in a predetermined configuration relative to the other wires for performing the verification test and measuring a value of an electrical parameter associated with the wire under test. The verification test may also include comparing the value of the measured electrical parameter associated with the wire under test to an expected value of the electrical parameter. The wire under test passes the verification test in response to the measured value of the electrical parameter corresponding substantially to the expected value of the electrical parameter. The device is configured to determine an identification of the bus or of a particular remote data connection from which the bus was removed by reading configuration pin settings of the bus connector.

In accordance with an embodiment, a device for verifying wire integrity of a bus may include a bus connector configured to connect to a controller area network (CAN) bus connector. The CAN bus connector may be configured for connecting a plurality of CAN buses to a data concentrator. Each CAN bus may include a shielded twisted pair of wires including a CAN high wire, a CAN low wire and a CAN shield wire. The device may also include measurement circuitry configured to perform a verification test on at least the CAN high wire and CAN low wire of each CAN bus. The verification test of each CAN bus may include connecting a wire under test in a predetermined configuration relative to the other wire for performing the verification test and measuring a value of an electrical parameter associated with the wire under test. The verification test may also include comparing the value of the measured electrical parameter associated with the wire under test to an expected value of the electrical parameter. The wire under test passes the verification test in response to the measured value of the electrical parameter corresponding substantially to the expected value of the electrical parameter.

In some embodiments of the present invention in combination with any of the above embodiments, the device may include a hand-holdable portable housing with the measurement circuitry contained in the housing. A user interface for controlling operation of the device may be provided on a face of the housing. Information related to the verification tests may be presented on a display of the user interface. The information may include test results and an identification of the bus on which the verification test is being performed based on reading a pin configuration setting of the bus by the device.

In some embodiments of the present invention in combination with any of the above embodiments, a device for verifying wire integrity of a bus may include an interface for connecting to the bus that is configured to select subsets of a plurality of wires in a connector of the bus for testing. The device or interface may automatically select a subset of wires of the bus

and run the verification tests. The device or interface may then select another subset of wires without requiring user interaction. In this manner, all wires of the bus may be automatically verification tested.

In some other embodiments of the present invention and in combination with any of the above embodiments, the verification test may include detecting a short circuit between the wire under test and another wire of the bus and detecting a short circuit between the wire under test and a ground potential. The verification test may also include indicating that the wire passed the verification test in response to not detecting the short circuit between the wire under test and the other wire of the bus and not detecting the short circuit between wire under test and the ground potential.

In accordance with another aspect of the present invention, a method for verifying wire integrity of a bus may include detecting connection to a bus connector. The bus connector may be configured to connect a plurality of buses to an apparatus and each bus may include a plurality of wires. The method may also include determining an identification of a particular bus from the plurality of buses or of a particular remote data connection from which the bus was removed by reading configuration pin settings of the bus connector. The method may also include automatically performing a verification test of each bus. The verification test of each bus may include connecting a wire under test in a predetermined configuration relative to the other wire by measurement circuitry for performing the verification test and measuring a value of an electrical parameter associated with the wire under test. The method may also include comparing the value of the measured electrical parameter associated with the wire under test to an expected value of the electrical parameter. The wire under test passes the verification test in response to the measured value of the electrical parameter corresponding substantially to the expected value of the electrical parameter.

BRIEF DESCRIPTION OF THE SEVERAL VIEWS OF DRAWINGS

The following detailed description of embodiments refers to the accompanying drawings, which illustrate specific embodiments of the disclosure. Other embodiments having different structures and operations do not depart from the scope of the present disclosure.

FIG. 1 is a block schematic diagram of an example of a device for verifying wire integrity of a bus in accordance with an embodiment of the present disclosure.

In block 808, the test results may be presented in response to completion of the wire integrity verification tests. An indication may be presented if all buses passed the verification tests. Any buses that failed may be identified and reasons for failure may also be presented.

In block 810, the test results may be stored. In block 812, the device may be disconnected from the bus connector.

In block 814, scrolling through the test results may be allowed similar to that previously described with reference to FIGs. 5E and 5F.

FIG. 9 is a flow chart of an exemplary method 900 including tests for verifying wire integrity of a bus in accordance with an embodiment of the present disclosure. The method 900 may be used for the verification tests in block 806 of FIG.8. In block 902, a verification test to detect a short circuit between a particular CAN high wire and an associate CAN low wire may be performed. Assuming the CAN bus is onboard an airplane, the verification test to detect the short circuit between the particular CAN high wire under test and the associated CAN low wire may include connecting the associated CAN low wire to ground potential and removing any connection of the verification device to a ground of the airplane. The wire integrity verification test may also include connecting the particular CAN high wire to a voltage source of the device and measuring a voltage across a sense resistor associated with the particular CAN ~~high~~ low wire. The measured voltage may be compared to an expected voltage for the particular CAN ~~high~~ low wire. The expected voltage for the particular bus may be stored in a bus parameter lookup table similar to lookup table 110 in FIG. 1. A short circuit is not detected in response to the measured voltage corresponding substantially to the expected voltage and the verification test is passed. The expected voltage is a function of the termination resistors on the bus and the number and resistive characteristics of the communicating LRUs attached to the bus. A short circuit is detected in response to the measured voltage not corresponding substantially to the expected voltage and the verification test is failed. Referring also to FIG. 10A, FIG. 10A is a schematic diagram illustrating an exemplary configuration 1000 formed by the measurement circuitry (600, 700 or 800) which also corresponds to the connections described above with reference to block 902 of FIG. 9.

In block 904, a verification test to detect a short circuit between the associated CAN low wire and ground may be performed. The verification test to detect the short circuit between the

What is claimed is:

1. A device for verifying wire integrity of a bus, comprising:

a bus connector configured to connect to a bus comprising a plurality of wires;

measurement circuitry configured to perform a verification test on each wire of the bus, the verification test of each wire comprising:

connecting a wire under test in a predetermined configuration relative to the other wires for performing the verification test;

measuring a value of an electrical parameter associated with the wire under test; and

comparing the value of the measured electrical parameter associated with the wire under test to an expected value of the electrical parameter, the wire under test passing the verification test in response to the measured value of the electrical parameter corresponding substantially to the expected value of the electrical parameter;

wherein the device is configured to determine an identification of the bus or of a particular remote data connection from which the bus was removed by reading configuration pin settings of the bus connector.

2. The device of claim 1, further comprising a hand-holdable portable housing, the measurement circuitry being contained within the housing.

3. The device of claim 2, further comprising a user interface for controlling operation of the device provided on a face of the housing.

4. The device of claim 3, wherein the user interface comprises a display for providing information related to the verification test.

5. The device of claim 4, wherein the information comprises test results of the verification test on each wire of the bus.

~~6. The device of any of claims 4-5, wherein the information comprises an identification of the bus on which the verification test is being performed based on reading a pin configuration setting of the bus by the device.~~

~~7~~6. The device of ~~any of claims 1-2~~claim 1 or 2, further comprising a connector for connecting the measurement circuitry to a mobile computer device, the mobile computer device being configured for controlling operation of the device and storing results of the verification test of each wire of the bus.

~~8~~7. The device of ~~any of~~ claim~~s~~ 1~~,~~ or 2~~, or 7~~, wherein the verification test further comprises:

detecting a short circuit between the wire under test and another wire of the bus;

detecting a short circuit between the wire under test and a ground potential; and

indicating that the wire passed the verification test in response to not detecting the short circuit between the wire under test and the other wire of the bus and not detecting the short circuit between wire under test and the ground potential.

~~9~~8. The device of claim ~~8~~7, wherein detecting the short circuit between the wire under test and the other wire of the bus comprises:

connecting the wire under test to ground by the measurement circuitry;

connecting the other wire to a voltage source of the device by the measurement circuitry;

measuring a voltage across a sense resistor associated with the wire under test by the measurement circuitry; and

comparing the measured voltage to an expected voltage for the wire by the measurement circuitry, the short circuit being detected in response to the measured voltage not corresponding substantially to the expected voltage.

~~10~~9. The device of claim ~~8~~7, wherein detecting the short circuit between the wire under test and the ground potential comprises:

connecting a ground of an airplane including the bus to a ground of the device by the measurement circuitry;

removing any connections to other wires of the bus by the measurement circuitry;

connecting the wire under test to a voltage source of the device by the measurement circuitry;

measuring a voltage across a sense resistor associated with the wire under test by the measurement circuitry; and

comparing the measured voltage to an expected voltage for the wire by the measurement circuitry, wherein the short circuit is detected in response to the measured voltage not corresponding substantially to the expected voltage.

~~11~~10. A method for verifying wire integrity of a bus, comprising:

detecting connection to a bus connector, the bus connector being configured to connect a plurality of buses to an apparatus and each bus comprising a plurality of wires;

determining an identification of a particular bus from the plurality of buses or of a particular remote data connection from which the bus was removed by reading configuration pin settings of the bus connector;

automatically performing a verification test of each bus, the verification test of each bus comprising:

connecting a wire under test in a predetermined configuration relative to the other wire by measurement circuitry for performing the verification test;

measuring a value of an electrical parameter associated with the wire under test; and

comparing the value of the measured electrical parameter associated with the wire under test to an expected value of the electrical parameter, the wire under test passing the verification test in response to the measured value of the electrical parameter corresponding substantially to the expected value of the electrical parameter.

~~12. The method of claim 11, further comprising reading a configuration pin setting of the bus connector to determine an identification of the bus from the configuration pin setting.~~

~~13~~11. The method of ~~any of claims 11-12~~claim 10, wherein the verification test comprises:

detecting a short circuit between the wire under test and another wire of the bus;

detecting a short circuit between the wire under test and a ground potential; and

indicating that the wire passed the verification test in response to not detecting the short circuit between the wire under test and the other wire of the bus and not detecting the short circuit between wire under test and the ground potential.