

CLAIMS

What is claimed is:

1. A battery module, comprising:
 - a first set of power contacts;
 - a first set of signal contacts;
 - a battery pack operable to deliver electrical power to the set of power contacts;
 - an electronic isolation system operable to electrically disconnect and electrically connect the battery pack and the first set of power contacts; and
 - an electronic control system electrically connected to the electronic isolation system and to at least one of the first set of signal contacts or the first set of power contacts, the electronic control system being operable to measure a parameter associated with at least one of the battery module or an electrical device and to compare the parameter to a predefined value to determine if it is desirable to connect the battery module to the electrical device;

wherein the electronic isolation system connects the battery pack to the first set of power contacts based on a positive result of the comparison, and the electronic isolation system disconnects the battery pack and the first set of power contacts based on a negative result of the comparison.
2. The battery module of claim 1, comprising:
 - the parameter associated with one of the battery module and the electrical device comprises:
 - a first parameter associated with the battery module, and
 - a second parameter associated with the electrical device; and
 - the comparison of the parameter to a predefined value further comprises, comparison of a difference between the first parameter and the second parameter to a predefined acceptable range of the difference;

wherein, if the difference is within the acceptable range, the electronic isolation system connects the battery pack to the first set of power contacts and if the difference is not within the acceptable range, the electronic isolation system disconnects the battery pack and the first set of power contacts.

3. The battery module of claim 1, comprising:
 - a power flow control system connected between the battery pack and the first set of power contacts, the power flow control system operable to inhibit reverse flow of current from the first set of power contacts to the battery pack.
4. The battery module of claim 1, wherein the electronic isolation system comprises at least one switching device electrically connected between the battery pack and the first set of power contacts such that:
 - when the at least one switching device is in an open position, the first set of power contacts are isolated from the battery pack, and
 - when the at least one switching device is in a closed position, the first set of power contacts are electrically connected to the battery pack.
5. The battery module of claim 2, comprising:
 - the first set of power contacts being operable to electrically connect to a second set of power contacts of the electrical device;
 - the first set of signal contacts being operable to electrically connect to a second set of signal contacts of the electrical device;
 - the battery pack comprising at least an anode and a cathode that are operable to deliver electrical power to the set of power contacts;
 - the electronic control system being operable to measure the difference between the first parameter and the second parameter when the first and second sets of signal contacts are connected together.
6. The battery module of claim 5, wherein the electrical device is a second battery module.
7. The battery module of claim 6, wherein:
 - the first parameter comprises a first state of charge of the battery module;
 - the second parameter comprises a second state of charge of the second battery module; and

the difference comprises the difference between a first state of charge and the second state of charge.

8. The battery module of claim 7, wherein the acceptable range of the difference is when the first state of charge is within plus or minus 25 percent of the second state of charge.

9. A battery module, comprising:
a first set of power contacts;
a first set of signal contacts;
a battery pack operable to deliver electrical power to the set of power contacts;
a power flow control system connected between the battery pack and the first set of power contacts, the power flow control system operable to inhibit reverse flow of current from the first set of power contacts to the battery pack.

10. The battery module of claim 9, wherein the power flow control system comprises at least one diode connected between the battery pack and the first set of power contacts to inhibit the reverse flow.

11. The battery module of claim 9, comprising:
the first set of power contacts;
the first set of signal contacts;
an electronic isolation system operable to electrically disconnect and connect the battery pack and the first set of power contacts; and
an electronic control system electrically connected to the electronic isolation system and to one of the first set of signal contacts or the first set of power contacts, the electronic control system being operable to measure a difference between at least one parameter associated with both the battery module and an electrical device;
wherein, if the difference is within an acceptable range, the electronic isolation system connects the battery pack to the first set of power contacts; and if the difference is not within the acceptable range, the electronic isolation system disconnects the battery pack and the first set of power contacts.

12. The battery module of claim 11, wherein the electronic isolation system comprises at least one switching device electrically connected between the battery pack and the first set of power contacts such that:

when the at least one switching device is in an open position, the first set of power contacts are isolated from the battery pack, and

when the at least one switching device is in a closed position, the first set of power contacts are electrically connected to the battery pack.

13. The battery module of claim 11, wherein the electrical device is a second battery module.

14. The battery module of claim 13, wherein the difference comprises the difference between a first state of charge of the battery module and a second state of charge of the second battery module.

15. A battery module system, comprising:

a battery module system power bus; and

a plurality of battery modules, a first battery module of the plurality of battery modules comprising:

a first set of power contacts electrically connected to the power bus,

a first set of signal contacts,

a first battery pack operable to deliver electrical power to the first set of power contacts,

a first electronic isolation system operable to electrically disconnect and connect the first battery pack and the first set of power contacts, and

a first electronic control system electrically connected to the first electronic isolation system and to at least one of the first set of signal contacts or the first set of power contacts;

wherein the electronic control system being operable to measure a parameter associated with at least one of the first battery module or a second battery module of the plurality of battery modules and to compare the parameter to a predefined value to

determine if it is desirable to connect the first battery module to the second battery module; and

wherein the electronic isolation system connects the battery pack to the first set of power contacts based on a positive result of the comparison, and the electronic isolation system disconnects the battery pack and the first set of power contacts based on a negative result of the comparison.

16. The battery module system of claim 15, comprising:

the first battery module comprising any battery module of the plurality of battery modules; and

the second battery module comprising any other battery module of the plurality of battery modules.

17. The battery module system of claim 15, comprising:

the parameter associated with one of the first battery module and the second battery module further comprises:

a first state of charge associated with the first battery module, and

a second state of charge associated with the second battery module;

and

the comparison of the parameter to a predefined value further comprises, comparison of a difference between the first state of charge and the second state of charge to a predefined acceptable range of the difference;

wherein, if the difference is within the acceptable range, the electronic isolation system connects the battery pack to the first set of power contacts and if the difference is not within the acceptable range, the electronic isolation system disconnects the battery pack and the first set of power contacts.

18. The battery module system of claim 17, comprising:

the first battery module comprising a first power flow control system connected between the first battery pack and the first set of power contacts, the first power flow control system operable to inhibit reverse flow of current from the first set of power contacts to the first battery pack; and

the second battery module comprising a second power flow control system connected between the second battery pack and the second set of power contacts, the second power flow control system operable to inhibit reverse flow of current from the second set of power contacts to the second battery pack.

19. The battery module system of claim 1, comprising:
the power bus being operable to connect to an external electrical load.
20. The battery module system of claim 1, wherein the first battery module comprises:
a top detection device operable to detect another battery module of the plurality of battery modules positioned on a top of the first battery module; and
a bottom detection device operable to detect another battery module of the plurality of battery modules positioned on a bottom of the first battery module.