ENVIRONMENTS FOR ELECTRONICS

by knürr

AdvancedTCA®

and Electronic Integration

knürr
environments for electronics

An Introduction to AdvancedTCA®

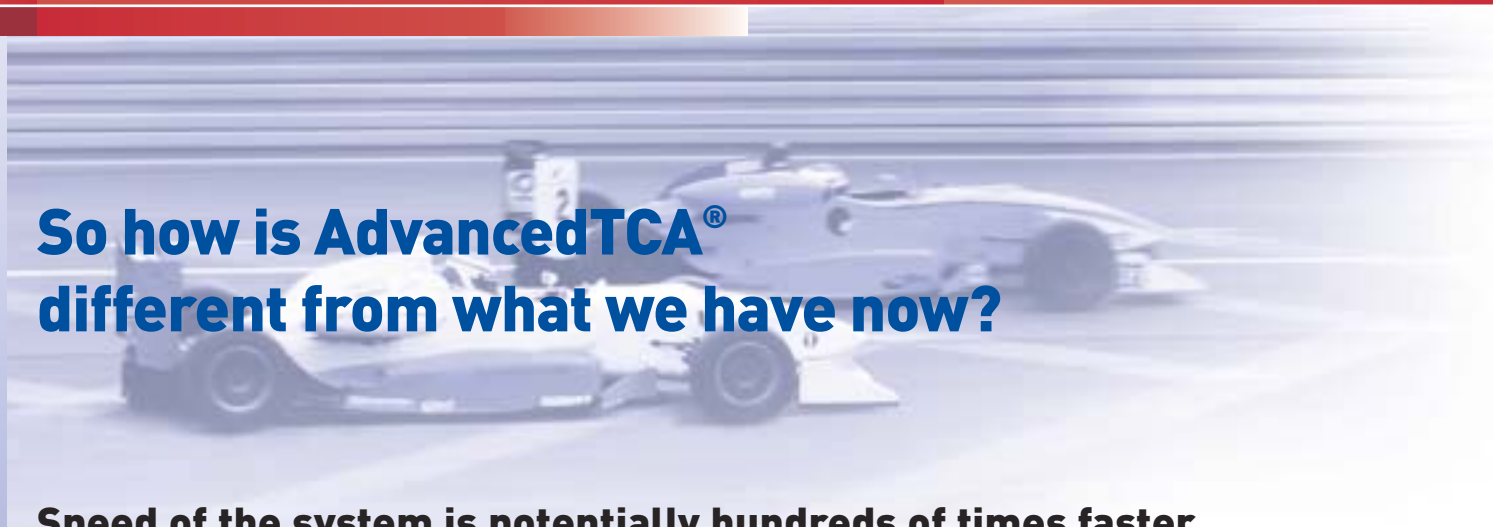
Advanced Telecom Computing Architecture

is the name given to a family of specifications that have been developed by a working party involving several hundred companies under the watchful eye of PICMG and known as the PICMG 3.X family of specifications.

Conventional backplane and system technologies make use of parallel bus structures that use adaptations of standard architecture with all of the limitations that these "standards" place on their performance in terms of cost and features. In addition the use of distributed power systems to allow a wide range of DSP's (Digital Signal Processors) to be used at will was not possible. When you add to these restrictions, the cost issues of developing systems, their hardware, and more importantly the time taken (and therefore the cost) to bring these products to market, as well the ongoing cost of ownership and replacement in the future things had to change.
The current PICMG® specification was developed to address these issues as well as providing a significant number of other benefits – "reliability", "serviceability" "availability" in the process.
The specification was ratified in late 2002.

That Change is AdvancedTCA®

Knürr is a member of
PCI INDUSTRIAL COMPUTER MANUFACTURERS GROUP



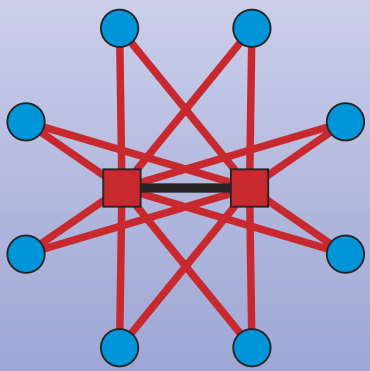
So how is AdvancedTCA® different from what we have now?

Speed of the system is potentially hundreds of times faster

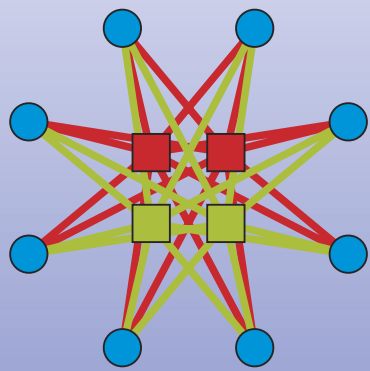
There are several principle differences to the existing products and standards. Firstly at the heart of the system is the backplane. This device has in the past used parallel bus structures to enable the systems to transfer data, relying on the software to provide the means of timing, encoding and decoding the data. The problem is that these signals are susceptible to interference as well as limiting the transfer speeds, power distribution could also be a problem.

AdvancedTCA avoids this by using serial interconnect principles – a technology used for some while now in communication between electronic devices – Infiniband® Serial RapidIO™ and recently PCI Express™. This means that with multiple links on a given blade or backplane and with each link capable of coping with up to 5 or even 6 Gbps - the transfer rates of parallel bus structures become pedestrian in comparison.

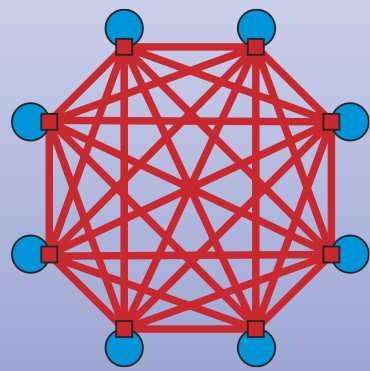
In addition the AdvancedTCA backplane offers several different communication topologies, all of them aimed at increasing system speeds as well as increasing reliability and redundancy –



Dual Star



Dual, Dual Star



Full Mesh

Mechanics designed to give substantial user benefits

AdvancedTCA architecture defines shelves with up to 16 slots per shelf for 23", and 600mm wide ETSI applications, and 14 slots for 19" ETA applications.

The limiting factor here is the width of the enclosures – and unlike cPCI – not the capability of the system driver's transmission distance. The card useable area is also almost doubled using an 8U high 280mm deep card and by using an increased card pitch, double sided assemblies are now a realistic capability as well as the use of mezzanine assemblies including AMC (Advanced Modular Computers) and SBC (Single Board Computers) devices. In addition the shelf mechanics make provision for dedicated rear transition modules that allow direct IO access to the active cards or blades. The mechanical structure has a refined relationship that eliminates many of the tolerance issues that have plagued many of the current systems, in particular covering issues like coding of cards and levels of engagement for the connector systems. A full EMC requirement is added in compliance with international standards.

Card front panels are also included complete with inject Eject and locking systems as well as EMC gasketing – moved to the other side of the assembly – to reduce handling damage in the field.

Power distribution

A dual power feed is provided to the system to enhance the redundancy capability of the system, and in addition the distribution of sufficient power at the nominal -48V DC voltage is more efficient in overcoming the natural loses within the backplane when compared to other lower DC voltages.

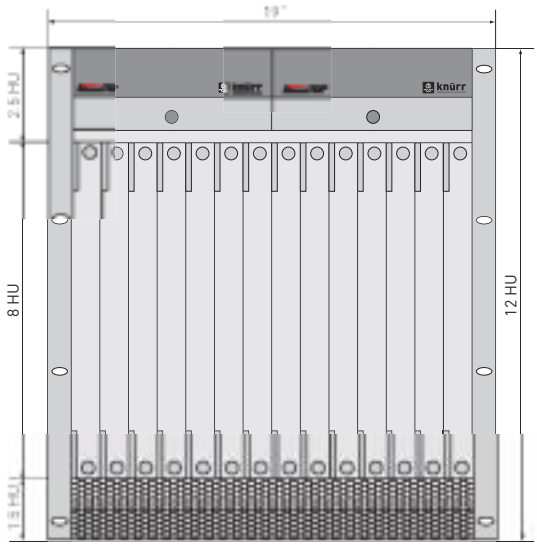
In addition each application can now choose the processor technology and other devices most suitable to the application and generate the specific power supply voltages on board from converters in a dedicated location on each card. The additional benefit here is that the cost of this conversion is directly linked to the application, and not to the overall system costs, and it is done as close as possible to the pint of use – further limiting the loses and other negative effects associated with more traditional systems.

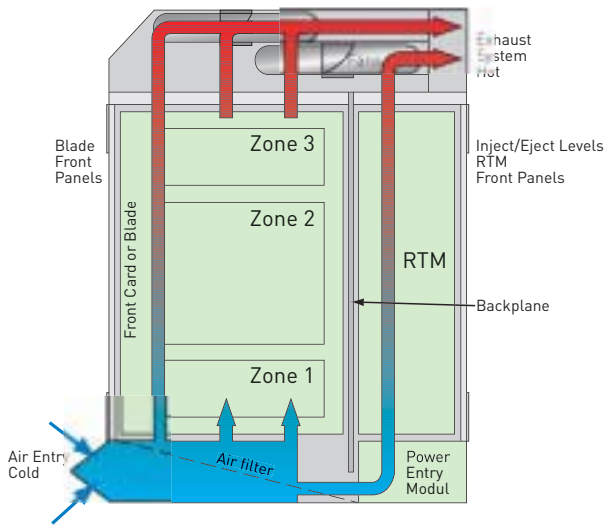
Improved thermal capacity and thermal control

Many regard the thermal issues of AdvancedTCA as an area of weakness, but this is not the case where an applied solution approach is taken to this issue. Each card has a specified capacity of 200 Watts per card or blade. This for many of Knürr's customers is already insufficient, and Knürr has developed products that push these limits much further but at the same time, provide solutions to other thermal issues that arise – for example thermal loading density of equipment rooms.

With increased limits an AdvancedTCA chassis could produce 3.2 Kwatts of heat and this could increase to 4.8 Kwatts at 300 Watts per card. The answer is not to just to increase the amount of air travelling through the system but to look at ways of controlling the heat and transferring it out of the system by other means to enhance the process and to add to this heat management for the rack or enclosure.

Knürr have developed their CoolTherm® liquid cooled cabinet to provide this capability and our AdvancedTCA products make direct use of this technology.





Availability, serviceability, reliability and ease of maintenance

AdvancedTCA is designed from the outset to provide the highest possible levels of availability – better than 99.999% - and by using a modular principle replacement of outdated or ineffective parts could not be easier.

All field removable parts – or FRU's (Field Replaceable Units) are recognised by the platform manager and if compliant with the specification guarantee interoperability and intermatabilty of the different units. This modular approach offers the ability to configure a wide range of parts from different suppliers to meet the systems needs. In addition the hardware life is greatly extended – as it is now only necessary to change those sub parts that are either outdated or failing – not the entire system or shelf. This means greatly reduced MTR (mean Time to Repair) and improved ROI (Return on Investment) as the systems will stay in service much longer.

Control and information on the system performance

For many bespoke systems the monitoring and control – often remotely- function has been a reality for some while – at a lower level however and from the point of view of being able to interchange parts and upgrade others the issue of communication becomes an issue. In AdvancedTCA all FRU's and key components are identified to a duplicated shelf or platform manager structure with the management cards providing key capabilities for:

Managing power and cooling resources

Monitoring and communicating with sensors and alarms

Managing visual and audible outputs

AdvancedTCA®

Enforcing shelf functional management

Accessing and storing inventory and historical data

Summary

The above are an outline of the advances that AdvancedTCA can bring to the standard equipment market place and in particular for Telecom applications and because of this AdvancedTCA will become the standard architecture in the foreseeable future. Knürr have taken these advances and added or enhanced Key Features that enable our customers to take those extra steps to place their products, like ours, ahead of the competition.

Oliver Gosemann, CEO Knürr AG

AdvancedTCA from Knürr

Knürr has a long history of product innovation and of supplying complete cost effective solutions to our customers requirements. We have achieved this by focussing on our core capabilities and providing high quality products through continuous improvement in all our products and process – our customers set the requirements and we respond with quality, flexibility, speed and perfect service.

We have continued the complete solution approach with our AdvancedTCA products with a complete range of products and solutions

from fully functional 12U AdvancedTCA systems

and development chassis

to fully configured thermal solutions by integrating our CoolTherm liquid cooling products with our AdvancedTCA chassis

With all of these products supported by accessory products and services including front panels cable management products and service parts and assemblies for shelf management, fan trays and power entry modules.

The Knürr approach is simple – we have applied our core skills – enclosure technology combined with thermal solutions to provide systems that offer unique features and benefits to offer products compliant with the international standards as well as offering improved capabilities – particularly with respect to thermal issues.

Backplanes and active card assemblies are not core products for Knürr, but we need to include these in our solutions and we have complimented our core capabilities with products from chosen partners that have key skills in these areas including backplanes and power entry modules as well shelf management products.
These products are technically supported through Knürr and we can therefore offer a world class package of proven products that will meet and in many cases exceed our customers expectations.

Safety

Electromagnetic compatibility

There are different classifications for the product depending on the intended use and location. Equipment intended for use within residential, commercial, or light industrial environments should meet Class B limits, but all PICMG® 3.0 equipment shall meet Class A limits of the following specifications/requirements:
- FCC, 47 CFR Part 15, Subpart B (US)
- EMC Directive 89/336/EEC (Europe)
- EN 55022, Information Technology Equipment - Radio Disturbance Characteristics – Limits And Methods Of Measurement (Europe)
- EN 55024, Information Technology Equipment - Immunity Characteristics - Limits And Methods Of Measurement (Europe)
- EN 300 386, Electro-Magnetic Compatibility (EMC) Requirements for Public Telecommunication Network Equipment; Electromagnetic Compatibility (EMC) Requirements

Grounding and bonding

The following are a selection of grounding and bonding standards that apply to ATCA equipment. There are also grounding and bonding requirements in several of the standards listed above.
- ETS 300 253, Earthing and Bonding of Telecommunications Equipment in Telecommunication Centers.
-ITUT K.27, Bonding Configurations and Earthing Inside a Telecommunication Building

ETSI–Europe

- ETS 300 019, Environmental conditions and environmental tests for telecommunication equipment (Europe)
- ETS 300 132, Equipment Engineering Power Supply Interface At The Input To Telecommunications Equipment (Europe)
- ETS 300 753, Acoustic Noise Emitted By Telecommunications Equipment (Europe)
- ETS 300 119, Environmental Conditions and Environmental Tests for Telecommunication Equipment

ETSI/NEBS requirements NEBS–USA

- Telcordia SR-3580. and specifically within this test specification
- Telcordia GR-63, Network Equipment-Building System (NEBS) Requirements—Physical Protection
- Telcordia GR-1089, Electromagnetic Compatibility And Electrical Safety Generic Criteria For Network Telecommunication Equipment
- Telcordia SR-3580, NEBS Criteria Levels
- GR-3028, Thermal Management In Telecommunications Central Offices

LVD 73/23/EEC (Europe)
EN 60950 (Europe) and harmonized specification UL60950 in the USA

Customer Engineering

- 12 U high, 19" rack, chassis with 14 slots
- Optional: 16 slots for 23" or 600mm wide rack
- Optional: 6 U high 6 slot development chassis
- Perfectly developed for use in Knürr CoolTherm® (as a solution for the platform environment and for improved cooling power)
- Highly reliable and short MTTR (average repair time)
- All important components are field replaceable units (system components that can be released and removed from the system)
- Dual redundant platform management cards – front or rear access – also customer specific applications
- All mechanical components can be easily expanded (building block system)
- Redundant power input at the rear of the rack
  - Each cable feed is protected with a circuit breaker
  - Segmented backplane-power supply-distribution system via a bus structure
- Thermal control achieved with fan trays with intelligent monitoring and control
- Standard front panels and customer-specific front panels (inject/eject)
- Cable management accessories

General specifications

The AdvancedTCA products in the Knürr range are designed to meet the requirements of the core PICMG specifications and these can be reviewed in detail in the published documents. However to provide an outline of the key criteria used please see the following information. Please note that the products have not been tested to all of these requirements but have been designed to meet the specifications based upon these requirements.

Environmental

Criteria	ETSI		NEBS Level 3	
	Specification	Reference	Specification	Reference
Temperature	Storage: -25 to +55°C, 0.5°C/min change Trans: -40 to +70°C, -40/+30°C change Operating (Class 3.2): -5 to +45°C, 0.5°C/min change	ETS 300 019-2-1 ETS 300 019-2-2 ETS 300 019-2-3	Operating normal: 5 to 40°C Operating short-term: -5 to 55°C for 96 hr Operating change: 30°C/hr Storage: -40 to 70°C	GR-63-CORE, R4-7
Humidity	Storage: 10% to 100% RH (non-condensing & condensing) Trans slow change: 95% RH @ 45°C Trans fast change: 95% RH @ -40 to +30°C Operating: 5% to 95% RH (non-condensing and condensing)	ETS 300 019-2-1 ETS 300 019-2-2 ETS 300 019-2-3	Operating normal: 5% to 85% RH Operating short-term: 5% to 90% RH Storage: 95% RH @ 45°C	GR-63-CORE, R4-7
Altitude	Altitude: -471 to 3708 m ASL	ETS 300 019-2-3	-60 to 1800 m ASL (no temperature derating) 1800 m to 4000 m ASL – temperature derating OK	GR-63-CORE, R4-8, R4-9, R4-10, O4-11, 04-12
Acoustic	Attended telco equipment room: 7.2 bels max: (L_{WAd}) at 1 m.	ETS 300 753	Equipment Frame located in a lineup with other equipment: 60 dBA max. at 600mm.	GR-63-CORE, R4-72

Additional requirements:
Air Filters 80% dust arrestant (GR-063, GR-078)

ATCA 12U 14 slot chassis

- 532.6mm H (12U), 419mm D x 448.5mm W (19" or ETSI Rackmountable)
- Front Accessible Cooling Design provided by upper fan trays capable of cooling 200+ watts per slot.
- 14 Slot, 8U x 280mm, 6HP (30mm) Subrack
- 14 Slot, 8U x 100mm, 6HP (30mm) Rear Transition Bay
- Dual Redundant 4U Front Accessible Shelf Management Modules based on Pigeon point
- Front Fan Status Indicators
- Front/Rear ESD Jacks Provided
- Dual Redundant 48V Input Power Entry Module (PEM)

W	H	D	Kg	Description	Order no.	UP
448,5mm	12U	419mm		ATCA 14 Slot Dual Star Ready to Run System with Push Pull Cooling	**04.099.015.8**	1
448,5mm	12U	419mm		ATCA 14 Slot Dual Star Ready to Run System enhanced cooling	**04.099.012.8**	1
448,5mm	12U	419mm		ATCA 14 Slot Dual Dual Star Ready to Run System enhanced cooling	**04.099.013.8**	1
448,5mm	12U	419mm		ATCA 14 Slot Full Mesh Ready to Run System enhanced cooling	**04.099.014.8**	1
510mm	12U	419mm		ATCA 16 Slot Dual Star Ready to Run System enhanced cooling	**04.099.025.8**	1
510mm	12U	419mm		ATCA 16 Slot Dual Dual Star Ready to Run System enhanced cooling	**04.099.026.8**	1
510mm	12U	419mm		ATCA 16 Slot Full Mesh Ready to Run System enhanced cooling	**04.099.027.8**	1

Dimensions 14 slot chassis.
- Height 532.6mm (12U),
- Depth 419mm
- Width 448.5mm

Dimensions 16 slot chassis.
- Height 532.6mm (12U),
- Depth 419mm
- Width 510mm

Weight
- 14 slot chassis approximately 10 Kgs
- 16 slot chassis approximately 12 Kgs

Construction and Finnish
- Mild Steel – plated finish Bright Zinc and clear passivated
- Black painted surfaces – Powder coated to RAL 9011
- Silver painted surfaces – Powder coated to RAL 9006
- EMI gasketing to meet EMC and environmental RoHAS requirements

Card cage
- Formed steel card cage to meet ATCA Form Factor requirements
- 8U high with N slots to suit application + Shelf management slots
- Meets strength, deflection and ESD/EMC requirements
- Equiped to provide inject eject and card retention and coding features.

Cooling
- Designed to provide in excess of 200 watts cooling per slot – free state
- The system is designed for use with Knürr CoolTherm liquid cooled cabinet to provide 300watts cooling capability per slot.
- Designed for use with CoolTherm rack for high density equipment room applications.
- Negative pressure cooling system in excess of 1500 CMH (Cubic Meters Hour)
- Front release quick change air filter to meet NEBS GR-78-CORE and ETSI requirements.
- Top mounted front access fan trays with integral intelligent fan control modules
- PWM controlled fans for precise control
- Backward curved impellers used to overcome internal resistance to air flow (back pressure)
- Air path short circuit prevention in the event of fan fail or reduced output for each outlet.
- Direct links from control modules to Shelf Management Cards providing historical and actual performance data.
- Visual and audible status and alarm displays
- N+1 Fan Redundancy

Power Entry
- Dual filtered PEM's (Power Entry Modules) each with dual outputs to the backplane
- Each PEM is also equipped with Telecom connectors for ringing voltage outputs
- Each PEM contains FRU ID card connection to the shelf manager
- Power attachment via simple terminal blocks and thermal trip over voltage protection
- Low level spike and surge protection to provide additional smoothing for input current.

Shelf Manager Cards
- Dual redundant shelf management cards in slot positions 15 or 17 respectively
- 4U over 4U design that plug directly into the backplane
- Front pluggable units complete with compliant inject eject and locking systems
- Based on Pigeon Point ShMM Sentry 300 technology
- Front panels contains
- Alarm reset switch
- Ethernet
- RS 232
- Telco Alarm connections
- LED status displays for; Power, Hot Swap, Major Minor and Critical alarms ShMM.

Backplanes
- Backplane interface compliant with PICMG 3.0 requirements – includes Dual Star, Dual Dual Star, and Full Mesh products
- Full support for Advanced ATCA PICMG 3.2, 3.2, and 3.3 specifications
- Multilayer PCB designed for optimum performance and power distribution
- Dual Star and Dual Dual Star design feature centered switch slot positions
- Direct PEM entry to the backplane
- Direct ShMC entry to the backplane – in card position 15 or 17 respectively
- ShMC RTM position used to distribute key control functions through the chassis via "K Knet" PCB network system
- N slot backplane + shelf management card position
- Full RTM capability

ATCA 5U 2 to 6 slot chassis

- 223mm H (5U), 419mm D x 448.5mm W (19" or ETSI Rackmountable)
- Front Accessible Cooling Design provided by single fan trays capable of cooling 200+ watts per slot.
- 5 Slot, 8U x 280mm, 6HP (30mm) Subrack
- 5 Slot, 8U x 100mm, 6HP (30mm) Rear Transition Rack
- Dual Redundant 4U Front Accessible Shelf Management Modules based on Pigeon point
- Front Fan Status Indicators
- Front/Rear ESD Jacks Provided
- Dual Redundant 48V Input Power Entry Module (PEM)

W	H	D	Kg	Description	Order no.	UP
448,5mm	5U	419mm	<20 kg	ATCA 6 Slot Dual Star Ready to Run System	**04.099.004.8**	1
448,5mm	5U	419mm	<20 kg	ATCA 6 Slot Full Mesh Ready to Run System	**04.099.005.8**	1
448,5mm	7U	450mm	<20 kg	ATCA 6 Slot Dual Star Ready to Run Development System	**04.099.006.8**	1
448,5mm	7U	450mm	<20 kg	ATCA 6 Slot Full Mesh Ready to Run Development System	**04.099.007.8**	1

Dimensions 6 slot chassis
- Height 223mm (5U)
- Depth 419mm
- Width 448.5mm

Weight
- 6 slot chassis approximately 5 Kgs

Construction and Finnish
- Mild Steel – plated finish Bright Zinc and clear passivated
- Black painted surfaces – Powder coated to RAL 9011
- Silver painted surfaces – Powder coated to RAL 9006
- EMI gasketing to meet EMC and environmental RoHAS requirements

Card cage
- Formed steel card cage to meet ATCA Form Factor requirements
- 8U high with 5 slots + Shelf management slots
- Meets strength, deflection and ESD/EMC requirements
- Equiped to provide inject eject and card retention and coding features.

Cooling
- Designed to provide in excess of 200 watts cooling per slot – free state
- The system is designed for use with Knürr CoolTherm liquid cooled cabinet to provide 300watts cooling capability per slot.
- Designed for use with CoolTherm rack for high density equipment room applications.
- Negative pressure cooling system in excess of 750 CMH (Cubic Meters Hour)
- Front release quick change air filter to meet NEBS GR-78-CORE and ETSI requirements.
- Side mounted front access fan trays with integral intelligent fan control modules
- PWM controlled fans for precise control
- Backward curved impellers used to overcome internal resistance to air flow (back pressure)
- Air path short circuit prevention in the event of fan fail or reduced output for each outlet.
- Direct links from control modules to Shelf Management Cards providing historical and actual performance data.
- Visual and audible status and alarm displays
- N+1 Fan Redundancy

Power Entry
- Single filtered PEM's (Power Entry Modules) with dual outputs to the backplane
- The PEM is also equipped with Telecom connectors for ringing voltage outputs
- The PEM contains FRU ID card connection to the shelf manager
- Power attachment via simple terminal blocks and thermal trip over voltage protection
- Low level spike and surge protection to provide additional smoothing for input current.

Shelf Manager Cards
- Dual redundant shelf management cards in dedicated bottom slot (horizontal load) or left hand slot for (vertical load)
- 4U over 4U design that plug directly into the backplane
- Front pluggable units complete with compliant inject eject and locking systems
- Based on Pigeon Point ShMM Sentry 300 technology
- Front panels contains
  - Alarm reset switch
  - Ethernet
  - RS 232
  - Telco Alarm connections
  - LED status displays for; Power, Hot Swap, Major Minor and Critical alarms ShMM.

Backplanes
- Backplane interface compliant with PICMG 3.0 requirements
  - Full Mesh other products for Dual Star, Dual Dual Star, can be provided.
- Full support for Advanced ATCA PICMG 3.2, 3.2, and 3.3 specifications
- Multilayer PCB designed for optimum performance and power distribution
- Dual Star and Dual Dual Star design feature centered switch slot positions
- Direct PEM entry to the backplane
- Direct ShMC entry to the backplane
- ShMC RTM position used to distribute key control functions through the chassis via "K Knet™" PCB network system
- N slot backplane + shelf management card position
- Full RTM capability

ATCA 2 slot Pizza Case chassis

- 90mm H (2U), 389mm D x 435mm W (Desk Top and 19" or ETSI Rackmountable)
- Front Accessible Cooling Design provided by single fan tray.
- 2 Slot, 8U x 280mm, 6HP (30mm) Subrack
- 2 Slot, 8U x 100mm, 6HP (30mm) Rear Transition Rack
- Dual Redundant 4U Front Accessible Shelf Management Modules based on Pigeon point
- Front Fan Status Indicators
- Front/Rear ESD Jacks Provided
- Dual Redundant 48V Input Power Entry Module (PEM)

W	H	D	Kg	Description	Order no.	UP
435mm	90mm	450mm	<10 kg	ATCA 2 Slot Full Mesh Ready to Run system	**04.099.001.8**	1

Dimensions 2 slot chassis.
- Height 90mm (2U)
- Depth 389mm
- Width 435mm

Weight
- 2 slot chassis approximately < 5 Kgs

Construction and Finnish
- Mild Steel – plated finish Bright Zinc and clear passivated
- Black painted surfaces – Powder coated to RAL 9011
- Silver painted surfaces – Powder coated to RAL 9006
- EMI gasketing to meet EMC and environmental RoHAS requirements

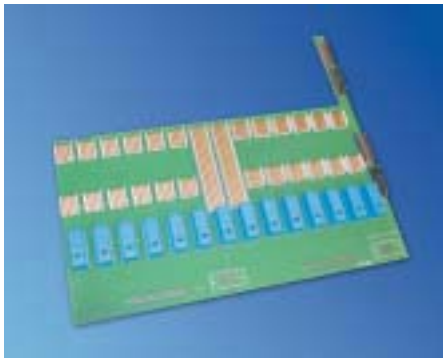
Card cage
- Formed steel card cage to meet ATCA Form Factor requirements
- 8U high with 2 slots + Shelf management slots
- Meets strength, deflection and ESD/EMC requirements
- Equiped to provide inject eject and card retention and coding features.

Cooling
- Designed to provide in excess of 200 watts cooling per slot – free state
- Designed for use with CoolTherm rack for high density equipment room applications.
- positive pressure cooling system
- Front release quick change air filter to meet NEBS GR-78-CORE and ETSI requirements.
- Side mounted fan tray with intelligent fan control modules
- PWM controlled fans for precise control
- Visual and audible status and alarm displays

Power Entry
- Rear entry single filtered PEM (Power Entry Module) with dual outputs to the backplane
- The PEM is also equipped with Telecom connectors for ringing voltage outputs
- The PEM contains FRU ID card connection to the shelf manager
- Power attachment via simple terminal blocks and thermal trip over voltage protection
- Simple low level spike and surge protection to provide additional smoothing for input current.

Shelf Manager Cards
- Dual redundant shelf management cards in dedicated bottom slot (horizontal load)
- 4U over 4U design that plug directly into the backplane
- Front pluggable units complete with compliant inject eject and locking systems
- Based on Pigeon Point ShMM Sentry 300 technology
- Front panels contains
  - Alarm reset switch
  - Ethernet
  - RS 232
  - Telco Alarm connections
  - LED status displays for; Power, Hot Swap, Major Minor and Critical alarms ShMM.

Backplanes
- Backplane interface compliant with PICMG 3.0 requirements - Full Mesh
- Full support for Advanced ATCA PICMG 3.2, 3.2, and 3.3 specifications
- Multilayer PCB designed for optimum performance and power distribution
- Direct PEM entry to the backplane
- Direct ShMC entry to the backplane
- 2 slot backplane + shelf management card position
- 2 slot RTM capability



AdvancedTCA Backplanes

- Complete family of product to PICMG 3.0 series specifications.
- Dual Star, Dual Dual Star, and Full Mesh designs.
- 2 – 16 slot Multilayer controlled impedance designs.
- Proven performance design – proven in intermatability trials.
- High performance data connectors in Zone 2.
- Shelf management position included in N+1 position.
- Direct power entry through the PEM units to the rear of the backplane.
- Split power distribution for safety and power transmission performance.

W	H	D	Kg	Description	Order no.	UP
78mm	392mm	N/A	<3 kg	ATCA 2 Slot Full Mesh Backplane	**04.099.085.9**	1
200mm	392mm	N/A	<3 kg	ATCA 6 Slot Full Mesh Backplane	**04.099.086.9**	1
230mm	392mm	N/A	<3 kg	ATCA 7 Slot Full Mesh Backplane*	**04.099.087.9**	1
261mm	392mm	N/A	<3 kg	ATCA 8 Slot Full Mesh Backplane*	**04.099.088.9**	1
291mm	392mm	N/A	<5 kg	ATCA 9 Slot Full Mesh Backplane*	**04.099.089.9**	1
322mm	392mm	N/A	<5 kg	ATCA 10 Slot Full Mesh Backplane*	**04.099.090.9**	1
352mm	392mm	N/A	<5 kg	ATCA 11 Slot Full Mesh Backplane*	**04.099.091.9**	1
384mm	392mm	N/A	<5 kg	ATCA 12 Slot Full Mesh Backplane*	**04.099.092.9**	1
414mm	392mm	N/A	<7,5 kg	ATCA 13 Slot Full Mesh Backplane*	**04.099.093.9**	1
444mm	392mm	N/A	<7,5 kg	ATCA 14 Slot Full Mesh Backplane	**04.099.094.9**	1
502mm	392mm	N/A	<7,5 kg	ATCA 16 Slot Full Mesh Backplane	**04.099.095.9**	1
200mm	392mm	N/A	<3 kg	ATCA 6 Slot Dual Star Backplane	**04.099.075.9**	1
444mm	392mm	N/A	<7,5 kg	ATCA 14 Slot Dual Star Backplane	**04.099.076.9**	1
502mm	392mm	N/A	<7,5 kg	ATCA 16 Slot Dual Star Backplane	**04.099.077.9**	1
200mm	392mm	N/A	<3 kg	ATCA 6 Slot Dual Dual Star Backplane	**04.099.080.9**	1
444mm	392mm	N/A	<7,5 kg	ATCA 14 Slot Dual Dual Star Backplane	**04.099.081.9**	1
502mm	392mm	N/A	<7,5 kg	ATCA 16 Slot Dual Dual Star Backplane	**04.099.082.9**	1

* non preferred items and may be subject to a delivery and minimum order restrictions

AdvancedTCA Shelf Management Module

- 280mm deep front pluggable module.
- Fitted to N+1 slot in 4U over 4U position.
- Proven Design – proven in interoperability trials.
- Dual redundant design providing fully featured capability.
- Based on Pigeon Point ShMM Sentry 300 technology.
- Front panel mounted – Alarm reset switch, Ethernet Connection, RS 232 connection, Telco alarms connection, status LED's.

W	H	D	Kg	Description	Order no.	UP
18mm	4U	280	<1kg	ATCA 4U Shelf Manager - Sentry 300 series	**04.099.140.x**	1
18mm	4U	280	<1kg	ATCA 4U Shelf Manager - Sentry 500 series	**04.099.141.x**	1
18mm	8U	280	<2kg	ATCA 8U Shelf Manager - Sentry 300 series	**04.099.142.x**	1
18mm	8U	280	<2kg	ATCA 8U Shelf Manager - Sentry 500 series	**04.099.143.x**	1

x denotes front panel

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5 Clear Chromate Aluminium

AdvancedTCA Fan tray Assemblies

- Self contained quick replacement units for minimum MTTR
- Integral PWM speed control and FRU ID in each fan tray.
- Each unit contains two Centrifugal blowers with proven Telco performance for excellent pressure capability.
- LED status display - fan 1 fail, fan 2 fail, power, alarm.
- Locking handle with status indicator.

W	H	D	Kg	Description	Order no.	UP
435mm	90mm	60mm		ATCA 2 Slot System fan tray module assembly	**04.099.051.8**	1
70mm	5U	419mm		ATCA 6 Slot System fan tray module assembly	**04.099.052.8**	1
100mm	225mm	419mm		ATCA 6 Slot Development System fan tray module assembly	**04.099.053.8**	1
225mm	100mm	419mm		ATCA 14 Slot System fan tray module assembly	**04.099.054.8**	1
250mm	100mm	419mm		ATCA 16 Slot System fan tray module assembly	**04.099.055.8**	1
448mm	2U	419mm		ATCA 14 Slot Push Pull Cooling System Upper fan tray module assembly	**04.099.056.8**	1
448mm	2U	419mm		ATCA 14 Slot Push Pull Cooling System Lower fan tray module assembly	**04.099.057.8**	1

AdvancedTCA Cable Tray Assemblies

- Removable cable tray assembly.
- Fabricated Steel design for low cost.
- Allows retention of the cable tray with card removal.
- Open structure to provide simple cable restraints to be used.
- Finished in RAL 9006 Aluminium Flake

W	H	D	Kg	Description	Order no.	UP
449mm	20mm	55mm	<0.5kg	ATCA 14 Slot System Front cable tray	**04.099.148.9**	1
510mm	20mm	55mm	<0.5kg	ATCA 16 Slot System Front cable tray	**04.099.149.9**	1

AdvancedTCA Replacement Air Filter

- Front release and front access to filter tray
- Quick release design for fast MTTR
- Filter mediums for different applications
- Hot swap design – system remains in service.
- No tools required.

W	H	D	Kg	Description	Order no.	UP
430mm	90mm	N/A	<0.5kg	ATCA 2 Slot System replacement air filter	**04.099.058.9**	1
419mm	70mm	N/A	<0.5kg	ATCA 6 Slot System replacement air filter	**04.099.059.9**	1
225mm	419mm	N/A	<0.5kg	ATCA 6 Slot Development System replacement air filter	**04.099.060.9**	1
440mm	290mm	N/A	<0.5kg	ATCA 14 Slot System replacement air filter	**04.099.061.9**	1
500mm	290mm	N/A	<0.5kg	ATCA 16 Slot System replacement air filter	**04.099.062.9**	1
440mm	70mm	N/A	<0.5kg	ATCA 14 Slot Push Pull Cooling System replacement air filter	**04.099.063.9**	1
500mm	70mm	N/A	<0.5kg	ATCA 16 Slot Push Pull Cooling System replacement air filter	**04.099.064.9**	1

AdvancedTCA Front Panels

- Formed "U" channel design for low cost applications.
- Extruded aluminium design for use with overlays.
- Inject Eject and locking mechanisms are fitted as standard.
- Micro-switch's can be added to provide additional "Hot Swap" features.
- Customised punching and printing also available.

W	H	D	Description	Order no.	UP
6HP	8U	N/A	8U ATCA Basic front panel assembly - Steel construction - finish as shown	**04.099.100.1**	1
6HP	8U	N/A	8U ATCA Basic front blanking panel assembly - Steel construction - finish as shown	**04.099.101.1**	1
6HP	8U	approx 280mm	8U ATCA Basic front panel assembly with air baffle - Steel construction - finish as shown	**04.099.102.1**	1
6HP	8U	approx 280mm	8U ATCA Basic front blanking panel assembly with air baffle - Steel construction - finish as shown	**04.099.103.1**	1
6HP	8U	N/A	8U ATCA Basic front panel assembly - Stainless Steel construction - finish as shown	**04.099.104.3**	1
6HP	8U	N/A	8U ATCA Basic front blanking panel assembly - Stainless Steel construction - finish as shown	**04.099.105.3**	1
6HP	8U	approx 280mm	8U ATCA Basic front panel assembly with air baffle - Stainless Steel construction - finish as shown	**04.099.106.3**	1
6HP	8U	approx 280mm	8U ATCA Basic front blanking panel assembly with air baffle -	**04.099.107.3**	1
			Stainless Steel construction - finish as shown		
6HP	8U	N/A	8U ATCA Basic + front panel assembly - Steel construction - finish as shown	**04.099.108.2**	1
6HP	8U	N/A	8U ATCA Basic + front blanking panel assembly - Steel construction - finish as shown	**04.099.109.2**	1
6HP	8U	approx 280mm	8U ATCA Basic + front panel assembly with air baffle - Steel construction - finish as shown	**04.099.110.2**	1
6HP	8U	approx 280mm	8U ATCA Basic + front blanking panel assembly with air baffle - Steel construction - finish as shown	**04.099.111.2**	1
6HP	8U	N/A	8U ATCA Basic + front panel assembly - Stainless Steel construction - finish as shown	**04.099.112.4**	1
6HP	8U	N/A	8U ATCA Basic + front blanking panel assembly - Stainless Steel construction - finish as shown	**04.099.113.4**	1
6HP	8U	approx 280mm	8U ATCA Basic + front panel assembly with air baffle - Stainless Steel construction - finish as shown	**04.099.114.4**	1
6HP	8U	approx 280mm	8U ATCA Basic + front blanking panel assembly with air baffle -	**04.099.115.4**	1
			Stainless Steel construction - finish as shown		
6HP	8U	N/A	8U ATCA Extruded Aluminium front panel assembly - Stainless Steel construction - finish as shown	**04.099.116.5**	1
6HP	8U	N/A	8U ATCA Extruded Aluminium front blanking panel assembly -	**04.099.117.5**	1
			Stainless Steel construction - finish as shown		
6HP	8U	approx 280mm	8U ATCA Extruded Aluminium front panel assembly with air baffle -	**04.099.118.5**	1
			Stainless Steel construction - finish as shown		
6HP	8U	approx 280mm	8U ATCA Extruded Aluminium front blanking panel assembly with air baffle -	**04.099.118.5**	1
			Stainless Steel construction - finish as shown		
6HP	8U	N/A	8U ATCA Basic RTM panel assembly - Steel construction - finish as shown	**04.099.119.1**	1
6HP	8U	N/A	8U ATCA Basic RTM blanking panel assembly - Steel construction - finish as shown	**04.099.120.1**	1
6HP	8U	approx 280mm	8U ATCA Basic RTM panel assembly with air baffle - Steel construction - finish as shown	**04.099.121.1**	1
6HP	8U	approx 280mm	8U ATCA Basic RTM blanking panel assembly with air baffle - Steel construction - finish as shown	**04.099.122.1**	1
6HP	8U	N/A	8U ATCA Basic RTM panel assembly - Stainless Steel construction - finish as shown	**04.099.123.3**	1
6HP	8U	N/A	8U ATCA Basic RTM blanking panel assembly - Stainless Steel construction - finish as shown	**04.099.124.3**	1
6HP	8U	approx 280mm	8U ATCA Basic RTM panel assembly with air baffle - Stainless Steel construction - finish as shown	**04.099.125.3**	1
6HP	8U	approx 280mm	8U ATCA Basic RTM blanking panel assembly with air baffle -	**04.099.126.3**	1
			Stainless Steel construction - finish as shown		
6HP	8U	N/A	8U ATCA Basic + RTM panel assembly - Steel construction - finish as shown	**04.099.127.2**	1
6HP	8U	N/A	8U ATCA Basic + RTM blanking panel assembly - Steel construction - finish as shown	**04.099.128.2**	1
6HP	8U	approx 280mm	8U ATCA Basic + RTM panel assembly with air baffle - Steel construction - finish as shown	**04.099.129.2**	1
6HP	8U	approx 280mm	8U ATCA Basic + RTM blanking panel assembly with air baffle - Steel construction - finish as shown	**04.099.130.2**	1
6HP	8U	N/A	8U ATCA Basic + RTM panel assembly - Stainless Steel construction - finish as shown	**04.099.131.4**	1
6HP	8U	N/A	8U ATCA Basic + RTM blanking panel assembly - Stainless Steel construction - finish as shown	**04.099.132.4**	1
6HP	8U	approx 280mm	8U ATCA Basic + RTM panel assembly with air baffle - Stainless Steel construction - finish as shown	**04.099.133.4**	1
6HP	8U	approx 280mm	8U ATCA Basic + RTM blanking panel assembly with air baffle -	**04.099.134.4**	1
			Stainless Steel construction - finish as shown		
6HP	8U	N/A	8U ATCA Extruded Aluminium RTM panel assembly - Stainless Steel construction - finish as shown	**04.099.135.5**	1
6HP	8U	N/A	8U ATCA Extruded Aluminium RTM blanking panel assembly -	**04.099.136.5**	1
			Stainless Steel construction - finish as shown		
6HP	8U	approx 280mm	8U ATCA Extruded Aluminium RTM panel assembly with air baffle -	**04.099.137.5**	1
			Stainless Steel construction - finish as shown		
6HP	8U	approx 280mm	8U ATCA Extruded Aluminium RTM blanking panel assembly with air baffle -	**04.099.138.5**	1
			Stainless Steel construction - finish as shown		

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