

The Benefit of Torque-Limiting Card-Lok Retainers for Field Level Repairs



Card-loks must be installed with a calibrated torque wrench that is set to the correct amount of torque in order to achieve optimal performance.

Military equipment—such as shipboard, surveillance, mobile artillery and control stations, combat aircraft and unmanned air vehicles—often consists of highly technological and sensitive electronics. It is likely that these electronics, at some point, will be exposed to harsh environments, including extreme heat, dust, moisture, shock and vibration.

Within these harsh environments, card-loks are often used for printed circuit board retention and thermal management to ensure continued reliability and performance. For mission-critical applications, where high availability and rapid deployment are required, torque-limiting card-loks should be considered to support field level maintenance.

A TWO-LEVEL MAINTENANCE APPROACH

In the past the Department of Defense supported a four level maintenance system consisting of unit, direct support, general support and depot repairs. This system had an echeloned maintenance structure, required a large logistical footprint and relied heavily on the evacuation of systems for repair. As a result, units were required to plan for equipment downtime while evacuating equipment to higher maintenance levels, wait for that item to be repaired and then sent back through the appropriate channels. This process often was prolonged when dealing with large or expensive equipment.



Torque-limiting card-loks include an internal ratcheting mechanism, which provides highly repeatable and reliable clamping force and thermal performance.



Unlike traditional card-loks, torque-limiting card-loks satisfy the requirements for field-level maintenance because they do not require any specific tools to install or utilize them, ongoing calibration or advanced technical knowledge.

The transition to a two level maintenance system, consisting of sustainment and field level repairs, has reduced equipment downtime and minimized the complexity of the maintenance process. This new methodology enables more maintenance capacity at the unit level and allows mission-critical equipment to be returned to fully mission capable (FMC) status faster.

SUSTAINMENT-LEVEL MAINTENANCE

Sustainment-level maintenance requires mission profile considerations—such as the enemy, terrain and weather, troops and time constraints and personnel. Sustainment maintenance is a repair-and-return-to-the-supply system activity. These repairs often require a trained technician to disassemble/reassemble parts, complete repairs to national standards, and use a variety of specialized tools.

FIELD-LEVEL MAINTENANCE

Within the military's two-level maintenance structure, field-level maintenance focuses on component replacement, damage, repair, recovery and related maintenance activities at the military squadron, ship or unit level—essentially wherever they are located worldwide. Field maintenance tasks do not require specialized tools, and are typically a system swap versus a system repair. Oftentimes, this type of maintenance activity is basic enough to be successfully completed by an operator.

CARD-LOK RETAINERS AND FIELD LEVEL REPAIRS

Field-level maintenance is generally preferred because it reduces cost and equipment downtime. Unlike traditional card-loks, torque-limiting card-loks have been specifically designed to satisfy the requirements for field-level maintenance. Torque-limiting card-loks do not require any specific tools for installation, ongoing calibration of tools, or require any advanced technical knowledge for installation.

TORQUE-LIMITING CARD-LOK (Comparing the Technology)

Similar to conventional card-loks, torque-limiting card-loks are based on a screw-actuated design with a hex head. When torqued, conventional and torque-limiting card-loks function in the same manner, the wedges are pushed together, they slide against each other on 45 degree angles, and the assembly expands widthwise. This expansion provides the clamping force required for board retention and aids in thermal transfer from the PCB to the cold wall.

For all card-loks, achieving the specified torque is critical for achieving optimal clamping and thermal performance. If the card-lok is under-torqued, the clamping force may not provide enough retention, especially in high shock and vibration environments, resulting in loose printed circuit boards and poor thermal transfer. If the card-lok is over-torqued, severe damage may result to the cold wall or printed circuit board.

Attaining accurate torque is not always simple, especially in rugged, high stress environments, such as the battlefield. In order to achieve optimal results, a conventional card-lok must be actuated using a torque wrench, the torque wrench must be properly calibrated, and the card-lok must be torqued to a specified level. In some situations, the operator may not have access to a properly calibrated torque wrench, specifically in cases where the operator's tools are exposed to harsh environmental conditions, or the operator may not know the proper torque level, which varies depending on the card-lok design.

The torque-limiting card-lok was developed to mitigate these issues; it features an integrated ratcheting mechanism which provides highly repeatable and reliable performance. Because the torqueing mechanism is built in, a calibrated torque wrench is not required for installation; operators can use any standard tool with a hex head. Once the proper torque has been achieved, the ratchet mechanism will "slip" creating an audible and tactile response. This feature not only eliminates risks associated with under- or over-torqueing the card-lok, but improves the ease of installation.

Because the torque-limiting card-lok can be a system repair, it doesn't require any specialized tools or technical knowledge, and can be completed by the operating crew—making it ideal for field-level maintenance.

IN THE FIELD

Torque-limiting card-loks are designed primarily for security and defense applications, however, any application that has critical board clamping for thermal transfer requirements, requires high equipment availability or has a high expense for downtime may benefit from a torque-limiting card-lok design.

Schroff's Calmark torque-limiting card-lok retainers are available in various profiles, finishes and performance specifications. Testing reports are available upon request.

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