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(54) **RTD MEASUREMENT DEVICE**

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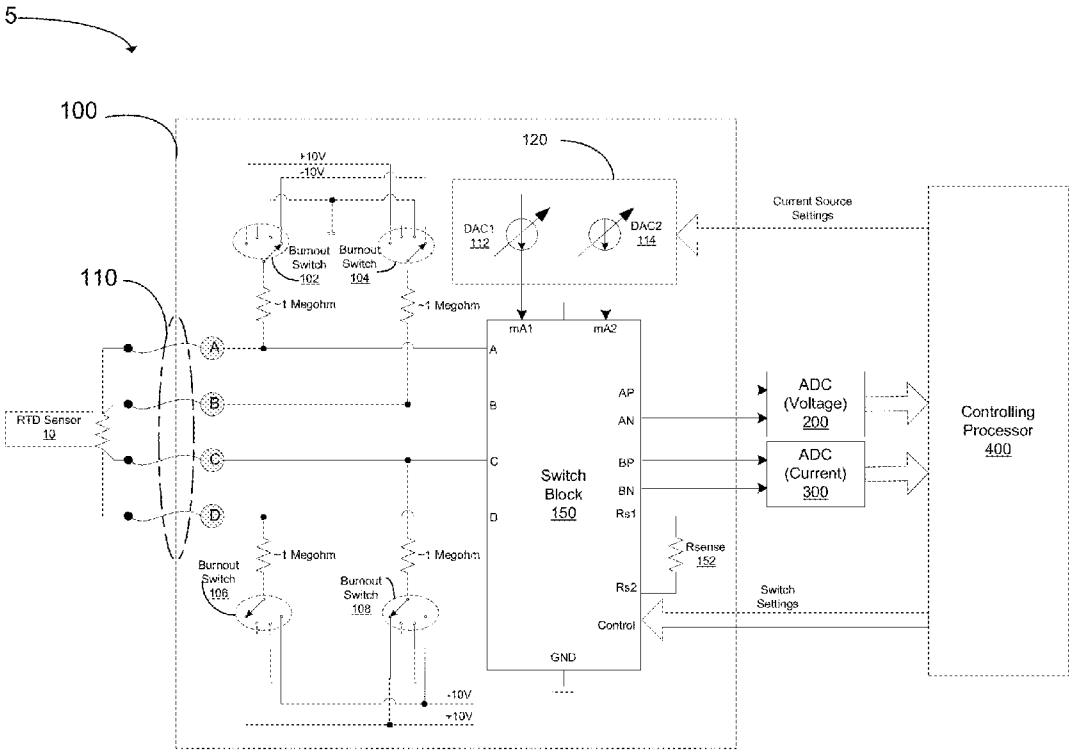
(57) **ABSTRACT**

Aspects of the invention provide for a resistance temperature device (RTD) measurement device. In one embodiment, aspects of the invention include a RTD measurement device that includes: an input including a plurality of terminals from an RTD sensor; a plurality of burnout switches, each burnout switch connected to a terminal of the RTD sensor; a plurality of resources; and a switch block connecting the plurality of terminals and the plurality of resources to determine a measurement of the RTD sensor.



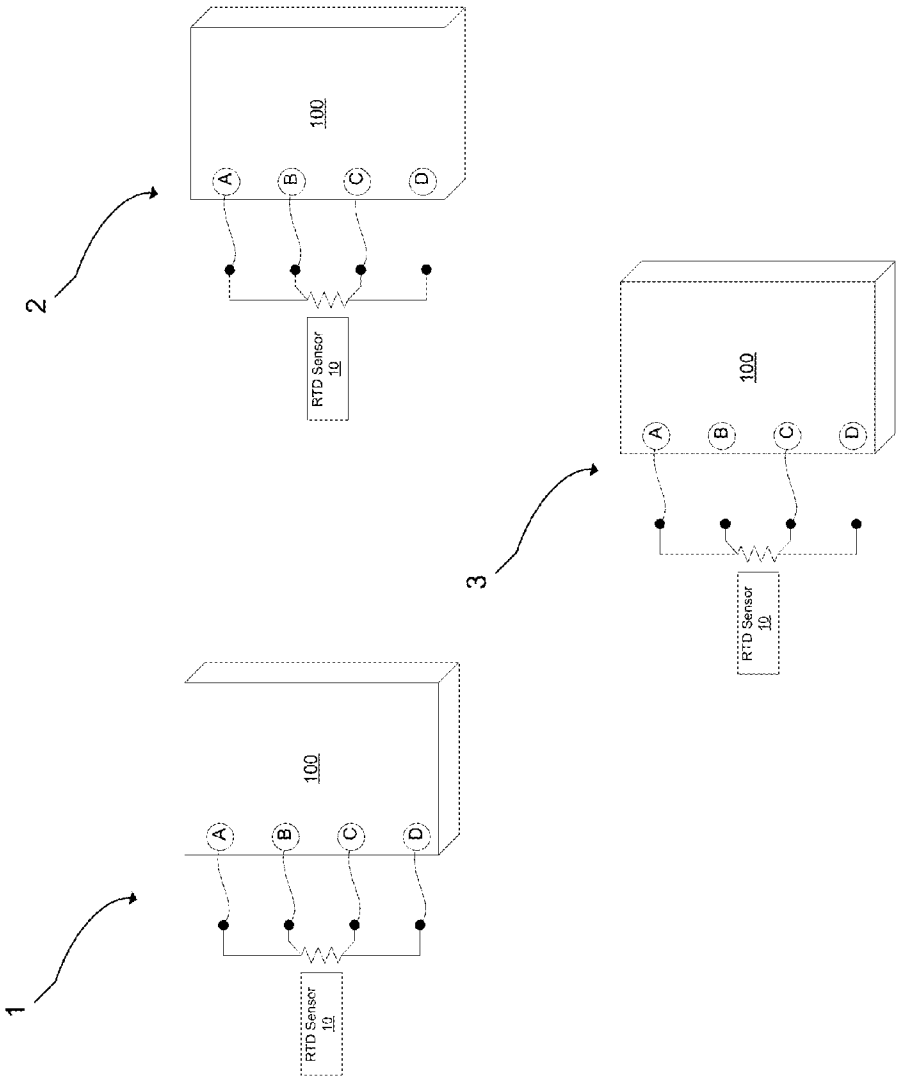


FIG. 1

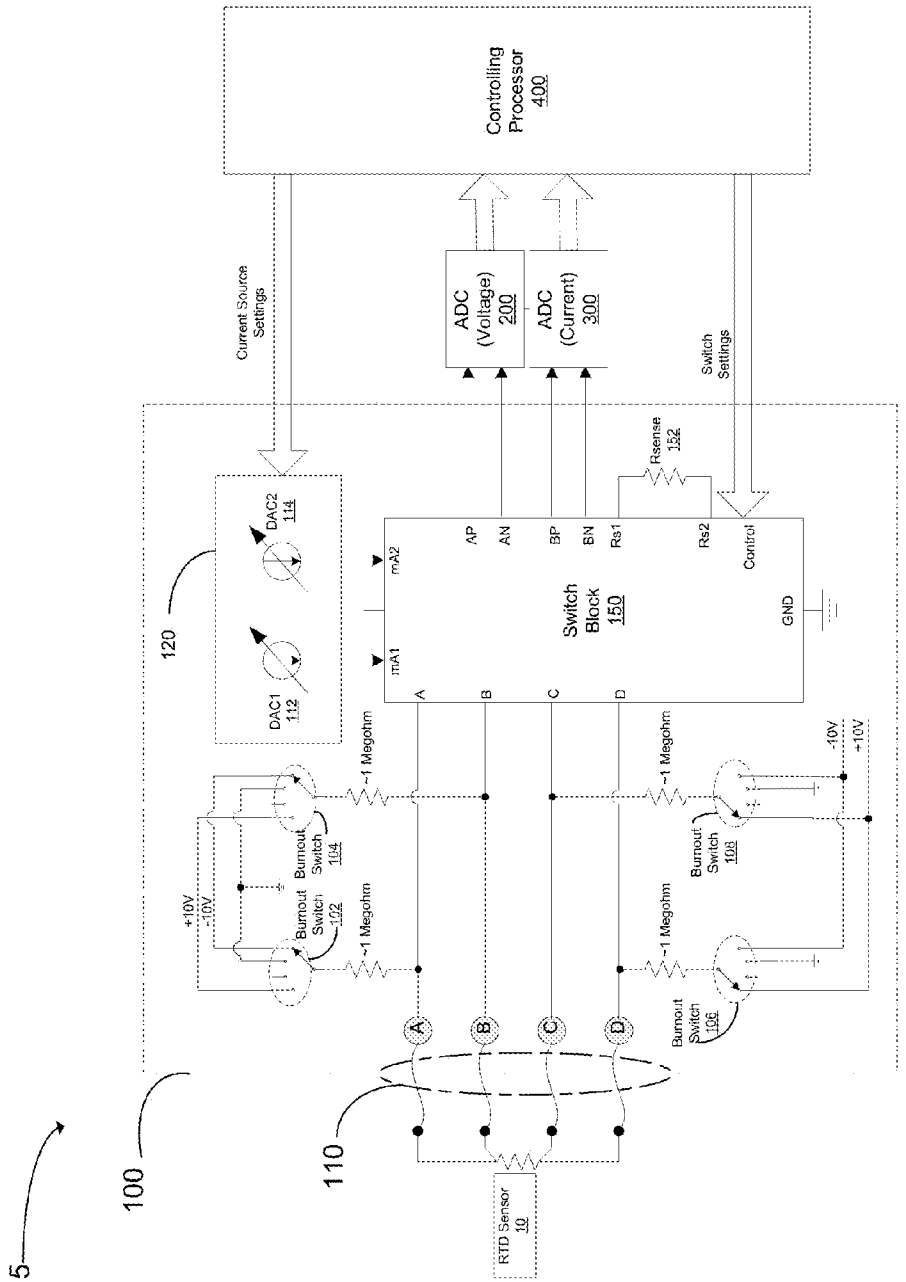

Controlling Processor 400
ADC (Voltage) 200
ADC (Current) 300
Current Source Settings
Switch Settings
Rsense 152
DAC2 114
DAC1 112
120
Switch Block 150
AP
AN
BP
BN
Rs1
Rs2
Control
GND
mA2
mA1
A
B
C
D
~1 Megohm
Burnout Switch 102
Burnout Switch 104
Burnout Switch 106
Burnout Switch 108
+10V
-10V
100
110
RTD Sensor 10
5

FIG. 2

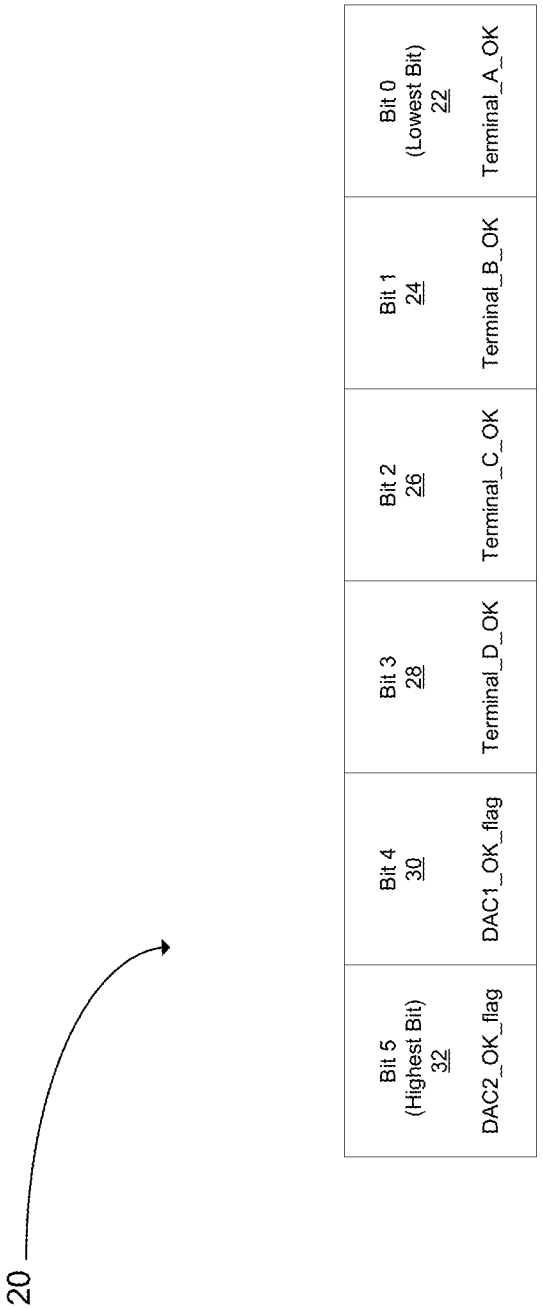

20
Bit 5
(Highest Bit)
32
Bit 4
30
Bit 3
28
Bit 2
26
Bit 1
24
Bit 0
(Lowest Bit)
22
DAC2_OK_flag
DAC1_OK_flag
Terminal_D_OK
Terminal_C_OK
Terminal_B_OK
Terminal_A_OK

FIG. 3

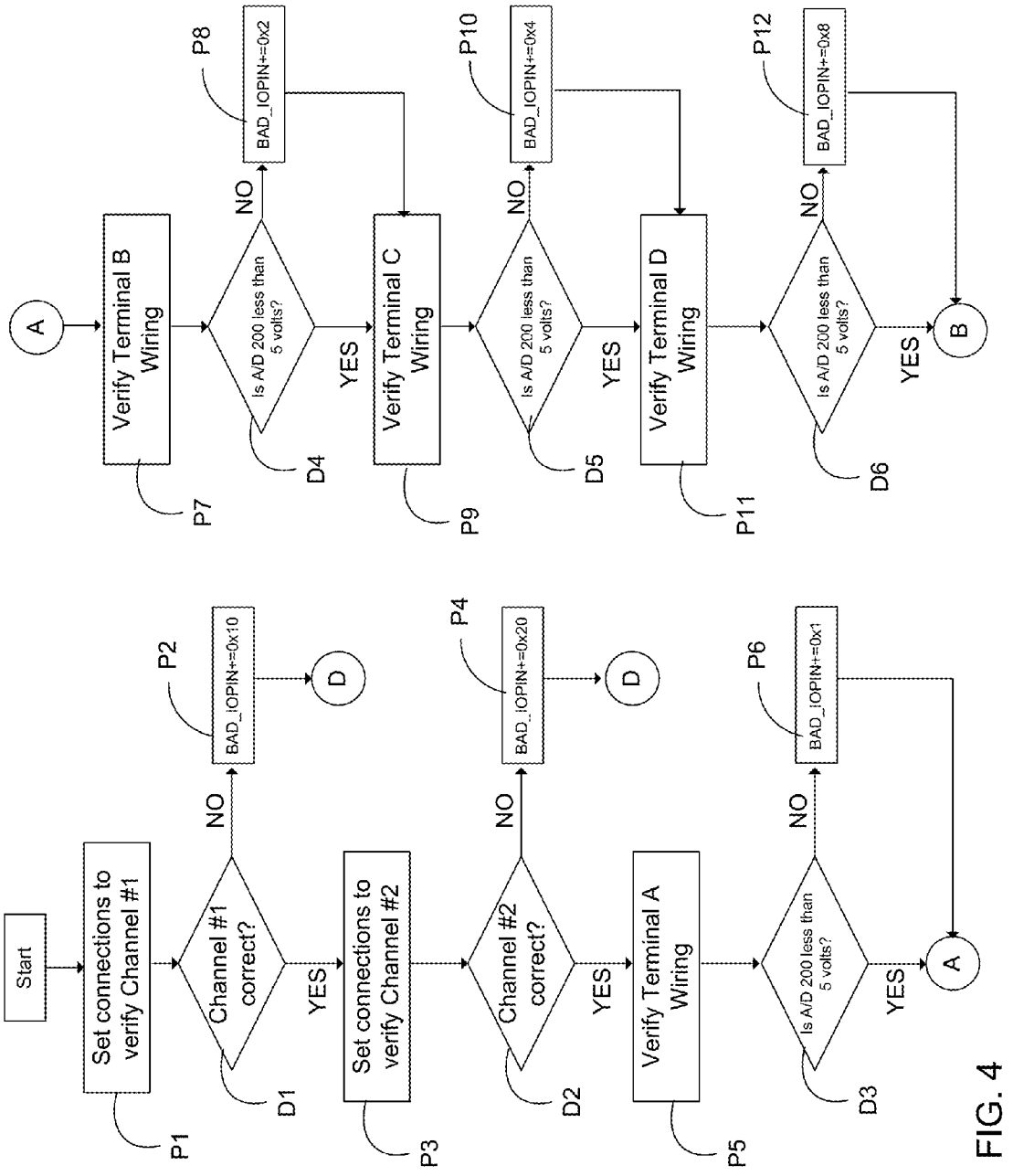

Start
Set connections to verify Channel #1
P1
Channel #1 correct?
D1
NO
BAD_iOPIN+=0x10
P2
D
YES
Set connections to verify Channel #2
P3
Channel #2 correct?
D2
NO
BAD_iOPIN+=0x20
P4
D
YES
Verify Terminal A Wiring
P5
Is A/D 200 less than 5 volts?
D3
NO
BAD_iOPIN+=0x1
P6
A
YES
A
Verify Terminal B Wiring
P7
Is A/D 200 less than 5 volts?
D4
NO
BAD_iOPIN+=0x2
P8
YES
Verify Terminal C Wiring
P9
Is A/D 200 less than 5 volts?
D5
NO
BAD_iOPIN+=0x4
P10
YES
Verify Terminal D Wiring
P11
Is A/D 200 less than 5 volts?
D6
NO
BAD_iOPIN+=0x8
P12
B
YES

FIG. 4

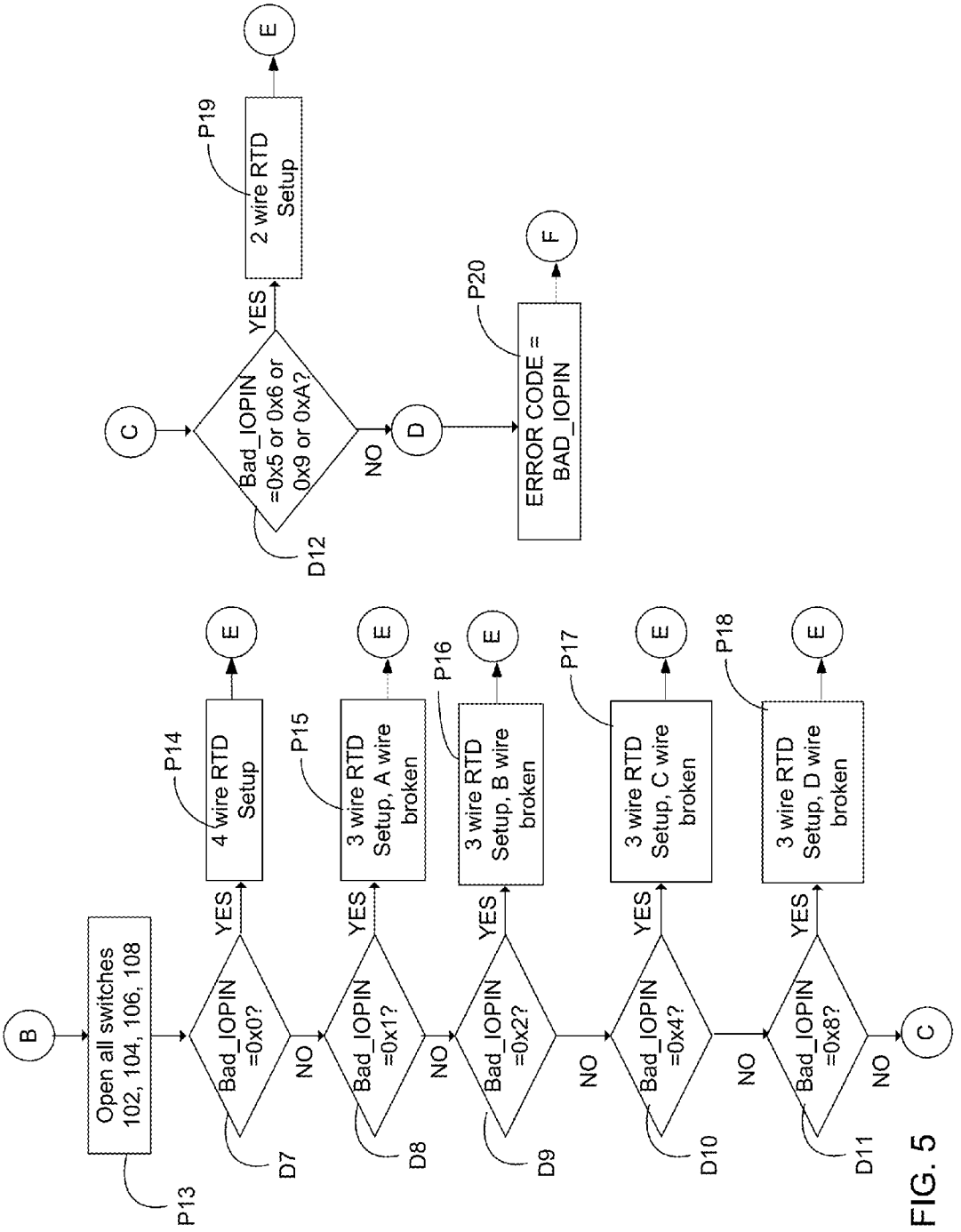

B
Open all switches 102, 104, 106, 108
P13
Bad_IOPIN =0x0?
D7
YES
4 wire RTD Setup
P14
E
NO
Bad_IOPIN =0x1?
D8
YES
3 wire RTD Setup, A wire broken
P15
E
NO
Bad_IOPIN =0x2?
D9
YES
3 wire RTD Setup, B wire broken
P16
E
NO
Bad_IOPIN =0x4?
D10
YES
3 wire RTD Setup, C wire broken
P17
E
NO
Bad_IOPIN =0x8?
D11
YES
3 wire RTD Setup, D wire broken
P18
E
NO
C
C
Bad_IOPIN =0x5 or 0x6 or 0x9 or 0xA?
D12
YES
2 wire RTD Setup
P19
E
NO
D
ERROR CODE = BAD_IOPIN
P20
F

FIG. 5

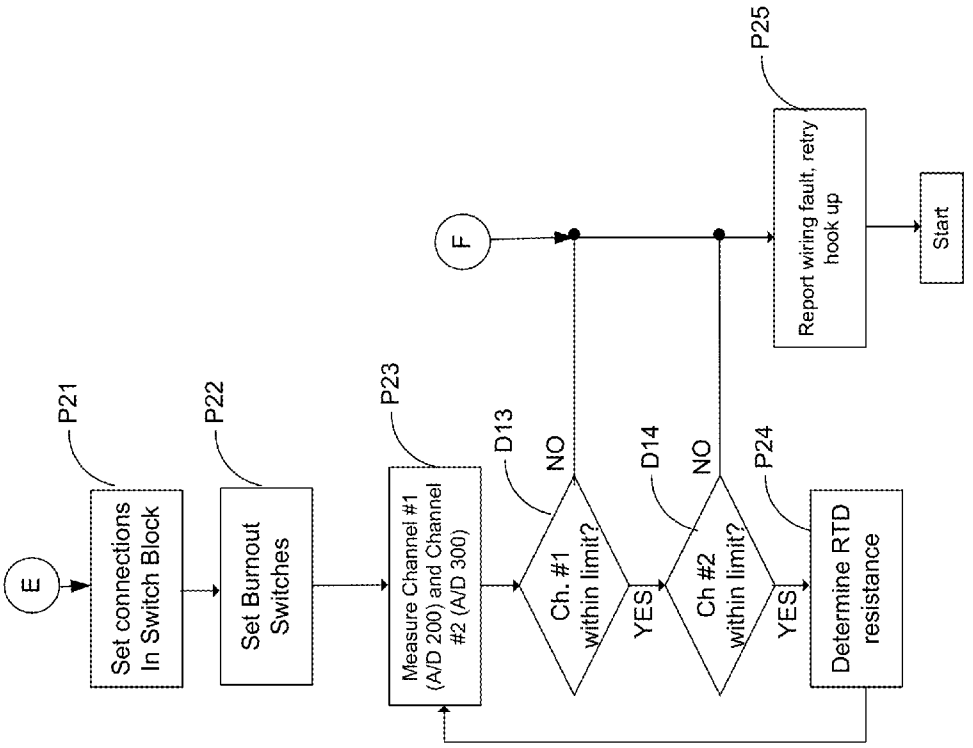

E
P21
Set connections In Switch Block
P22
Set Burnout Switches
P23
Measure Channel #1 (A/D 200) and Channel #2 (A/D 300)
D13
NO
Ch. #1 within limit?
YES
D14
NO
Ch #2 within limit?
YES
P24
Determine RTD resistance
F
P25
Report wiring fault, retry hook up
Start

FIG. 6

RTD MEASUREMENT DEVICE

BACKGROUND OF THE INVENTION

[0001] The subject matter disclosed herein relates generally to a resistance temperature device (RTD) measurement device. More particularly, the present disclosure related to a RTD measurement device including a switch block to determine wiring setup and wiring failures.

[0002] RTD sensors are temperature-sensing devices; therefore, the resistance of an RTD sensor increases with temperature. As seen in FIG. **1**, a typical RTD sensor **10** includes 4 wires that may connect to a RTD measurement device **100**. However, not all 4 wires are required to utilize the RTD sensor. A first configuration 1 shows a 4-wire configuration, where terminals A, B, C, and D of RTD measurement device **100** are connected to the RTD sensor **10**. In a second configuration 2, an exemplary S-wire configuration is shown. In this second configuration 2, only A, B, and C terminals of RTD measurement device **100** are shown as connected. However, it is understood that a 3-wire configuration may include A, B, and D connected; A, C, and D connected; or B, C, and D connected. In a third configuration 3, an exemplary 2-wire configuration is shown. In this third configuration 3, only A and C terminals of RTD measurement device **100** are shown as connected. However, it is understood that a 2-wire configuration may include A and D connected; B and D connected; or B and C connected. In other words, at least one terminal on either side of the RTD sensor **10** must be connected to the RTD measurement device in order to measure the resistance across RTD sensor **10**.

[0003] Regardless of the type of wiring configuration, at times, there may be poor connections on any of the terminals wires, which can lead to measurement errors.

BRIEF DESCRIPTION OF THE INVENTION

[0004] Aspects of the invention provide for a RTD measurement device. In one embodiment, aspects of the invention include a RTD measurement device that includes: an input including a plurality of terminals from an RTD sensor; a plurality of burnout switches, each burnout switch connected to a terminal of the RTD sensor; a plurality of resources; and a switch block connecting the plurality of terminals and the plurality of resources to determine a measurement of the RTD sensor.

[0005] A first aspect of the invention provides an apparatus, comprising: an RTD sensor; a processor; and an RTD measurement device coupled to the RTD sensor and configured to receive settings from the processor, wherein the RTD measurement device comprises: an input including a plurality of terminals from the RTD sensor; a plurality of burnout switches, each burnout switch connected to a terminal of the RTD sensor; a plurality of resources; and a switch block connecting the plurality of terminals and the plurality of resources to determine a measurement of the RTD sensor.

[0006] A second aspect of the invention provides a system, comprising: an RTD sensor; a processor; and an RTD measurement device coupled to the RTD sensor and configured to receive settings from the processor, wherein the RTD measurement device comprises: an input including a plurality of terminals from the RTD sensor; a plurality of burnout switches, each burnout switch connected to a terminal of the RTD sensor; a plurality of resources; and a switch block connecting the plurality of terminals and the plurality of resources to determine a measurement of the RTD sensor.

[0007] A third aspect of the invention provides a method of operating an RTD measurement device, the method comprising: determining a type of wiring setup for an RTD sensor coupled to the RTD measurement device, the determining including verifying a wiring for each terminal of the RTD sensor using a switch block connected to a plurality of resources; measuring a first channel of an output of the RTD measurement device; measuring a second channel of the output of the RTD measurement device; and determining resistance of the RTD sensor, based on the measurement of the first channel and the measurement of the second channel.

BRIEF DESCRIPTION OF THE DRAWINGS

[0008] These and other features of this invention will be more readily understood from the following detailed description of the various aspects of the invention taken in conjunction with the accompanying drawings that depict various embodiments of the invention, in which:

[0009] FIG. **1** shows a several wiring configurations between a RTD sensor and a RTD measurement device according to embodiments of the invention.

[0010] FIG. **2** shows a detailed schematic diagram of a system including a RTD sensor and a RTD measurement device according to embodiments of the invention.

[0011] FIG. **3** shows a record of data used by a RTD measurement device according to embodiments of the invention.

[0012] FIG. **4** shows a flow diagram of an operational methodology for a system according to embodiments of the invention.

[0013] FIG. **5** shows a flow diagram of an operational methodology for a system according to embodiments of the invention.

[0014] FIG. **6** shows a flow diagram of an operational methodology for a system according to embodiments of the invention.

[0015] It is noted that the drawings of the invention are not to scale. The drawings are intended to depict only typical aspects of the invention, and therefore should not be considered as limiting the scope of the invention. In the drawings, like numbering represents like elements between the drawings.

DETAILED DESCRIPTION OF THE INVENTION

[0016] Various embodiments of the present invention are directed to a RTD measurement device that determines a type of wiring configuration for a RTD sensor, and also determines if there are any poor connections. In the case that a poor connection exists, the RTD measurement device can reassign the wiring connections to continue to use the RTD sensor. In these embodiments, the RTD measurement device includes a switch block for determining if there are any poor connections and for reassigning the wiring connections. Technical effects associated with the various embodiments of the present invention allow for a single RTD measurement device to be used for any RTD sensor, regardless of wiring configuration, and also for determining poor connections in the wiring configurations and reassigning the wiring connections so that the RTD sensor can still be used.

[0017] Referring now to the drawings, FIG. **1** shows a detailed schematic diagram of a system **5** including a RTD sensor **10** and a RTD measurement device **100** according to

embodiments of the invention. Although all four wires of RTD sensor **10** are shown as connected to terminals A, B, C, and D of RTD measurement device **100**, it is understood that RTD sensor **10** may include any wiring configuration (i.e., 4-wire, 3-wire, or 2-wire configuration).

[0018] RTD measurement device **100** includes an input **110** including a plurality of terminals (terminal A, B, C, and D) from RTD sensor **10**. As mentioned above, with respect to FIG. **1**, it is understood that RTD sensor **100** may include any wiring configuration; however, at least one wire on each side of the resistor of RTD sensor **10** must be connected in order to measure the resistance of the RTD sensor **10**.

[0019] RTD measurement device **100** also includes a plurality of burnout switches **102**, **104**, **106**, **108** that are each connected to a terminal A, B, C, D of the RTD measurement device **100**. For example, burnout switch **102** is connected to terminal A; burnout switch **104** is connected to terminal B, burnout switch **106** is connected to terminal C; and burnout switch **108** is connected to terminal D. Between each switch **102**, **104**, **106**, **108** and the connected to the respective terminal A, B, C, D is a resistor that is approximately 1 Megaohm. Each burnout switch **102**, **104**, **106**, **108** is able to switch between four different connections: +10V, −10V, ground, or an open switch. As will be described herein, these burnout switches **102**, **104**, **106**, **108** are used to verify the wiring of the RTD sensor **10** in order to determine the wiring configuration of RTD sensor **10**, and to also detect faulty wiring in that wiring configuration or determine the resistance of the RTD sensor **10**.

[0020] RTD measurement device **100** also includes a plurality of resources **120**, such as current source DAC1 **112** and current source DAC2 **114**. RTD measurement device **100** further includes a switch block **150** that connects the plurality of terminals A, B, C, D and the plurality of resources **120** to determine a measurement of the RTD sensor **10**. Also shown in RTD measurement device **100** is a sensing resistor Rsense **152**.

[0021] As will be described in FIGS. **4-6**, current sources **112**, **114** receive current source settings from a controlling processor **400** and switch block **150** receives switch settings from controlling processor **400**. Switch settings indicate the proper connections for burnout switches **102**, **104**, **106**, **108** and also the proper connections within switch block **150**.

[0022] The output of RTD measurement device **100** is a first channel **200** (ADC Voltage) and a second channel **300** (ADC Current). This output is sent to the controlling processor **400** in order to determine the wiring configuration of the RTD sensor **10**, the resistance of RTD sensor **10**, and/or the existence of any faulty wiring between the RTD sensor **10** and the RTD measurement device **100**.

[0023] Turning now to FIG. **3**, a record of data **20** used by the RTD measurement device **100** according to embodiments of the invention is shown. The record of data **20**, as shown, includes 6 bits of data. The first bit **22** (i.e., "Bit **0**", the lowest bit) records if terminal A is connected to RTD sensor **10**. The second bit **24** ("Bit **1**") records if terminal B is connected to RTD sensor **10**. The third bit **26** ("Bit **2**") records if terminal C is connected to RTD sensor **10**. The fourth bit **28** ("Bit **3**") records if terminal D is connected to RTD sensor **10**. The fifth and sixth bit **30**, **32** ("Bit **4**" and "Bit **5**") record if the first channel **200** and the second channel **300**, respectively, are verified. As will be described later herein, this record of data **20** will be referred to herein as "BAD_IOPIN." It is understood that, at initialization (i.e. "Start"), this record of data **20** ("BAD_IOPIN") is set to no value ("BAD_IOPIN=0x0").

[0024] For exemplary purposes only, in the example described later herein, the command "BAD_IOPIN+=0x1" records an open connection between RTD sensor **10** and terminal A of the RTD measurement device **100**. That is, the first bit **22** of the record of data **20** is set to "1." The command "BAD_IOPIN+=0x2" records an open connection between RTD sensor **10** and terminal B of the RTD measurement device **100**. The second bit **24** of the record of data **20** is set to "1." The command "BAD_IOPIN+=0x4" records an open connection between RTD sensor **10** and terminal C of the RTD measurement device **100**. The third bit **26** of the record of data **20** is set to "1." The command "BAD_IOPIN+=0x8" records an open connection between RTD sensor **10** and terminal C. The fourth bit **30** of the record of data is set to "1." The command "BAD_IOPIN+=0x10" and "BAD_IOPIN+=0x20" record that the first channel **200** and the second channel **300** are not operating correctly. That is, the fifth bit **32** and the sixth bit **34** of the record of data are set to "1."

[0025] Turning now to FIGS. **4-6** and with regard to the system **5** shown in FIG. **3**, a flow diagram of an operational methodology for a system according to embodiments of the invention is shown. The description below of the operational methodology of operating RTD measurement device **100** is not limited by the specific values provided herein. It is understood that these values are for exemplary purposes only, and are not intended to limit the invention.

[0026] Initially, the first channel **200** and the second channel **300** of the output of the RTD measurement device **100** are verified. To verify the first channel **200** and second channel **300**, at process P1, connections are set to verify the first channel **200**. That is, controlling processor **400** generates current source settings for the current sources **112**, **114** and switch settings for the switch block, accordingly. For example, the first current source **112** (DAC1) will be set for 1 milliamp (mA). Within switch block **150**, the first current source **112** (DAC1) is connected to "Rs1" of sensing resistor **152** and "AP" for the first channel **200**. This connection provides the current from the first current source **112** (DAC1) to the sensing resistor **152**. Further, ground "GND" of switch block **150** is connected to "Rs2" of sensing resistor **152** and "AN" for the first channel **200**. This connection sends the current through the sensing resistor **152** to ground.

[0027] At D1, the output of the first channel **200** is verified to determine if it is the correct value, based on the current provided by the first current source **112** (DAC1) and the value of the sensing resistor **152**. If the output at the first channel **200** is not correct, "NO" at D1, the processor **400** sets, at P2, the record of data **20** accordingly ("BAD_IOPIN+=0x10"). At this point, processor **400** will generate an error code.

[0028] If the first channel **200** is correct, "YES" at D1, then connections are set to verify the second channel **300** (P3). At P3, to verify the second channel **300**, connects are set. For example, the second current source **114** (DAC2) is set to 2 mA. The second current source **114** (DAC2) is connected to "Rs1" of sensing resistor **152** and "BP" for the second channel **300**. Further, "GND" of switch block **150** is connected to "Rs2" of sensing resistor **152** and "BN" of second channel **300**. Similar to the connections set for the first channel **200**, these connections provide the current through sensing resistor **152** to ground.

[0029] At D2, the output of the second channel **300** is verified to determine if it is the correct value, based on the

current provided by the second current source **114** (DAC2) and the value of the sensing resistor **152**. If the output at the second channel **300** is not correct, "NO" at D2, the processor **400** sets, at P4, the record of data **20** accordingly ("BAD_IOPIN+=0x20"). At this point, processor **400** will generate an error code.

[0030] If the output at the second channel **300** is correct, "YES" at D2, the type of wiring setup/configuration for the RTD sensor **10** (4-wire, 3-wire with either terminal A, B, C, or D broken, or a 2-wire setup) is determined. In order to determine the type of wiring setup/configuration, the wiring for each terminal in the RTD measurement device **100** is verified. At P5, the wiring at terminal A is verified. In order to verify the wiring at terminal A, processor **400** sends switch settings to the switch block **150**. For example, to verify the wiring at terminal A, the switch settings will set the first burnout switch **102** to +10V and burnout switches **104**, **106**, **108** are set to −10V. In switch block **150**, terminal A is connected to "AP" and "GND" is connected to "AN." This connection checks terminal A with respect to ground. At D3, the output of the first channel **200** is checked to determine if terminal A is open (or is a broken wire). If terminal A is open or is a broken wire, the output at the first channel **200** should be close to +10V, and, at P6, the processor sets the record of data **20** accordingly ("BAD_IOPIN+=0x1"). However, if terminal A is properly connected to RTD sensor **10**, the output at the first channel **200** should be less than +10V. For example, the output at the first channel **200** should be less than 5V.

[0031] At P7, the wiring at terminal B is verified. Similar to the connections to verify the wiring at terminal A, the second burnout switch **104** (i.e., the burnout switch connected to the terminal being verified) is set to +10V, while the other burnout switches are set to −10V. The terminal being verified (terminal B) is connected to "AP," while "AN" is connected to "GND." At D4, the output at the first channel **200** is checked to determine if terminal B is properly connected (output at first channel **200** is less than, for example, 5V). If "NO," then at P8, the processor **400** sets the record of data **20** accordingly ("BAD_IOPIN+=0x2"). If "YES," then the wiring at terminal C is verified.

[0032] At P9, to verify the wiring at terminal C, burnout switch **106** is set to +10V, and burnout switches **102**, **104**, **108** are set to −10V. Terminal C is connected to "AP" and "AN" is connected to "GND." At D5, the output at the first channel **200** is checked to determine if terminal C is properly connected (e.g., the output at the first channel **200** is less than, for example, 5V). If "NO," then at P10, the processor **400** sets the record of data **20** accordingly ("BAD_IOPIN+=0x4"). If "YES," then the wiring at terminal D is verified.

[0033] At P11, to verify the wiring at terminal C, burnout switch **108** is set to +10V, and burnout switches **102**, **104**, **106** are set to −10V. Terminal D is connected "AP" and "AN" is connected to "GND." At D6, the output at the first channel **200** is checked to determine if terminal D is properly connected (e.g., the output at the first channel **200** is less than, for example, 5V). If "NO," then at P12, the processor **400** sets the record of data **20** accordingly ("BAD_IOPIN+=0x8"). At this point, all the terminals in the RTD measurement device **100** have been verified, and type of wiring for the RTD sensor **10** may be determined based on the record of data **20**.

[0034] At P13, all of the burnout switches **102**, **104**, **106**, **108** are opened. At D7, the processor **400** determines if the "BAD_IOPIN=0x0." If "YES," then, at P14, all four terminals (A,B,C,D) are properly connected and RTD sensor **10** is a 4-wire setup/configuration. If "NO," then the processor **400** determines at D8 if "BAD_IOPIN=0x1." If "YES," then, at P15, the processor **400** determines that RTD sensor **10** is a 3-wire RTD configuration with A terminal open. At D9, the processor **400** determines if "BAD_IOPIN=0x2." If "YES," then at P16, the processor **400** determines that RTD sensor **10** is a 3-wire RTD configuration with B terminal open. At D10, the processor **400** determines if "BAD_IOPIN=0x4." If "YES," then at P17, the processor **400** determines that RTD sensor **10** is a 3-wire RTD configuration with C terminal open. At D11, the processor **400** determines if "BAD_IOPIN=0x8." If "YES," then at P18, the processor **400** determines that RTD sensor **10** is a 3-wire RTD configuration with D terminal open.

[0035] At D12, the processor determines if "BAD_IOPIN=0x5 or 0x6 or 0x9 or 0xA." If "YES," then the processor determines that RTD sensor **10** is a proper 2-wire RTD configuration, with at least one terminal connected on either side of the resistor of RTD sensor **10**. "BAD_IOPIN=0x5" means that terminal A and terminal C are open (only terminal B and terminal D are properly connected). "BAD_IOPIN=0x6" means that terminal B and terminal C are open (terminal A and terminal D are properly connected). "BAD_IOPIN=0x9" means that terminal A and terminal D are open (terminal B and terminal C are properly connected). "BAD_IOPIN=0xA" means that terminal B and terminal D are open (terminal A and terminal C are properly connected).

[0036] However, if "NO" at D12, then the processor **400** generates an error code at P20 because RTD sensor **10** is not properly connected to the RTD measurement device **100**. At P25, a wiring fault is reported and the process may begin again.

[0037] Once the type of wiring for RTD sensor **10** is determined, the output of the RTD measurement device **10** at the first channel **200** and the second channel **300** are measured in order to determine the resistance of the RTD sensor. In order to measure the output at the first channel **200** and the second channel **300** properly, the processor **400** sends current source settings and switch settings to the current sources **112**, **114** and the switch block, respectively.

[0038] That is, at P21 and P22, the connections are set in the switch block and the burnout switches, based on the setting provided by the processor **400**. The connections are set such that currents from the first and second current sources **112**, **114** are routed through the resistance of the RTD sensor **10** while the first channel and second channel **200**,**300** are connected to measure the voltage and current for the resistance. There are sufficient switches within the switch block **150** to allow this routing to occur for the various combinations of connections, with FIG. **5** showing detection of six connection settings. Once connected, the processor begins the measurement loop, as described herein.

[0039] At P23, the output at the first channel and the second channel are measured. At D13, the processor **400** determines whether the output at first channel **200** is within the specified limit, and at D14, the processor determines whether the output at the second channel **300** is within the specified limit. If "YES," the resistance of the RTD sensor is determined based upon the output of the first channel **200** and the output of the second channel. The processor **400** will repeat the measurements of the first channel **200** and the second channel **300** to have a real-time value for the resistance of the RTD sensor **10**, until the output of either the first channel **200** or the second channel **300**, or both, are no longer within the specified limit.

At that point, at P25, processor **400** reports a wiring fault, and processor **400** will run through the process again to determine the proper wiring configuration.

[0040] The terminology used herein is for the purpose of describing particular embodiments only and is not intended to be limiting of the invention. As used herein, the singular forms "a", "an" and "the" are intended to include the plural forms as well, unless the context clearly indicates otherwise. It will be further understood that the terms "comprises" and/or "comprising," when used in this specification, specify the presence of stated features, integers, steps, operations, elements, and/or components, but do not preclude the presence or addition of one or more other features, integers, steps, operations, elements, components, and/or groups thereof.

[0041] This written description uses examples to disclose the invention, including the best mode, and also to enable any person skilled in the art to practice the invention, including making and using any devices or systems and performing any incorporated methods. The patentable scope of the invention is defined by the claims, and may include other examples that occur to those skilled in the art. Such other examples are intended to be within the scope of the claims if they have structural elements that do not differ from the literal language of the claims, or if they include equivalent structural elements with insubstantial differences from the literal languages of the claims.

What is claimed is:

1. A resistance temperature device (RTD) measurement device, comprising:
- an input including a plurality of terminals from an RTD sensor;
- a plurality of burnout switches, each burnout switch connected to a terminal of the RTD sensor;
- a plurality of resources; and
- a switch block connecting the plurality of terminals and the plurality of resources to determine a measurement of the RTD sensor.

2. The RTD measurement device of claim **1**, wherein the RTD sensor includes one of the following: a 4-wire sensor, a 3-wire sensor, and a 2-wire sensor.

3. The RTD measurement device of claim **2**, wherein, in response to a 4-wire sensor including a broken wire, the switch block is configured to connect the plurality of terminals and the plurality of resources, such that the RTD sensor operates as a 3-wire sensor.

4. The RTD measurement device of claim **2**, wherein, in response to a 3-wire sensor including a broken wire, the switch block is configured to connect the plurality of terminals and the plurality of resources, such that the RTD sensor operates as a 2-wire sensor.

5. The RTD measurement device of claim **1**, wherein the plurality of resources includes a pair of current sources.

6. The RTD measurement device of claim **5**, wherein the plurality of resources further includes a sensing resistor.

7. The RTD measurement device of claim **1**, further comprising an output including a first channel and a second channel, wherein the measurement of the RTD sensor is based on the output.

8. A system, comprising:
- a resistance temperature device (RTD) sensor;
- a processor; and
- an RTD measurement device coupled to the RTD sensor and configured to receive settings from the processor, wherein the RTD measurement device comprises:
  - an input including a plurality of terminals from the RTD sensor;
  - a plurality of burnout switches, each burnout switch connected to a terminal of the RTD sensor;
  - a plurality of resources; and
  - a switch block connecting the plurality of terminals and the plurality of resources to determine a measurement of the RTD sensor.

9. The system of claim **8**, wherein the RTD sensor includes one of the following: a 4-wire sensor, a 3-wire sensor, and a 2-wire sensor.

10. The system of claim **9**, wherein, in response to a 4-wire sensor including a broken wire, the switch block is configured to connect the plurality of terminals and the plurality of resources, such that the RTD sensor operates as a 3-wire sensor.

11. The system of claim **9**, wherein, in response to a 3-wire sensor including a broken wire, the switch block is configured to connect the plurality of terminals and the plurality of resources, such that the RTD sensor operates as a 2-wire sensor.

12. The system of claim **8**, wherein the plurality of resources includes a pair of current sources.

13. The system of claim **12**, wherein the plurality of resources further includes a sensing resistor.

14. The system of claim **8**, wherein the RTD measurement device further comprises an output including a first channel and a second channel, wherein the measurement of the RTD sensor is based on the output.

15. A method of operating a resistance temperature device (RTD) measurement device, the method comprising:
- determining a type of wiring setup for an RTD sensor coupled to the RTD measurement device, the determining including verifying a wiring for each terminal of the RTD sensor using a switch block connected to a plurality of resources;
- measuring a first channel of an output of the RTD measurement device;
- measuring a second channel of the output of the RTD measurement device; and
- determining resistance of the RTD sensor, based on the measurement of the first channel and the measurement of the second channel.

16. The method of claim **15**, further comprising determining if the measurement of the first channel is within a specified limit.

17. The method of claim **16**, further comprising determining if the measurement of the second channel is within a specified limit.

18. The method of claim **17**, wherein, in response to the measurement of the first channel outside the specified limit or the measurement of the second channel outside the specified limit, reporting an error.

19. The method of claim **15**, further comprising, prior to determining the type of wiring setup, verifying the first channel and the second channel of the output of the RTD measurement device.

20. The method of claim **15**, further comprising setting connections and switches in the RTD measurement device based on the type of wiring setup.

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