TOLERANCE COMPENSATING CIRCUIT BOARD LEVER

A control module (20) comprises a motherboard (24) and at least one circuit board (26) removably connected to the motherboard (24). There is at least one lever (28) connected to the removable circuit board (26). The lever (28) is movable between a release and locked position. The lever (28) contacts a lock bracket (38) in the locked position to move the bracket against a spring force, such that a bias force maintains the at least one circuit board (26) in contact with the motherboard (24).
This application relates to a structure and method for mounting circuit boards into a motherboard.

Modem systems are becoming more and more complex. Thus, complicated controls are incorporated into many systems. As an example, one such system could be on aerospace systems such as an aircraft.

A control module for such a system may include a chassis mounting a motherboard and a plurality of removable circuit boards. One type of circuit board, known as line removal modules, may provide a variety of functions.

Designers of the control modules will mount a motherboard and then select appropriate LRMs to provide the particular function demanded by the system which will utilize the control module. It is known that the removable LRMs must be held against the motherboard such that electronic connections are made.

In the past, levers have been utilized to lock the LRMs into the chassis and in contact with the motherboard. However, due to manufacturing tolerances, the known systems do not always provide sufficient LRM travel to ensure a reliable electrical connection. Also, various biasing arrangements have been proposed but are generally complex.

A control module comprises a motherboard and at least one circuit board removably connected to the motherboard. There is at least one lever connected to the removable circuit board. The lever is moveable between a release and locked position. The lever contacts a bracket in the locked position to move the bracket against a spring force, such that a bias force maintains the at least one circuit board in contact with the motherboard.

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A circuit board and chassis are also disclosed. These and other features may be best understood from the following drawings and specification.

A control module comprises a motherboard and at least one circuit board removably connected to the motherboard. There is at least one lever connected to the removable circuit board. The lever is moveable between a release and locked position. The lever contacts a bracket in the locked position to move the bracket against a spring force, such that a bias force maintains the at least one circuit board in contact with the motherboard.

A circuit board and chassis are also disclosed. These and other features may be best understood from the following drawings and specification.

Figure 1A shows a control module.
Figure 1B schematically shows connection in the Figure 1A module.
Figure 2 shows a locking assembly in an unlocked position.
Figure 3A shows a locking assembly in a locked position.
Figure 3B shows a detail.
Figure 4 shows geometric details of the locking system.
bracket 30 and hence the LRM 26 further into the chassis, such that the connection 27 between the motherboard 24 and the LRM 26 is fully closed.

[0017] Figure 3B shows a locking pawl 90 which is pivotally connected to the lever 28. Pawl 90 has arms 92 that can be pivoted to the position illustrated where they lock on pins 94 on the bracket 30. The pawl 90 is moved to this position once the lever has been moved to the Figure 3A/3B position, and the pawl 90 locks the lever at that position.

[0018] To remove the LRM 26, the pawl 90 is pivoted away from the Figure 3B position, releasing the lever. As can also be seen, the lever 28 has heads 34 spaced about a central member 96 of the bracket 30. Thus, the pin 40 can extend between the spaced heads 34.

[0019] In a method of installing a circuit board into a motherboard according to this disclosure, a circuit board 26 is initially moved into the chassis 22, and moved toward the motherboard 24 for connection. During this movement, it may be necessary to slightly pivot the levers 28 such that the head 34 can move beyond an outer side 38S of the lock bracket 38 at both of the two locations.

[0020] Once the circuit board 26 is moved into the chassis sufficiently such that the head 34 of the lever 28 can be moved between the side walls 38S of the lock bracket 38, the levers 28 are then pivoted to the position such as shown in Figure 2.

[0021] Next, the levers 28 are pivoted such that the head 34 cams against the sides 38S on the lock brackets 38, and the levers are further pivoted, drawing the lock brackets 38 against the force from the spring 46 until it reaches the Figure 3A position. In this position, the Belleville washers 46, or other bias members, pull the lock brackets 38 back into the chassis, thus causing the levers 28 to further pull the circuit board 26 into the chassis, ensuring an adequate connection. The pawl 90 is then moved to the Figure 3B position.

[0022] As shown in Figure 4, a distance d1 can be defined as between a center of the pivot point 36 and an end 78 on the head 34. A second distance d2 is the distance across the gap S between the faces 82 and 80, respectively, of the brackets 44 and 38 ensures sufficient LRM movement to compensate for the tolerance accumulation of the system.

[0023] In embodiments, d2 is a subset or partial part of the overall LRM travel that results from the d1 moment arm length and movement. The LRM 26 required overall movement or engagement travel will be vary depending on the mating connector types used between the LRM 26 and the motherboard, Item 24. Thus, d1 is selected to provide adequate LRM 26 movement to ensure a proper connection given the greatest possible tolerance stack-up for a given system.

[0024] In one feature, a chassis for a control module provides a housing having an inner end 25 and a forward opening 27. A fixed bracket 44 mounts a biasing member 46, and a lock bracket 38 slides on the housing. Lock bracket 38 is spaced towards the opening 27 from the fixed bracket 44. Biasing member 46 biases lock bracket 38 towards fixed bracket 44.

[0025] Although LRMAs are disclosed, other circuit boards may come within the scope of this disclosure. In addition, while Belleville washers 46 are illustrated, other biasing members would come within the scope of this disclosure.

[0026] Although an embodiment of this invention has been disclosed, a worker of ordinary skill in this art would recognize that certain modifications would come within the scope of this invention. For that reason, the following claims should be studied to determine the true scope and content of this invention.

Claims

1. A control module (20) comprising:
   a motherboard (24); and
   at least one circuit board (26) removably connected to said motherboard (24), and there being at least one lever (28) connected to said removable circuit board (26), and said lever (28) being moveable between a release and a locked position, and said lever (28) contacting a lock bracket (38) in said locked position to move said bracket (38) against a spring force, such that a bias force maintains said at least one circuit board (26) in contact with said motherboard (24).

2. The control module as set forth in claim 1, wherein said lock bracket (38) slides on a chassis (22), as said lever (28) moves between said release and locked positions.

3. The control module as set forth in claim 1 or 2, wherein said lock bracket (38) is moveable relative to a fixed bracket (44) and said fixed bracket (44) mounts a bias member (46) biasing said lock bracket (38) toward said motherboard (24), to provide said bias force.

4. The control module as set forth in claim 3, wherein said fixed bracket (44) receives a holder (40) for said biasing member (46) that extends through said lock bracket (38).

5. The control module as set forth in any preceding claim, wherein said circuit board (26) is generally planar and extends between two ends and there being levers (28) and lock brackets (38) at each of said two ends.

6. The control module as set forth in any preceding claim, wherein said at least one circuit board (26) includes a plurality of removable circuit boards (26).
7. The control module as set forth in any preceding claim, wherein said lever (28) is pivotally mounted on a bracket (30) on a side of said at least one circuit board (26).

8. The control module as set forth in any preceding claim, wherein said lever (28) has a head (34) which cams against a side of said lock bracket (38) when said lever (28) is in said locked position.

9. The control module set forth in claim 8, wherein said lever (28) has a pair of spaced heads (34) which cam said side of said lock bracket (38) when said lever (28) is in said locked position.

10. The control module as set forth in any preceding claim, wherein said biasing member includes Belleville washers.

11. The control module set forth in any preceding claim, wherein a distance (d₁) between a center of a pivot point (36) on said lever (28) and an outer end (78) of a head (34) on said lever (28) is selected such that as said lever (28) is moved to said locked position a resultant overall travel of said circuit board (26) is adequate to ensure a proper connection given the greatest possible tolerance stack-up of the control module (20) of the mother board (24) and said removable circuit board (26).

12. The control module as set forth in any preceding claim, wherein said at least one removable circuit board (26) is a line replaceable module.

13. A circuit board (26) comprising:

   a body configured to functionally attach to a motherboard (24) positioned within a housing (22) due to movement of said body; and
   a lever (28) pivotally connected to said body configured to move the body relative to the housing toward the motherboard (24) when pivoted between a first position and a second position, a distance between a center of a pivot point (36) on said lever (28) and an outer end (78) of a head (34) on said lever (28) being selected such that as said lever (28) is moved from the first position to the second position the body moves toward the motherboard (24) a dimension sufficient to ensure proper functional engagement between the circuit board (26) and the motherboard (24) at all possible tolerance stack-up conditions of the motherboard (24), the housing (22) and the circuit board (26).

14. A chassis (22) for a control module comprising:

   a housing having an inner end (25) and a forward opening (27); a biasing member (46), and a lock bracket (38) which slides on the housing, said biasing member (46) biasing said lock bracket (38) towards said inner end (25).

15. The chassis as set forth in claim 14, wherein a fixed bracket (44) receives a holder (40) for said biasing member (46) that extends through said lock bracket (38); wherein, optionally, said biasing member (46) includes Belleville washers.
# DOCUMENTS CONSIDERED TO BE RELEVANT

<table>
<thead>
<tr>
<th>Category</th>
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**TECHNICAL FIELDS SEARCHED (IPC)**

- G06F
- H05K

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The present search report has been drawn up for all claims

**Place of search** | **Date of completion of the search** | **Examiner**
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Munich | 29 May 2017 | Semple, Mark

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