

IDENTIFYING THE IDEAL MECHANICAL PCB HARDWARE FOR ELECTRONIC SYSTEMS

Mechanical Printed Circuit Board (PCB) hardware and retainers are an important component in any electronic subassembly or system, as they provide the required clamping force and placement to board module assemblies, electronic subracks or system chassis. These essential mechanical components ensure complete PCB protection.

To ensure optimal performance of the electronic system, the PCB must be supported and placed in correct alignment.

If a board does not have a secure clamp, the board may not only fall out of alignment, but it may also start to flex which can result in system failure or accidental ejection of the board.

In addition to board protection and placement, retainers are ideal for thermal management with sensitive electronics. Retainers prevent wear and failure by transferring heat away from electronic components, while delivering higher retention force on the board. PCB handles, code keys, injectors and ejectors can provide a failsafe solution for ensuring proper board placement, insertion and extraction.

With today's diverse electronic systems applications, a variety of PCB hardware and retainer solutions may be deployed to address a broad range of unique protection requirements. This article introduces different types of PCB hardware solutions and their applications. These range from general electronic systems requiring basic board retention and placement to complex high-tension, clamping force applications found in high shock and vibration environments, such as industrial and transportation applications.

TYPES OF MECHANICAL PCB HARDWARE

With multiple styles available, correctly specified PCB hardware can provide a reliable protection solution for diverse applications. Examples include: injectors and ejectors, nylon and metallic card guides, PCB tainers, Card-Lok and Wedge-Lok board retainers, code keys and conduction-cooled assemblies.

Injectors and Ejectors

PCB injectors and ejectors are generally used in both sheet metal and cold wall applications to facilitate the installation and removal of standard PCBs with high-density backplane interconnects.



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Available in metal and plastic design, in addition to various lever styles and finishes, injectors and ejectors can be easily installed and removed in diverse applications. These components are levers, which are fitted to the PCB and are retained in front of the selected PCB guide. Injectors and ejectors are designed to ensure simple insertion and extraction of the PCB from a subrack, case or system chassis.

Nylon and Metallic Card Guides

Nylon and metallic card guides provide an economical and quick solution to effectively align and mount PCBs. With easy card insertion, these card guides firmly support and protect the board. Card guides are available with tough, electrically insulating nylon or metallic material.

PCB Tainers

PCB tainers feature a spring-action card retention design, and provide a low-cost board alignment and retention solution for sheet metal applications. PCB tainers are optimal for providing protection against basic shock, vibration and unique grounding characteristics, often found in harsher environments.



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Card-Loks and Wedge-Loks

Card-Lok and Wedge-Lok retainers are designed to secure PCBs to the cold wall in cold plate-heat exchanger applications. They are typically mounted to the board or subrack. Providing retention to the card guide, the Card-Lok retainer clamps to the board edge to ensure secure clamping at the connector side, top and bottom edges and backplane side.

Advanced Card-Lok and Wedge-Lok retainers employ a screw-actuated wedge action that locks the PCB in place with the use of a standard hex wrench, establishing the secure hold required for military two-level maintenance systems. Eliminating the need for a torque wrench, this design applies no insertion and extraction force on the PCB, removing the risk of over tightening to prevent damage to the board and Card-Lok during installation. Card-Lok retainers are available in various lengths, individual wedge dimensions, mounting configurations and finishes to satisfy diverse application requirements.



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Conduction Cooled Assemblies and Code Keys

Conduction-cooled assemblies (CCAs) are generally used when passive free air convection or active forced air cooling is not possible, such as in space applications, or where creating airflow with moving parts might affect the reliability of the system. Featuring a robust, lightweight aluminum design, CCAs deliver high thermal conductivity, while ensuring sufficient structural support. CCAs consist of a conduction-cooled frame, backing plate, extractors and wedge clamps. They are designed for PCBs requiring cooling in severe environments where convection cooling is not practical. CCAs are available in numerous configuration sizes and finishes to provide structural support in extremely high shock and vibration applications. CCAs may be configured for various platform and application requirements, including, but not limited to 3U or 6U VME, VPX, IEEE 1101.2 and VITA 30.1 applications.

Code keys are attached to the PCB or CCA to mitigate the risk of inadvertent PCB insertion into an incorrect slot within the electronic assembly.

MECHANICAL PCB HARDWARE AND RETAINER APPLICATIONS

Multiple retainer types are available to meet the unique needs of every application.

Industrial Machinery

In many industrial settings, continuous vibration poses a unique challenge to PCBs. Retainers are used to keep circuit boards in complete alignment, and firmly positioned in their card slot. In addition to providing structural support, retainers actively remove the heat from the circuit boards, ensuring they do not overheat in high-heat situations.

Energy

In harsh oil and gas environments where shock and vibration is often present, Card-Lok and Wedge-Lok retainers are an ideal solution. With high secure clamping, these retainers ensure PCB protection.

Medical – MRI scanners

In medical applications where certain devices are used, such as a medical imaging device (MRI) scanner, the protection of these electronics is extremely critical. For an accurate test, it is important that they operate continuously without interruption or movement. Retainers with high resistance to shock and vibration are ideal to ensure the PCB does not move during scanning.

In-flight Aerospace Electronics (Commercial)

During flights, passengers have the opportunity to view television or movies via in-flight entertainment devices attached to airplane seats. Given the constant movement throughout the flight, which can include vibration and significant jostling of the devices, it is critical that they have superior protection. Retainers are ideal to ensure PCBs are securely in place, regardless of the movement that may occur in flight.

Mobile Embedded – E-Mobility

For in flight, railway and mobile embedded systems, high protection from retainers is crucial to continuous performance and communication. Retainers with resistance to high shock and vibration are ideal to ensure the embedded system is held firmly in place, without chance for movement.

Conclusion

Retainers can be used for a variety of applications, ranging from general industrial systems that require complete board alignment to harsh oil and gas environments where shock and vibration conditions require retainers with high, secure clamping force. It's important for design engineers to assess the various types of retainers, and determine the one best suited for their specific application.

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