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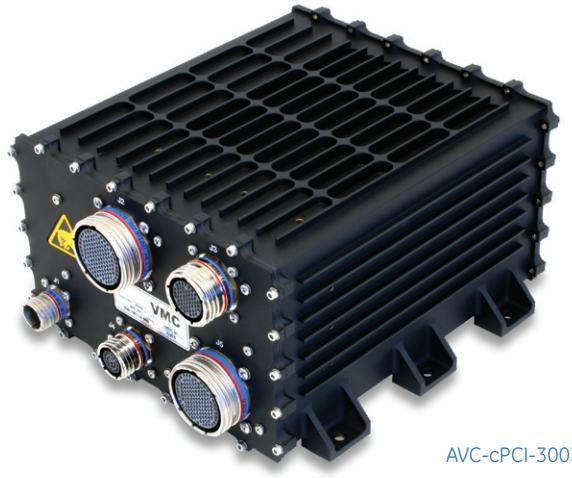
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GE Fanuc
Embedded Systems



AVC-cPCI-3003

AVC-cPCI-3000 Series

Advanced Vehicle Computer

Features

- COTS or modified COTS AVC rugged conduction cooled chassis
  - 3 to 14 3U cPCI slot
  - MIL-C-38999 connectors
- Lightweight
  - As little as 8.2 pounds (3.72 kg) including modules
- Power supply
  - 65 to 300 watt
  - Single or dual
- CM4, CR3, or RL4 single board computers
- Typical interface cards
  - 1394A/B firewire
  - 1553 PMC2, cPCI
  - 8-Port Ethernet hub
  - ARINC 429-PMC2-CC
  - DIO cPCI (3U) discrete I/O
  - Fibre Channel
  - GPS
  - High speed serial
  - Sentiris PMCvideo processor
  - ABI/ASF-PMC2-CC

The AVC-cPCI 3000 Series provides a rugged, yet highly flexible COTS computing platform suited for mission applications requiring rock-solid reliability such as UAVs, booster and ground vehicles. Utilizing a dip brazed aluminum alloy (AlMgSi1) and manufacturing techniques including Electrical Discharge Machining (EDM) and milling, AVC-cPCI-3000 Series systems are strong, lightweight and EMI resistant. Ranging in size from 3.43"x 9.75" x 11.97" for a 3-slot chassis, to 8.65" x 11.26" x 13.6" for a 14-slot version, the AVC-cPCI 3000 Series is well suited for integration into tight spaces that typify rugged environments. External fins provide additional heat sinking capability, allowing the system to take full advantage of surrounding airflow.

To minimize radiative electromagnetic interaction with other systems, the AVCcPCI 3000 Series utilizes EMI gasketing on both the front and rear panels. In addition, the use of MIL-C-38999 connectors serves to minimize conductive EM emissions and susceptibility.

As with all our vehicle computers, GE Fanuc Embedded Systems can provide a broad range of integration services ranging from shock, vibration and thermal modeling to board level integration, software development, qualification and acceptance. Our team of talented and experienced engineers can provide a valuable adjunct to your existing in-house resources.

Ruggedization

GE Fanuc Embedded Systems subjects every system to a comprehensive battery of tests, including shock, random and sine vibration, acceleration, thermal cycles (including vacuum, flight simulation thermal vacuum, and electromagnetic radiation. GE Fanuc Embedded Systems conducts all design, analysis, manufacturing and testing in strict accordance with any applicable MIL and industry standards. The Standards sidebar lists specific standards to which the AVCs are designed, built, and tested.

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AVC-cPCI-3000 Series Advanced Vehicle Computers

PASS Features

- Graphical Data Display
  - Real-time and archive data
  - Gauges, strip charts, aircraft displays, tables, and annunciators
- EU Conversions
  - Binary shift and mask
  - Linear conversions
  - Concatenation
  - Integer/floating point
- Data Source Time Correlation
  - Merge archive and snapshot data into a single window
- Software Function Generator in BC and RT
  - Ramp, square, sawtooth waves
  - On-the-fly editing of data words
- Exporting
  - Export converted and raw data to Microsoft Excel
  - Export archive data to ASCII file

Standards

- Design and Analysis:
  - MIL-HDBK-1547A 06-JUL 1998
  - MIL-HDBK-217F 28-FEB 1995
  - EEE STD 802.3-2000
  - IA/EIA-RS422-B 1-MAY 1994
  - TIA/EIA-RS485-A 1-MAR 1998
  - CPCI 2.1
  - IEEE 1394A
- Manufacturing:
  - NCSL Z450-1
  - ANSI/J-STD-001C
  - PC-A-610C Acceptability of Electronic Assemblies
- Test:
  - MIL-STD-810
  - MIL-STD-461E 20-AUG 1999
  - MIL-STD-1540C 15-SEP 1994
  - MIL-STD-1553B 15-JAN 1996
- Services
  - Configuration management
  - Life cycles support
  - ESS testing
  - Integration services
  - System and user level documentation

Bulkheads & Wiring

Internally, the systems consist of two compartments: one contains the cPCI card slots, the other contains the power supply, transition module, and external I/O. For increased resistance to the demands of rugged environment operation, several models completely eliminate the use of a backplane wiring harness, instead using a PC board to route the I/O signals through the backplane bulkhead to the transition module. To facilitate correct insertion of cPCI cards, all slots are keyed, eliminating the possibility of backplane connector pin damage.

Cooling

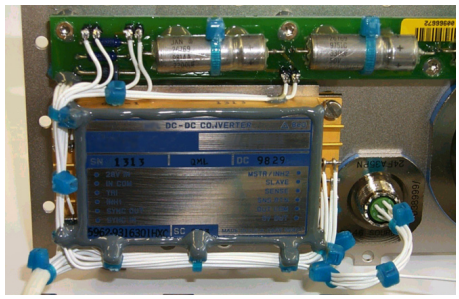
All AVCs are designed to provide effective thermal paths to remove heat primarily through conduction. By careful selection of both components, and component placement and mounting, GE Fanuc Embedded Systems has qualified the cPCI 3000 series to operate in a vacuum at temperatures of up to 85 degrees C.

EMI Control

The control of EMI has been carefully considered in the chassis design. EMI filters are provided for power inputs to reduce bus conducted emissions and susceptibility. The power supply DC-to-DC converter is located in its own aluminum shielded box. At the unit level the closure surfaces are designed to reduce line-of-sight apertures to near zero and are very effective in eliminating electronic field emissions from the system. The chassis has been tested to MIL-STD-461E.

Power Supply

A system is only as good as its power supply. Rather than "reinvent the wheel", GE Fanuc Embedded Systems chose to use an existing COTS power supply from a leading manufacturer of high-reliability microelectronic power conversion products. Several AVC power supplies can be supplied in hermetically sealed packages and/or housed in a separate aluminum compartment within the AVC, significantly reducing radiated emissions.



Power Supply and Wiring

Typical voltages include +5, +3.3, +12, and -12 volts. Rated from 60 to 150 watts (300 watt dual power supplies), the power supply is capable of supplying 150% or more of the power needed by the cards in the system, allowing for additional cards in the future. Protected internally against damage of up to 50 VDC, they also have reverse polarity and inrush protection, and can tolerate a 50 ms power loss before dropout.

cPCI Backplane

The CompactPCI backplane operates in a 3.3 volt signaling environment, and, as an option, can be configured to operate at 5 volts. With a 32-bit data width operating at 33 MHz, it also supports 66 MHz for future upgrades. The P1 connectors route the cPCI signals and power while the 132-pin P2 connector leaves 105 pins available for user I/O. All rear I/O is routed through the J2 connector.

Inputs/Outputs

At their core, all AVC systems are about managing complex tasks by providing a broad array of flexible inputs, processing, and outputs. That's why GE Fanuc Embedded Systems has, so far, created over 20 distinct AVC systems, with more on the way.

Most systems provide DSP-based inputs and outputs, including TTL I/O, Bi-level optically coupled outputs, analog, lamp drivers, and much more. Other I/O cards provide MIL-STD-1553 and/or ARINC 429 channels, IEEE 1394 Firewire, GPS, high speed serial, Fibre Channel, timers, temperature sensors, and intelligent I/O support. Many other I/O options are available; consult GE Fanuc Embedded Systems for details.

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AVC-cPCI-3000 Series Advanced Vehicle Computers

Chassis Vibration and Shock Analysis Results

- Object and Icon Oriented
  - Active icon objects for quick navigation
  - Copy data into multiple buffers using drag, drop, cut, and paste
- Open API Connectivity
  - Easily integrates with custom code via DLL or DCOM
  - Easily integrates with LabVIEW and other third party applications
- Enhanced Data Views
  - View multiple time-correlated buses in same window
  - Sync multiple archive file views
  - Data display in binary, octal, decimal, or hex Multiple bus activity indicators
- Archive and Monitoring
  - Simultaneous archiving of four MIL-STD-1553 data buses
  - Archive by time or file size
  - Separate files for each stream
  - Sync view of multiple streams
  - Bus, RT, and RT SA labeling
  - Optional IRIG timecode reader for time correlation of all data
- Data Function Generator
  - BC and RT data simulation including square, ramp, and sawtooth
- Advanced Bus Error Handling
  - Detects and reports multiple errors per message (if present)
  - Word/message error injection
  - Allows for bus retry initialization messages
  - Error reporting for lists that stop on error

Single Board Computers

Each member of the AVC-cPCI 3000 Series features a ruggedized PowerPC®- or Intel-based Single Board Computer (SBC) designed to withstand the demands of harsh environments. All SBCs are conduction cooled with an operating temperature range from -40°C to +85°C, increased shock and vibration immunity using stiffener bars and wedge locks, and ship with conformal coating. Other common features include, onboard Ethernet, flexible RS-232 and/or RS-422/485 serial ports, parallel ports, and watchdog timers.

With processor speeds up to 500 MHz, the PowerPC based CM4 Single is compatible with proven operating systems such as VxWorks, Green Hills INTEGRITY, and Lynx OS. The CM4 also features onboard Ethernet, serial ports, watchdog timers, DMA channels, and a 32-bit PMC interface. The SBC architecture facilitates the integration of other cPCI modules into the system to deliver reliable, cost-effective performance that you can leverage for many applications. In addition, some AVC systems can accommodate up to three CM4s. Even with an attached conduction cooled PMC module, the CM4 fits into a single slot and will operate in a CompactPCI system slot or non-system slot.

Driven by an Intel® Ultra Low Voltage (ULV) Celeron® processor, the CR3 SBC is designed for embedded processing applications using 32-bit CompactPCI architecture. In addition to the common features mentioned earlier, the CR3 includes 128 MB of SDRAM, a PS/2 keyboard/mouse port, DMA channels, and a carrier card with the option of one or two CompactFlash® storage disks.

RL4, a Single Slot PowerPC™ 750/755 3U CompactPCI Embedded Computer, is designed to meet the needs of embedded application developers. Featuring an all-in-one design with flexible processor and memory configurations, a 32-bit PMC interface, and a wide array of onboard peripherals, the RL4 fits into a single slot even with an attached conduction cooled PMC module. Features unique to the RL4 include two DMA controllers, four timers, 32-KB non-volatile SRAM, RTC, temperature sensor and I_2O intelligent I/O support.

Product Development Support

GE Fanuc Embedded Systems provides many levels of product support. For every system, we supply full documentation, including electrical and mechanical drawings, wiring diagrams, user manuals for both chassis and member components, board support packages, and appropriate driver and test software. For systems containing 1553 or ARINC interfaces, we also include the Integrated Avionics Library, a full suite of C functions that you can use to perform many common card functions, thus reducing your software development cycle time. Note: Some AVC models contain multiple SBCs, high-speed serial, and other interfaces.

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AVC-cPCI-3000 Series Advanced Vehicle Computers

Specifications

Typical Qualification Environment

- Operating Temperature: –34° C to +85° C
- Thermal Cycling: –34 °C to 71 °C with a minimum one-hour dwell at each temperature extreme when the unit reaches internal thermal equilibrium. Rate of temperature change at 2 °C /min.
- Shock: Along X, Y, Z axes

Frequency (Hz)	SRS (Gs)
100	40
300	180
10000	180
Q	10

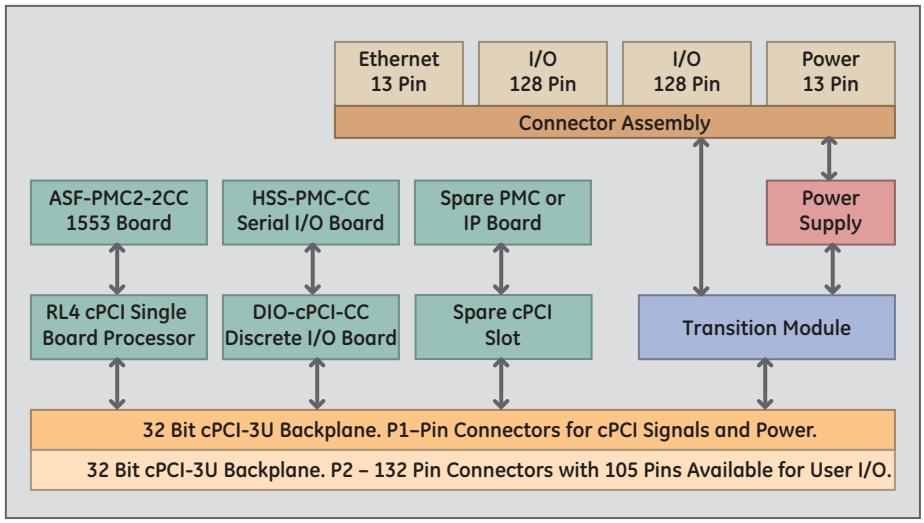
- Vibration: Random vibration along each of the three major axes

Frequency (Hz)	PSD (g_/Hz)
20	0.32
40	0.32
75	0.08
150	0.16
600	0.16
2000	0.0144
gRMS	12.6

Duration = 180 seconds/axis

- EMC: Fitted with MIL-C-38999 connectors and tested to MIL-STD-461E
  - Conducted emissions: CE102
  - Conducted susceptibility: CS101, CS114, CS115, S116
  - Radiated emissions: RE102
  - Radiated susceptibility: RS103

Simplified AVC Configuration Block Diagram



Ordering Information

AVC-cPCI 3000	3 slots	RL4, HSS-PMC-CC, DIO1-cPCI3U-CC, PMC2-CC-D
AVC-cPCI 3001	14 slots	(3) CM4, (2) HSS-cPCI3U-CC, (2) DIO2-cPCI3U-CC, (2) DIO3-cPCI3U-CC, 1394-cPCI3U-CC, (3) 3101-BP-CC-XT, Fibre Channel, ABI-PMC2-1, (2) 8-Port Ethernet Hub, GPS, Dual Power Supply
AVC-cPCI 3002	14 slots	(2) CM4, (2) HSS-cPCI3U-CC, (2) DIO2-cPCI3U-CC, (2) DIO3-cPCI3U-CC, (2) 3101-BP-CC-XT, ABI-PMC2-1, (2) 8-Port Ethernet Hub, GPS, Dual Power Supply
AVC-cPCI 3003	6 slots	CM4, DIO4-cPCI3U-CC, ABI-PMC2-2, A429-PMC2CC-8R8T, (2) HSScPCI3UCC. Designed to support 1394 Firewire, additional CM4, and ABIPMC2-2.
AVC-cPCI 3004	7 slots	CM4, HSS-cPCI3U-CC, DIO2-cPCI3U-CC, DIO3-cPCI3U-CC, ABI-PMC2-1
AVC-cPCI 3005	6 slots	CM4, Fibre Channel, DIO4-cPCI3U-CC, HSS-cPCI3U-CC. Designed to support 1394 Firewire, A429-PMC2CC-8R8T, ABI-PMC2-2, and additional CM4 and HSS-cPCI3U-CC.
AVC-cPCI 3006	14 slots	(2) CM4, DIO1-cPCI3U-CC, (2) PMCCC-4T P, 8-Port Ethernet Hub, and Dual Power Supply. Designed to support 4 additional CM4, 3 additional DIO1, and 4 additional PMCCC-4T.
AVC-cPCI 3007	6 slots	(3) CM4, HSS-cPCI3U-CC, ESW-cPCI 8-Port Ethernet Hub
AVC-cPCI 3008	6 slots	(2) CR3, 1553-3CP3-2F, 1553-3CP3-2S, with TEWS HSS PMC (third party product), (2) GE Fanuc Embedded Systems cPCI carrier, (2) Sentiris PMC Video Processor
AVC-cPCI 3009	6 slots	CR3, (2) 1553-3CP3-1S, GE Fanuc Embedded Systems cPCI carrier, Tsunami PMC
AVC-cPCI 3010	6 slots	CM4, CAN PMC, ABI-PMC2CC-2, cPCI3UCC-TLM, HSDL-cPCI3U-CC

About GE Fanuc Embedded Systems

GE Fanuc Embedded Systems is a leading global provider of embedded computing solutions for a wide range of industries and applications. Our comprehensive product offering includes many types of I/O, single board computers, high performance signal processors, fully integrated, rugged systems including flat panel displays, plus high speed networking and communications products. The company is headquartered in the U.S. and has design, manufacturing and support offices throughout the world. Whether you're looking for one of our standard products or a fully custom solution, GE Fanuc Embedded Systems has the breadth, experience and 24/7 support to deliver what you need. For more information, visit www.gefanucembedded.com.

GE Fanuc Embedded Systems Information Centers

Americas:
1 800 322 3616 or 1 256 880 0444

Asia Pacific:
86 10 6561 1561

Europe, Middle East and Africa:
+49 821 5034-0

Additional Resources

For more information, please visit the GE Fanuc Embedded Systems web site at:

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