Ruggedized ATR Military Chassis and ZIF III Board Retainers

Ruggedized Military ATR Chassis

ATR (Air Transport Rack) military enclosures protect critical systems across a wide range of military applications. They are installed in fighter and transport aircraft, nuclear submarines, advanced battle tanks, ships, simulators and ground test systems. The enclosures may be 1/2 ATR, 3/4 ATR, and Full ATR sizes uniquely configured for the applications, systems, and vehicles that demand reliability.

These ruggedized military chassis are designed to protect internal VMEbus boards and the backplane while exposed to harsh environmental conditions in mission critical applications. Each application may require a different ATR chassis, but all must provide reliable performance. These military enclosures must meet EMI/EMC requirements, prevent noise interference, provide lightning protection and isolation from small particle contaminants. The rugged enclosures also create a harsh thermal environment with complex cooling demands. A sophisticated cooling solution is typically required to meet the high power consumption by the multiple circuit boards within the enclosure.

Figure 1. Typical Ruggedized Full ATR Military Chassis

Meeting Thermal Demands

Military enclosure thermal management is a complex issue that is affected by several environmental factors and system constraints. Eliminating heat from these isolated enclosures is critical to the reliability of the VME boards and systems they contain. Thermal management within the isolated chassis requires maximizing conduction cooling, often with limited to no air flow. The ZIF III card retainer is the industry leader for maximizing thermal transfer between circuit boards and the chassis cold plate.

The ZIF III retainer, Figure 2, benefits from zero insertion force, quarter-turn lock/unlock, and uniform clamping pressure along the full length of the chassis sidewall, maximizing the thermal path for the tight VMEbus board spacing (0.8” pitch). With a thermal resistance of 1.2°C-In/W, the ZIF III board retainer provides an extremely low thermal conduction path to the cold plate.

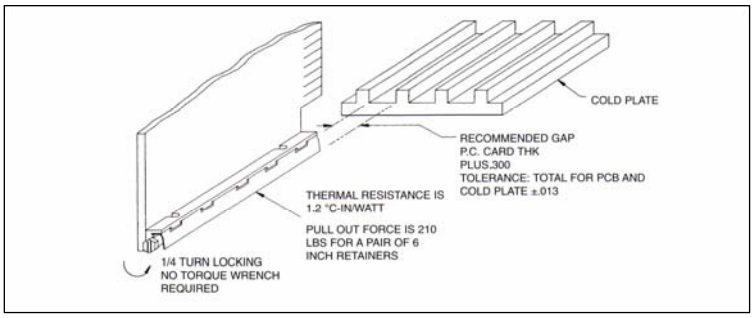

Figure 2. PCB with ZIF III retainer and chassis cold plate

ZIF III Board Retainer Features

The ZIF III board retainer is a three piece assembly: aluminum housing, stainless steel rod, and beryllium-copper spring. It is designed to mount along the full length of the PCB. The board and retainer assembly securely locks into an ATR chassis cold-wall with a simple cam-lock quarter-turn. The ZIF III does not require a torque wrench or special settings.

The unique locking design of the ZIF III board mountable retainer produces a uniform pressure distribution along the PCB edge. Once locked into the ATR chassis cold plate, the retainer/PCB assembly provides a thermally conductive path to remove heat and a resistance to extreme shock and vibration. Screw mounting of the ZIF III to the VMEbus board provides uniform mounting pressure to the PCB with no board warping. The quarter-turn lock and unlock design allows quick loading and unloading of boards. The slot in the hex-head rod (Figure 3) is colored to provide visual indication of the lock-status of the retainer.

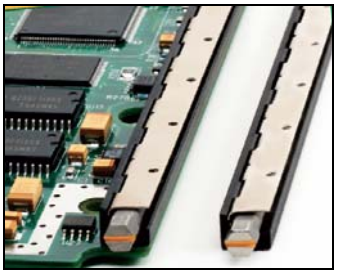

Figure 3. ZIF III board retainer both mounted and un-mounted on PCB.

Parameter	ZIF III Retainer Features	Benefits
Insertion and Extraction	Zero	No PC board damage
Cold Plate	Card Thickness plus .300”	Standard for retainers
Clamping Pressure	Uniform pressure along the PCB edge	Excellent heat transfer
Locking/Unlocking	1/4 turn	No torque gage required; Fast operation
Operation Repeatability	Always 1/4 turn lock/unlock	Consistent and easy to operate
Over-torque Sensitivity	Not susceptible to over-torque	Does not damage PC boards
PC board operational damage	Constant and even edge pressure on boards	No PC board damage
Retainer Mounting Options	Screw mounting	Standard for retainer mounting
Thermal Performance	1.2°C-inch/Watt	Very good cooling efficiency

Table 1. ZIF III Board Retainer Features

VMEbus Card Size	ZIF III Retainer Size	CTS Standard Part Number
9U Size D	12” (2 Required)	Z3A12SBSBNL/R
6U Size C	12” (2 Required)	Z3A12SBSBNL/R
6U Size B	6” (2 Required)	Z3A60SBSBNL/R

Table 2. ZIF III Board Retainer Common Sizes

ZIF III Board Retainer Locking Torque & Thermal Characteristics

Slot Width (IN)	Insertion Depth	*Locking Torque (IN – LBS)		Thermal Resistance for ZIF III Retainer Per 1” of Length at Different Power Levels (ºC/W/IN)			
		Top	Bottom	10 Watts	25 Watts	50 Watts	75 Watts
.495	.150	17.5	20.5	1.17	1.19	1.16	1.16
	.200	17.5	20.5	0.84	0.94	0.94	0.93
	.250	17.5	20.5	0.69	0.76	0.82	0.84
.487	.150	24.5	26.0	1.17	1.07	1.08	1.07
	.200	24.5	26.0	0.97	1.02	0.98	0.97
	.250	24.5	26.0	0.89	0.85	0.89	0.87
.480	.150	29.5	32.0	1.03	0.96	0.99	0.94
	.200	29.5	32.0	0.90	0.78	0.82	0.78
	.250	29.5	32.0	0.67	0.68	0.68	0.67
**** Torque value per 6” length of ZIF III retainer.***							

Table 3. ZIF III Thermal Resistance from Plate to Cold-wall (using Beryllium-Copper spring & Stainless Steel Rod)

Environmental Qualification Tests

Qualified to MIL-Std-810:

- **High Temperature:** Method 501, Procedure 1, Steps 1-7, 71°C, after 48 hours exposure to 150°C. Lock/Unlock Torque within 25% of initial value.
- **Low Temperature:** Method 502, Procedure 2, Steps 1-3 & 6, -55°C, Lock/Unlock Torque within 25% of initial value.
- **Salt Fog:** Method 509, Procedure 1, Lock/Unlock Torque within 25% of initial value.
- **Vibration:** Method 514, Procedure 1, Part 1, Category B.1, Curve L, 5Hz to 2 KHz. Retainer shall not unlock.
- **Shock:** Method 516, Procedure 1, Figure 516 & 202. Retainers shall not unlock.

Additional CTS/IERC ZIF III product information can be found at:

http://www.ctscorp.com/components/heat_sinks.asp#Military

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