME boards from our alliance partners. VMEbus technology is employed around the world in a variety of highly demanding applications.

MVME8110

- Freescale QorIQ™ P5010 1.2GHz
- Up to 4 GB DDR3-1200 MHz ECC Memory
- 512 KB MRAM
- 2 PMC/XMC sites
- Embedded NAND Flash (8GB eMMC)
- Up to 3 USB 2.0 ports
- Up to 3 Ethernet ports
- Up to 5 Serial ports
- 2 GPIO

MVME8100

- Freescale QorIQ™ P5020 1.8/2.0GHz
- Up to 8 GB DDR3-1333 MHz
- ECC Memory
- 512 KB FRAM
- 2 PMC/XMC sites
- Embedded NAND Flash (8GB eMMC)
- 2 x 4 PCIe or 2 x 4 SRIO connectivity to VXS backplane P0
- Up to 3 USB 2.0 ports
- Up to 5 Ethernet ports
- Up to 5 Serial ports
- 4 GPIO
- Extended temperature and conduction cooled variants

MVME2500

- 800 MHz or 1.2GHz Freescale QorIQ™ P2010 or P2020 processors
- 1GB or 2GB DDR3-800, soldered down
- Three on-board Gigabit Ethernet interfaces (one front, one rear, one configurable by customer to front or rear)
- Five serial ports
- One USB 2.0 port
- One PCM/XMC site
- Optional rear transition module
- Hard drive mounting kit available
- Extended temperature (-40 °C to +71 °C) and rugged variants
- MVME2502 - 2 PMC variant

MVME4100

- System-on-chip Freescale MPC8548E processsor (1.3 GHz) with PowerPC® e500 processor core
- 2GB of DDR2 ECC memory, 128MB NOR flash and 4GB NAND flash
- 512KB of MRAM non-volatile memory
- 2eSST VMEbus™ protocol with 320MB/s transfer rate across the VMEbus technology
- Four GbE ports; five serial ports
- USB 2.0 controller for integrating cost-effective peripherals
- Dual 33/66/100MHz PMC sites for expansion
- 8x PCI/PCI-X expansion connector for PMC/XMC expansion using Artesyn XMCspan carrier
- Extended temperature (-40 °C to +71 °C)

MVME7100

- System-on-chip Freescale MPC864xD processsor with dual PowerPC e600 processor cores
- Up to 2GB of DDR2 ECC memory, 128MB NOR flash and 4GB or 8GB NAND flash
- USB 2.0 controller for integrating cost-effective peripherals
- 2eSST VMEbus protocol with 320MB/s transfer rate across the VMEbus technology
- Dual 33/66/100MHz PMC-X sites for expansion via industry standard modules
- x8 PCI Express expansion connector for PMC-X and XMC expansion using XMCspan

A combination of high performance, rugged, modular construction and broad industry support makes Artesyn VMEbus™ compliant products ideal to address the needs of OEMs serving embedded computing markets.

![VMEbus Technology logo](VMEbus Technology™)

MVME5100

- MPC7410 or MPC750 microprocessor with 32KB/32KB L1 cache
- Up to 512MB of on-board ECC SDRAM expandable up to 1GB with optional RAM500 memory expansion modules
- 17MB flash memory
- Dual IEEE P1386.1 compatible 32/64-bit PMC expansion slots
- 64-bit PCI expansion mezzanine connector allowing up to four more PMCs
- Dual 16550 compatible async serial ports
- Dual 10BaseT/100BaseTX Ethernet

MVME5500

- MPC7457 PowerPC® processor at 1GHz
- 512KB of on-chip L2 cache and 2MB of L3 cache
- AltiVec coprocessor for high-performance computational applications
- Two banks of soldered flash memory (32MB and 8MB)
- Dual independent 64-bit PCI buses and PMC sites with a bus speed of up to 66 MHz
- Gigabit Ethernet interface plus an additional 10/100BaseTX Ethernet interface 64-bit PCI expansion mezzanine connector allowing up to four more PMCs
- I/O compatibility with MVME51xx family
- Support for processor PMCs (PrPMCs)

MVME3100

- System-on-chip Freescale MPC8540 processsor with PowerPC® e500 processor core
- Two GbE ports plus an additional 10/100BaseTX port
- Up to 512MB of DDR333 ECC memory
- 2eSST VMEbus protocol with 320MB/s transfer rate across the VMEbus technology
- USB 2.0 and Serial ATA controllers for integrating cost-effective peripherals
- Dual 33/66/100 MHz PMC-X sites for expansion via industry standard modules
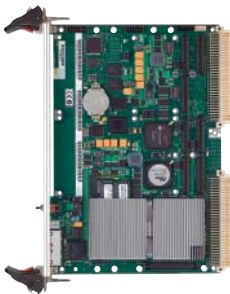
MVME6100

- MPC7457 PowerPC processor running at up to 1.267 GHz
- 128-bit AltiVec® coprocessor for parallel processing
- Up to 2GB of on-board DDR ECC memory and 128MB of flash memory
- 2eSST VMEbus protocol with 320MB/s transfer rate across the VMEbus technology
- Two 33/66/100 MHz PMC-X sites
- Dual GbE interfaces for high performance networking

XMCspan

- Single-slot 6U VMEbus format
- PLX PEX8533 PCI Express 6-port switch
- Tundra Tsi384 PCI Express to PCI-X interface bridges
- Support for two single-wide, or one double-wide XMC or PMC per XMCspan
- Stacking capability
- Front-panel I/O
- Single 4-lane interface with P15 connector for XMCs
- Injector/ejector handles per VME64 extensions
- Compatible with Artesyn's MVME7100 and MVME4100 VMEbus SBCs

CompactPCI® Products

CompactPCI® technology offers the performance and processor independence of the PCI bus in a rugged, modular Eurocard form factor, creating a robust embedded computing technology that is ideal for telecommunications, industrial control and imaging applications.

CompactPCI® Boards

Artesyn offers processor boards featuring either Intel® or PowerPC® processors, enabling you to choose the right processor for your application.
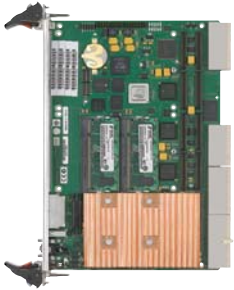
CPCI6200
PICMG 2.0/2.16 Processor Board

- Freescale MPC8572 (1.3 or 1.5 GHz) dual-core integrated processor
- Integrated north bridge in the processor
- 2GB or 4GB ECC-protected DDR3-800 memory
- Four on-board GbE interfaces
- Two serial ports; one USB 2.0 port
- Support for PICMG 2.16 CompactPCI Packet Switching Backplane specification
- Full PICMG® 2.1, R2.0 Hot Swap specification compliance
- Two PCI-X/PCI mezzanine card (PMC) site
- PLX6466 PCI-to-PCI bridge technology

Artesyn products are designed to deliver enhanced reliability, serviceability and longevity in the most extreme environments

Solution Services

As an embedded computing industry leader, we have a deep knowledge of our customers, their diverse markets, product applications and environments. Our Solution Services portfolio extends our customers' reach in today's demanding markets. This suite of services was designed around our customers' product lifecycles and allows Artesyn to deliver critical services and support when and where they are needed.

We can also create specialized service offerings for your specific product or industry requirements. Our engineers, technicians and consultants are ready to tackle your toughest challenges, allowing you to focus on what will really add value to your business.

Design Services

During your project design and development phase, it's all about time. Time-to-market and time-to-revenue are the yardsticks you use to measure your success. You need to complete your project in the shortest amount of time with the least number of changes or redesign cycles. Our Design Services range from product concept creation to pre-release customer acceptance.

- Development Consulting
- Development Support
- Application Porting
- Benchmarking
- Performance Analysis
- System Concept Design
- Regulatory Testing
- Engineering Support

Deployment Services

Deployment Services are designed to protect your product investment after release to your customers or markets. You need to ensure customer satisfaction while maintaining a predictable support cost model. Even if you have your own services organization, our Deployment offerings can complement and extend your service portfolio.

- Technical Support
- Product Integration
- Warranty Services
- Repair Services
- On-site Support
- Installation Support
- Logistics Programs
- Revision Management

Global Possibilities

Thanks to our extensive worldwide network of logistics facilities and design centers in the USA, Europe, India and Asia-Pacific region, we can deliver services where you need them. Service programs can be customized and tailored to specific geographic needs depending on the technology deployed, support requirements and product lifecycle. As global product support becomes more complex, we help simplify your service chain to insure success wherever your customers are located.

Renewal Services

As your product moves into the mature stage of its lifecycle, you may be faced with challenges that include long-term support for customers not ready to move to newer products, finding ways to increase the current product's performance and/or functionality, as well as migrating legacy applications and functionality to new platforms. With our Renewal Services, we have solutions for each of these challenges.

- Longevity of Repair
- Longevity of Support
- Product Migration Consultation
- Platform Technology Insertion

Seamless Lifecycle Support

The Solution Services portfolio focuses on three service offerings based on typical product development and lifecycles; Design, Deployment and Renewal. Design Services can help you minimize design time and speed your new products to market. Deployment Services can help you to train your technical staff, resolve technical issues as well as integrate and test your products efficiently and cost effectively. Renewal Services provide long-term product and support options and can help you to achieve a smooth transition between generations of products.

Our Solution Services portfolio extends your reach by enabling you to seamlessly deliver global services to your customers in all phases of their product lifecycle.

Technology Partner Program

Artesyn's Technology Partner Program brings together a select community of companies committed to transforming leading-edge embedded technologies into globally available, application-specific business solutions. The Technology Partner Program enables Artesyn Embedded Technologies to offer complete solutions to customers by building upon the foundations of these important industry standards – ATCA, COM Express, PCI Express, Carrier Grade Linux and the Service Availability Forum.

With a diverse array of partners spanning a broad range of technologies and applications, the Technology Partnership Program ensures customers that they will receive comprehensive, application-specific solutions with guaranteed interoperability from a single source.

Our partners' capabilities span a broad range of technologies and capabilities. Silicon provider partners help us determine the appropriate product and services roadmaps to meet customers' requirements for performance and stability. OS partners offer the ability to provide customers a choice of fully integrated, rugged operating systems. Application and protocol partners allow us to offer more complete solutions to layer on top of the OS. And finally, additional partners help us gain time-to-market advantages in specific areas such as modular storage or network I/O.

For more information, and the latest list of Artesyn partners, please visit:
www.Artesyn.com/computing/about-us/partners

Terms and Conditions of Sale

The Artesyn Embedded Technologies company that accepts Buyer's order for Goods is herein referred to as the "Seller" and the person or entity purchasing goods or services ("Goods") and/or licensing software and/or firmware which are preloaded, or to be loaded into Goods ("Software") from Seller is referred to as the "Buyer." These Terms and Conditions, any price list or schedule, quotation, acknowledgment or invoice from Seller relevant to the sale of the Goods and licensing of Software and all documents incorporated by specific reference herein or therein constitute the complete and exclusive statement of the terms governing the sale of Goods and license of Software by Seller to Buyer. Seller's acceptance of Buyer's purchase order is expressly conditional on Buyer's assent to all of Seller's terms and conditions of sale, including terms and conditions that are different from or additional to the terms and conditions of Buyer's purchase order. Buyer's acceptance of the Goods and/or Software will manifest Buyer's assent to these Terms and Conditions. Seller reserves the right in its sole discretion to refuse orders. Notwithstanding anything to the contrary, in the event that the provisions of these Terms and Conditions conflict with the provisions of an effective agreement signed by a duly authorized representative of both parties ("Effective Agreement") that applies to the transaction(s) contemplated herein, the Effective Agreement shall control.

1. PRICES: Unless otherwise specified in writing by Seller, the price quoted or specified by Seller for the Goods and/or Software shall remain in effect for 30 days after the date of Seller's quotation or acknowledgment of Buyer's order for the Goods and/or Software, whichever occurs first, provided an unconditional authorization from Buyer for the shipment of the Goods and/or Software is received and accepted by Seller within such time period. If such authorization is not received by Seller within such 30 day period, Seller shall have the right to change the price for the Goods and/or Software to Seller's price for the Goods and/or Software at the time of shipment. All prices and licensee fees are exclusive of taxes, transportation and insurance, which are to be borne by Buyer.

2. TAXES: Any current or future tax or governmental charge (or increase in same) affecting Seller's costs of production, sale, or shipment, or which Seller is otherwise required to pay or collect in connection with the sale, purchase, delivery, storage, processing, use or consumption of Goods, shall be for Buyer's account and shall be added to the price or billed to Buyer separately, at Seller's election.

3. TERMS OF PAYMENT: Unless otherwise specified by Seller, terms are net 30 days from date of Seller's invoice by bank wire transfer or automated clearing house in U.S. currency. Payment will be made no less frequent than weekly. Seller shall have the right, among other remedies, either to terminate this agreement or to suspend further performance under this and/or other agreements with Buyer in the event Buyer fails to make any payment when due, which other agreements Buyer and Seller hereby amend accordingly. Buyer shall be liable for all expenses, including attorneys' fees, relating to the collection of past due amounts. If any payment owed to Seller is not paid when due, it shall bear interest, at a rate to be determined by Seller, which shall not exceed the maximum rate permitted by law, from the date on which it is due until it is paid. Any payment due to either party under this agreement shall be made in full without any set-off, restriction, condition deduction or withholding for or on account of any counterclaim. Should Buyer's financial responsibility become unsatisfactory to Seller, cash payments or security satisfactory to Seller may be required by Seller for future deliveries of the Goods and/or Software. If such cash payment or security is not provided, in addition to Seller's other rights and remedies, Seller may discontinue deliveries.

4. SHIPMENT AND DELIVERY: While Seller will use all reasonable commercial efforts to maintain the delivery date(s) acknowledged or quoted by Seller, all shipping dates are approximate and not guaranteed. Seller reserves the right to make partial shipments. Seller, at its option, shall not be bound to tender delivery of any Goods and/or Software for which Buyer has not provided shipping instructions and other required information. If the shipment of the Goods and/or Software is postponed or delayed by Buyer for any reason, Buyer agrees to reimburse Seller for any and all storage costs and other additional expenses resulting therefrom. Risk of loss and legal title to the Goods shall transfer from Seller to Buyer upon delivery to and receipt by carrier at Seller's shipping point. Unless otherwise specified by Seller, all shipments are F.C.A. Seller's shipping point (Incoterms 2010). Any claims for shortages or damages suffered in transit are the responsibility of Buyer and shall be submitted by Buyer directly to the carrier. Shortages or damages must be identified and signed for at the time of delivery.

Buyer shall inspect Goods delivered to it by Seller immediately upon receipt, and, any course of dealing to the contrary notwithstanding, failure of Buyer to give Seller notice of any claim within 10 days after receipt of such Goods shall be an unqualified acceptance of such Goods.

5. LIMITED WARRANTY: Subject to the limitations of Section 6 and unless otherwise specified by Seller in writing, Seller warrants that the Goods manufactured by Seller will be free from defects in material and workmanship and substantially meet Seller's published specifications at the time of shipment under normal use and regular service and maintenance for (a) the period specified in Seller's then current product data sheets from the date of manufacture by Seller for standard Embedded Power Goods, (b) 2 years from initial shipment for standard Embedded Computing Goods, and (c) the period specified by Seller in writing for custom Embedded Power Goods and custom Embedded Computing Goods. Unless otherwise stated in a separate Software license agreement, Seller makes no warranty as to any Software. **THE WARRANTIES SET FORTH IN SECTIONS 5 AND 7 ARE THE SOLE AND EXCLUSIVE WARRANTIES GIVEN BY SELLER WITH RESPECT TO THE GOODS AND SOFTWARE AND ARE IN LIEU OF AND EXCLUDE ALL OTHER WARRANTIES, EXPRESS OR IMPLIED, ARISING BY OPERATION OF LAW OR OTHERWISE, INCLUDING WITHOUT LIMITATION, MERCHANTABILITY AND FITNESS FOR A PARTICULAR PURPOSE WHETHER OR NOT THE PURPOSE OR USE HAS BEEN DISCLOSED TO SELLER IN SPECIFICATIONS, DRAWINGS OR OTHERWISE, AND WHETHER OR NOT SELLER'S PRODUCTS ARE SPECIFICALLY DESIGNED AND/OR MANUFACTURED BY SELLER FOR BUYER'S USE OR PURPOSE.**

These warranties do not extend to any losses or damages due to misuse, accident, abuse, neglect, negligence (other than Seller's), unauthorized modification or alteration, use beyond rated capacity, unsuitable power sources or environmental conditions, improper installation, repair, handling, maintenance or application or any other cause not the fault of Seller. To the extent that Buyer or its agents have supplied specifications, information, representation of operating conditions or other data to Seller in the selection or design of the Goods and the preparation of Seller's quotation, and in the event that actual operating conditions or other conditions differ from those represented by Buyer, any warranties or other provisions contained herein that are affected by such conditions shall be null and void.

If within 30 days after Buyer's discovery of any warranty defects within the warranty period, Buyer notifies Seller thereof in writing, Seller shall, at its option and as Buyer's exclusive remedy, repair, correct or replace per its return policy, or refund the purchase price for, that portion of the Goods found by Seller to be defective. Failure by Buyer to give such written notice within the applicable time period shall be deemed an absolute and unconditional waiver of Buyer's claim for such defects. Advance written permission to return Goods must be obtained from Seller. Such Goods must be shipped transportation prepaid to Seller. Returns made without proper written permission will not be accepted by Seller. Seller reserves the right

to inspect Goods prior to authorizing return. Goods repaired or replaced during the warranty period shall be covered by the foregoing warranties for the remainder of the original warranty period or 90 days from the date of shipment, whichever is longer.

Buyer assumes all other responsibility for any loss, damage, or injury to persons or property arising out of, connected with, or resulting from the use of Goods and/or Software, either alone or in combination with other products/components.

PRE-PRODUCTION (Prototype, Engineering Verification Test, or Design Verification Test) UNITS ARE SOLD "WHERE IS, AS IS, WITH ALL FAULTS" WITHOUT WARRANTY OF ANY KIND, EXPRESS OR IMPLIED, INCLUDING, WITHOUT LIMITATION, IMPLIED WARRANTIES OF MERCHANTABILITY OR FITNESS FOR INTENDED PURPOSE.

6. LIMITATION OF REMEDY AND LIABILITY: THE SOLE AND EXCLUSIVE REMEDY FOR BREACH OF ANY WARRANTY HEREUNDER (OTHER THAN THE WARRANTY PROVIDED UNDER SECTION 7) SHALL BE LIMITED TO REPAIR, CORRECTION OR REPLACEMENT, OR REFUND OF THE PURCHASE PRICE UNDER SECTION 5.

SELLER SHALL NOT BE LIABLE FOR DAMAGES CAUSED BY DELAY IN PERFORMANCE AND THE REMEDIES OF BUYER SET FORTH IN THIS AGREEMENT ARE EXCLUSIVE. IN NO EVENT, REGARDLESS OF THE FORM OF THE CLAIM OR CAUSE OF ACTION (WHETHER BASED IN CONTRACT, INFRINGEMENT, NEGLIGENCE, STRICT LIABILITY, OTHER TORT OR OTHERWISE), SHALL SELLER'S LIABILITY TO BUYER AND/OR ITS CUSTOMERS EXCEED THE PRICE PAID BY BUYER FOR THE SPECIFIC GOODS OR SOFTWARE PROVIDED BY SELLER GIVING RISE TO THE CLAIM OR CAUSE OF ACTION. BUYER AGREES THAT IN NO EVENT SHALL SELLER'S LIABILITY TO BUYER AND/OR ITS CUSTOMERS EXTEND TO INCLUDE INCIDENTAL, CONSEQUENTIAL OR PUNITIVE DAMAGES. The term "consequential damages" shall include, but not be limited to, loss of anticipated profits, business interruption, loss of use, revenue, reputation and data, costs incurred, including without limitation, for capital, fuel, power and loss or damage to property or equipment.

It is expressly understood that any technical advice furnished by Seller with respect to the use of the Goods and/or Software is given without charge, and Seller assumes no obligation or liability for the advice given, or results obtained, all such advice being given and accepted at Buyer's risk.

7. PATENTS AND COPYRIGHTS: Subject to the limitations of the second paragraph of Section 6, Seller warrants that the Goods sold, except as are made specifically for Buyer according to Buyer's specifications, do not infringe any valid U.S. patent or copyright in existence as of the date of shipment. This warranty is given upon the condition that Buyer promptly notifies Seller of any claim or suit involving Buyer in which such infringement is alleged and cooperates fully with Seller and permits Seller to control completely the defense, settlement or compromise of any such allegation of infringement. Seller's warranty as to utility patents only applies to infringement arising solely out of the inherent operation according to Seller's specifications and instructions of such Goods. In the event such Goods are held to infringe such a U.S. patent or copyright in such suit, and / or the use of such Goods is enjoined, or in the case of a compromise or settlement by Seller, Seller shall have the right, at its option and expense, to procure for Buyer the right to continue using such Goods, or replace them with non-infringing Goods, or modify same to become non-infringing, or grant Buyer a credit for the depreciated value of such Goods and accept return of them. In the event of the foregoing or, if in Seller's opinion, Seller receives a credible allegation of infringement, Seller may also, at its option,

cancel or suspend this agreement as to future deliveries of such Goods, without liability.

8. EXCUSE OF PERFORMANCE: Seller shall not be liable for delays in performance or for non-performance due to acts of God; acts of Buyer; war; fire; flood; weather; sabotage; epidemics; strikes or labor disputes; civil disturbances or riots; governmental requests, restrictions, allocations, laws, regulations, orders or actions; unavailability of or delays in transportation; default of suppliers; or unforeseen circumstances or any events or causes beyond Seller's reasonable control. Deliveries or other performance may be suspended for an appropriate period of time or canceled by Seller upon notice to Buyer in the event of any of the foregoing, but the balance of the agreement shall otherwise remain unaffected as a result of the foregoing.

If Seller determines that its ability to supply the total demand for the Goods, or to obtain material used directly or indirectly in the manufacture of the Goods, is hindered, limited or made impracticable due to causes set forth in the preceding paragraph, Seller may allocate its available supply of the Goods or such material (without obligation to acquire other supplies of any such Goods or material) among its purchasers on such basis as Seller determines to be equitable without liability for any failure of performance which may result therefrom.

9. RESCHEDULE/CANCELLATION: Unless otherwise agreed in writing by Seller, orders under this agreement may not be rescheduled or canceled by Buyer for any reason.

10. CHANGES: Buyer may request changes or additions to the Goods and/or Software consistent with Seller's specifications and criteria. In the event such changes or additions are accepted by Seller, Seller may revise the price, license fees and dates of delivery.

Seller reserves the right to change designs and specifications for the Goods and/or Software without prior notice to Buyer, except with respect to Goods and/or Software being made to order for Buyer. Seller shall have no obligation to install or make such change in any Goods and/or Software manufactured prior to the date of such change.

11. NUCLEAR/MEDICAL: GOODS AND SOFTWARE SOLD HEREUNDER ARE NOT FOR USE IN CONNECTION WITH ANY NUCLEAR, MEDICAL, LIFE-SUPPORT AND OTHER HIGH RISK APPLICATIONS WHERE GOODS OR SOFTWARE FAILURE COULD LEAD TO LOSS OF LIFE OR CATASTROPHIC PROPERTY DAMAGE. Buyer accepts Goods and Software with the foregoing understanding, agrees to communicate the same in writing to any subsequent purchasers or users and to defend, indemnify and hold harmless Seller from any claims, losses, suits, judgments and damages, including incidental and consequential damages, arising from such use, whether the cause of action be based in tort, contract or otherwise, including allegations that the Seller's liability is based on negligence or strict liability.

12. ASSIGNMENT: Buyer shall not assign its rights or delegate its duties hereunder or any interest herein without the prior written consent of Seller, and any such assignment, without such consent, shall be void.

13. SOFTWARE: Notwithstanding any other provision herein to the contrary, Seller or applicable third party licensor to Seller shall retain all rights of ownership and title in its respective Software, including without limitation all rights of ownership and title in its respective copies of such Software. Except as otherwise provided herein, Buyer is hereby granted a nonexclusive, non-transferable royalty free license to use the Software incorporated into the Goods solely for purposes of Buyer properly utilizing such Goods purchased from Seller. All other Software shall be furnished

to and used by, Buyer only after execution of Seller's (or the licensor's) applicable standard license agreement, the terms of which are incorporated herein by reference. The Software is Seller's own or Seller's supplier's proprietary information, and Buyer and its employees and agents shall not disclose the Software to others without Seller's prior written consent.

14. TOOLING: Tool, die, and pattern charges, if any, are in addition to the price of the Goods and are due and payable upon completion of the tooling. All such tools, dies and patterns shall be and remain the property of Seller. Charges for tools, dies, and patterns do not convey to Buyer, title, ownership interest in, or rights to possession or removal, or prevent their use by Seller for other purchasers, except as otherwise expressly provided by Seller and Buyer in writing with reference to this provision.

15. INTELLECTUAL PROPERTY: Seller's intellectual property, including without limitation, all patents, copyrights, trade secrets, trade-dress and any other intellectual property of any kind (including without limitation, that which exists in the underlying technology), furnished by Seller to Buyer in connection with this agreement is the property of Seller and Seller retains all rights, including without limitation, exclusive rights of use, licensing, and sale. Possession of Goods, pre-production units, specifications, prints or drawings, or any other materials does not convey to Buyer any rights or license thereto.

16. BUYER'S COMPLIANCE WITH LAWS: In connection with the transactions contemplated by this agreement, Buyer is familiar with and shall fully comply with all applicable laws, regulations, rules and other requirements of the United States and of any applicable state, foreign and local governmental body in connection with the purchase, license, receipt, use, transfer and disposal of the Goods and/or Software.

17. EXPORT/IMPORT: Buyer agrees that all applicable import and export control laws, regulations, orders and requirements, including without limitation those of the United States and the European Union, and the jurisdictions in which the Seller and Buyer are established or from which Goods and/or Software may be supplied, will apply to their receipt and use. In no event shall Buyer use, transfer, release, import, export, Goods and/or Software in violation of such applicable laws, regulations, orders or requirements.

18. GOVERNMENT CONTRACT CONDITIONS: In the event Buyer supplies Goods or Software to the U.S. Government or to a prime contractor selling to the U.S. Government, the following Federal Acquisition Regulation (FAR) clauses are accepted by Seller and are made part of this agreement applicable to such supply: 52.222-21 Prohibition of Segregated Facilities; 52.222-26 Equal Opportunity; 52.222-35 Equal Opportunity For Special Disabled Veterans, Veterans of Vietnam Era, and Other Eligible Veterans; 52.222-36 Affirmative Action For Workers with Disabilities; and 52.219-8 Utilization of Small Business Concerns. No additional FAR or FAR Supplement clauses are accepted by Seller. In the event Buyer elects to sell Goods or Software to the U.S. Government or any national, state, provincial or local non-U.S. governmental entity or to a prime contractor selling to such entities, Buyer does so solely at its own option and risk, and agrees not to obligate Seller as a subcontractor or otherwise to the U.S. Government or other governmental entity except as described in this Section 18. Buyer remains solely and exclusively responsible for compliance with all statutes and regulations governing sales to the U.S. Government or any national, state, provincial or local non-U.S. governmental entity. Seller makes no representations, certifications or warranties whatsoever with respect to the ability of its Goods, Software, or prices to satisfy any such statutes and regulations.

19. GENERAL PROVISIONS: These terms and conditions supersede all other communications, negotiations and prior oral or written statements regarding the subject matter of these terms and conditions. No change, modification, rescission, discharge, abandonment, or waiver of these terms and conditions shall be binding upon the Seller unless made in writing and signed on its behalf by a duly authorized representative of Seller. No conditions, usage of trade, course of dealing or performance, understanding or agreement purporting to modify, vary, explain, or supplement these terms and conditions shall be binding unless hereafter made in writing and signed by the party to be bound, and no modification or additional terms shall be applicable to this agreement by Seller's receipt, acknowledgment, or acceptance of purchase orders, shipping instruction forms, or other documentation containing terms at variance with or in addition to those set forth herein. Any such modifications or additional terms are specifically rejected and deemed a material alteration hereof. If this document shall be deemed an acceptance of a prior offer by Buyer, such acceptance is expressly conditional upon Buyer's assent to any additional or different terms set forth herein. No waiver by either party with respect to any breach or default or of any right or remedy, and no course of dealing, shall be deemed to constitute a continuing waiver of any other breach or default or of any other right or remedy, unless such waiver be expressed in writing and signed by the party to be bound. All typographical or clerical errors made by Seller in any quotation, acknowledgment or publication are subject to correction. In the event that any provision or portion thereof contained in the Contract is held to be unenforceable, the Contract shall be construed without such provision or portion thereof.

(A) If Seller is a U.S. incorporated entity: This Agreement shall be governed by the laws of the State of Delaware, U.S.A., without reference to its choice or conflict of laws principles. The parties agree to submit to the exclusive jurisdiction of the courts of the State of Delaware for all actions arising in connection herewith.

(B) If Seller is a European incorporated entity: This Agreement shall be governed by the laws of England. Any dispute arising out of or in connection with this Agreement that cannot be resolved through friendly consultation shall be referred to and finally resolved by arbitration in London, England before the London Court of International Arbitration in accordance with its arbitration rules. The arbitral award shall be final and binding on the parties.

(C) If Seller is an entity incorporated in the Asia Pacific region: This Agreement shall be governed by the laws of the Hong Kong Special Administrative Region of the People's Republic of China. Any dispute arising out of or in connection with this Agreement that cannot be resolved through friendly consultation shall be referred to and finally resolved by arbitration in Hong Kong before the Hong Kong International Arbitration Centre in accordance with its arbitration rules. The arbitral award shall be final and binding on the parties.

(D) No action, regardless of form, arising out of transactions relating to this agreement, may be brought by either party more than two (2) years after the cause of action has accrued. The U.N. Convention on Contracts for the International Sales of Goods shall not apply to this agreement.

Revised April 14, 2014

Ecosystem Leadership

Just as nature relies on communities of organisms functioning as an ecological unit, embedded computing platforms depend on a broad and powerful ecosystem, including standards bodies, industry associations, building block suppliers and software vendors. Artesyn Embedded Technologies brings a wealth of innovation and many years experience to accredited standards development organizations, specification consortia and industry associations through our executive memberships and key committee positions. We have long been committed to a strong ecosystem that works to further the development of the industries and technologies that are important to our customers' success.

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