US 20130115803A1

(19) United States
(12) Patent Application Publication
Tang et al.

(10) Pub. No.: US 2013/0115803 A1
(43) Pub. Date: May 9, 2013

(54) **SYSTEM AND METHOD FOR PROVIDING A VISUAL INDICATOR FOR CABLES**

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(21) Appl. No.: **13/292,846**

(22) Filed: **Nov. 9, 2011**

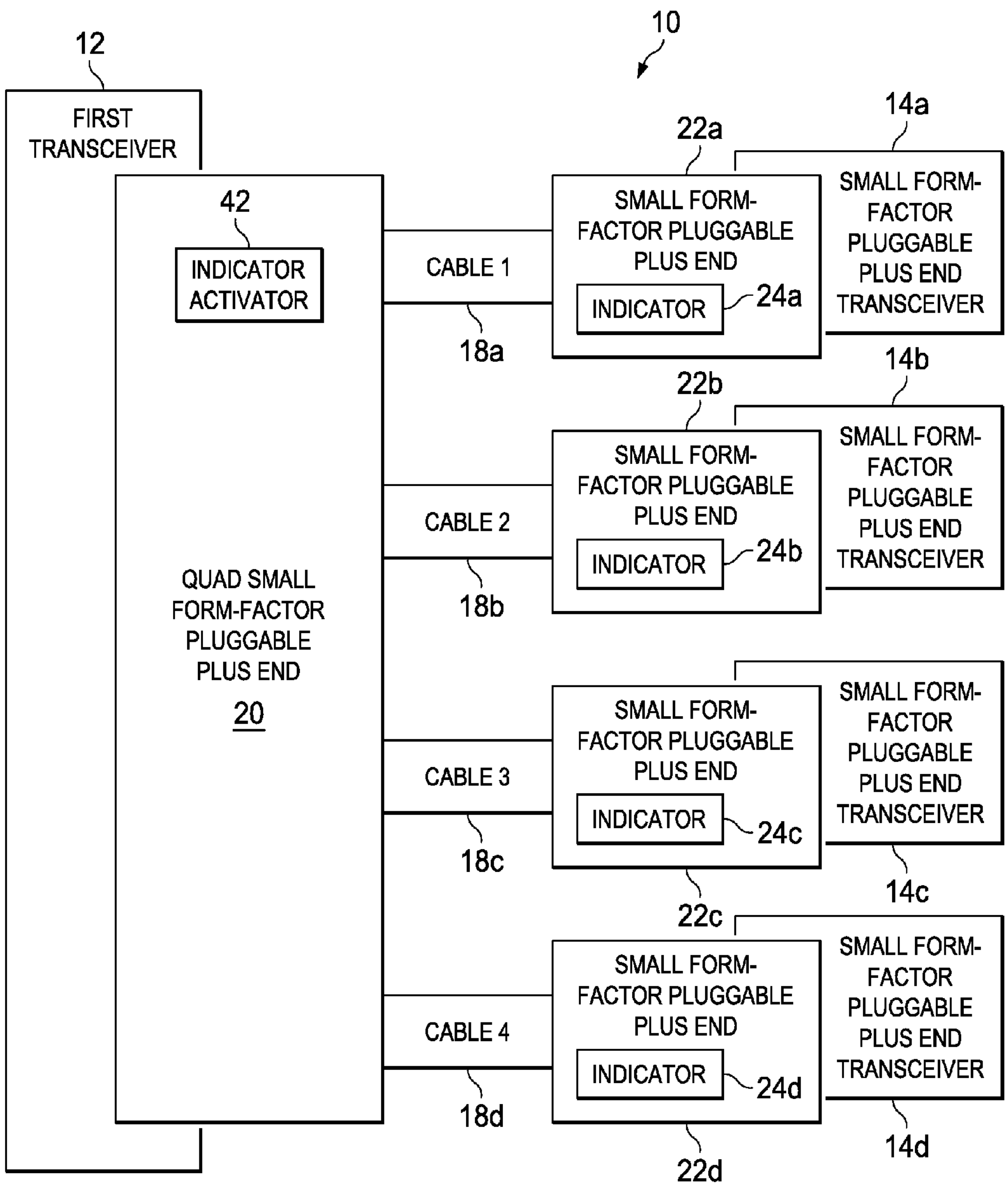
Publication Classification

(51) **Int. Cl.**
H01R 3/00 (2006.01)

(52) **U.S. Cl.**
USPC **439/488**

(57) **ABSTRACT**

A method is provided in one example and includes receiving a signal at an indicator activator provided on a first end of a data cable. The data cable comprises a second end that includes an indicator. The method also includes activating the indicator such that at least a portion of the data cable is illuminated. In more particular embodiments, the indicator activator is a switch, and the signal causes the switch to close such that a current is provided to the indicator.



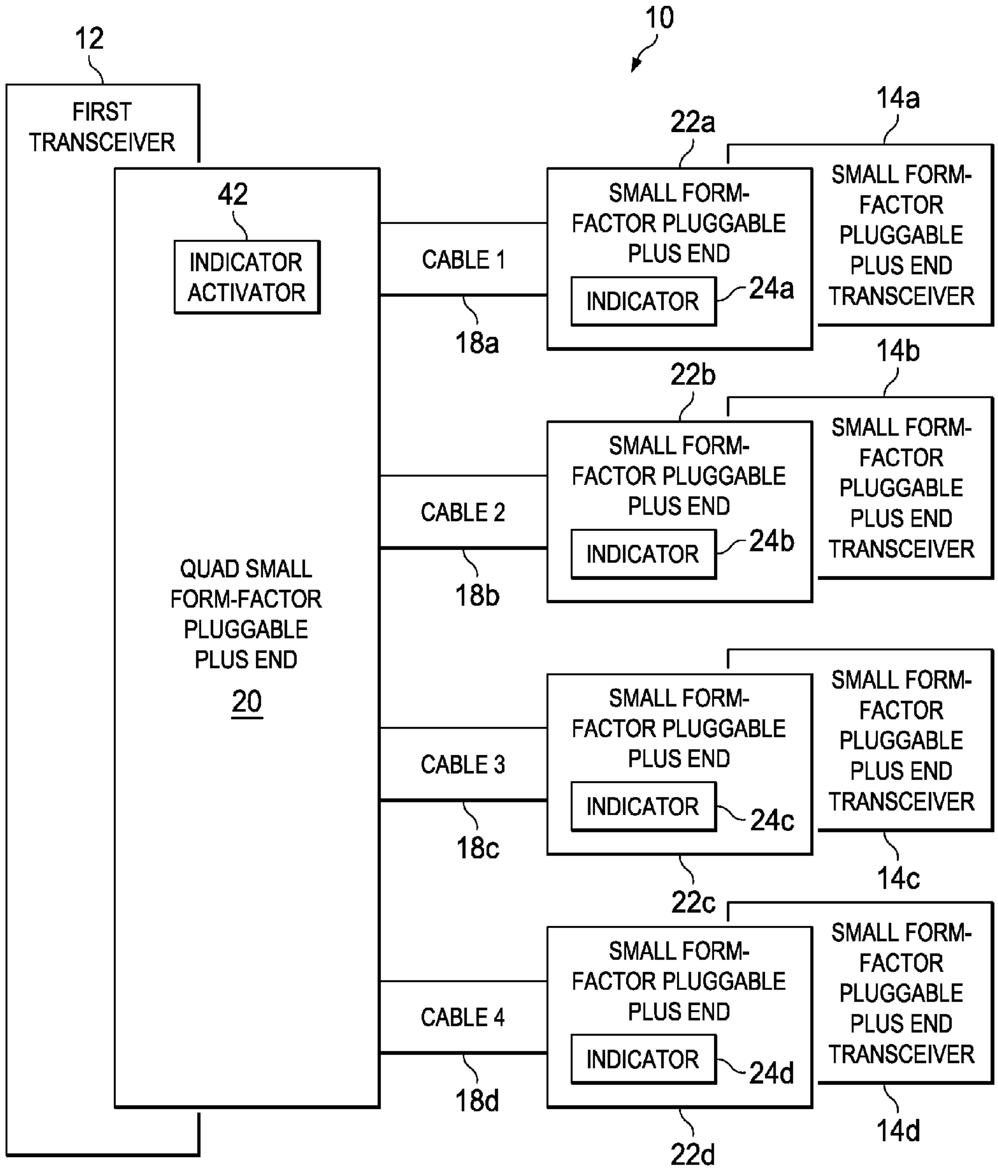

10
12
FIRST TRANSCEIVER
42
INDICATOR ACTIVATOR
QUAD SMALL FORM-FACTOR PLUGGABLE PLUS END
20
CABLE 1
18a
CABLE 2
18b
CABLE 3
18c
CABLE 4
18d
22a
SMALL FORM-FACTOR PLUGGABLE PLUS END
INDICATOR
24a
14a
SMALL FORM-FACTOR PLUGGABLE PLUS END TRANSCEIVER
22b
SMALL FORM-FACTOR PLUGGABLE PLUS END
INDICATOR
24b
14b
SMALL FORM-FACTOR PLUGGABLE PLUS END TRANSCEIVER
SMALL FORM-FACTOR PLUGGABLE PLUS END
INDICATOR
24c
22c
SMALL FORM-FACTOR PLUGGABLE PLUS END TRANSCEIVER
14c
SMALL FORM-FACTOR PLUGGABLE PLUS END
INDICATOR
24d
22d
SMALL FORM-FACTOR PLUGGABLE PLUS END TRANSCEIVER
14d

FIG. 1A

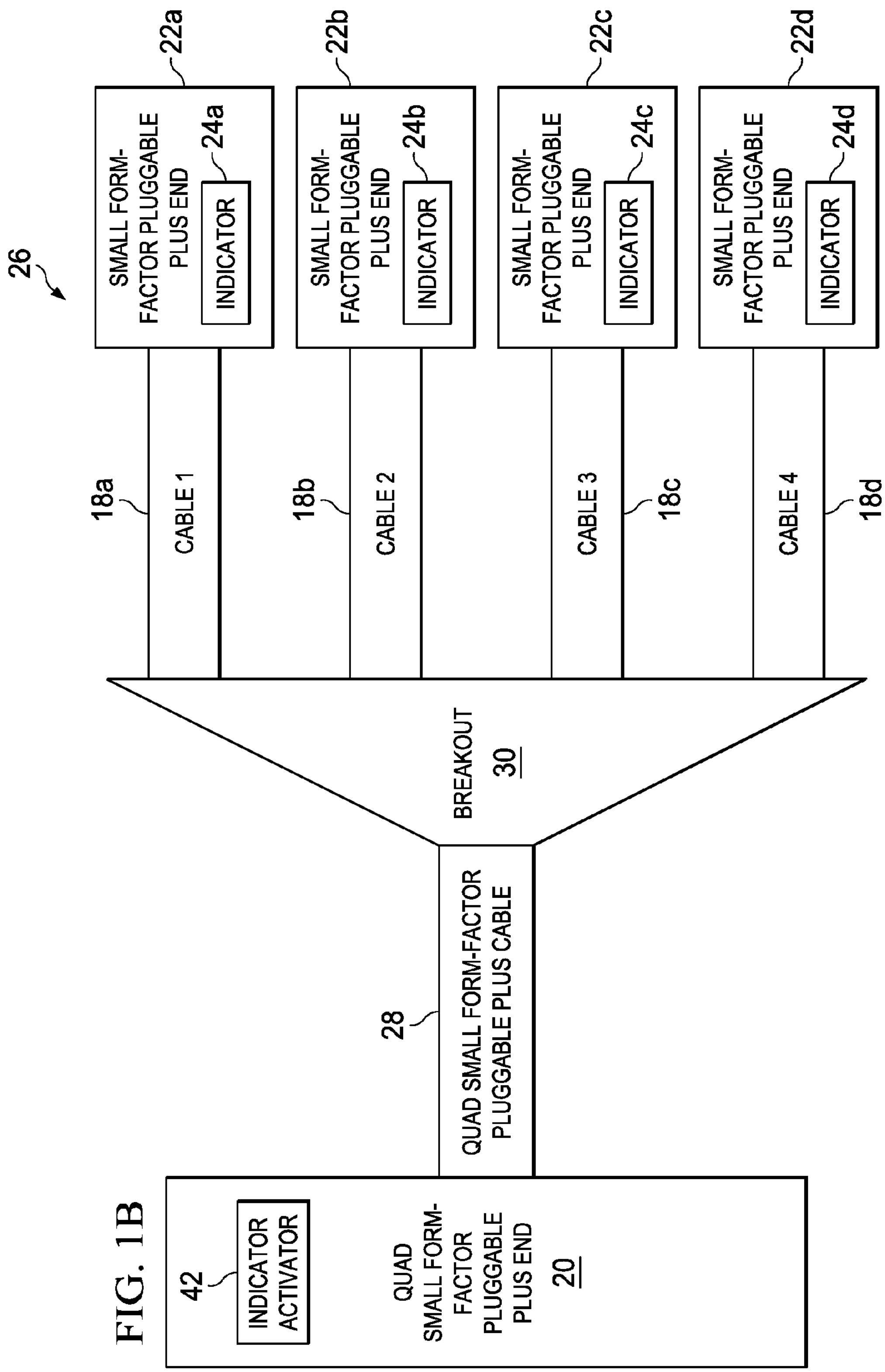

26
22a
SMALL FORM-FACTOR PLUGGABLE PLUS END
24a
INDICATOR
22b
SMALL FORM-FACTOR PLUGGABLE PLUS END
24b
INDICATOR
22c
SMALL FORM-FACTOR PLUGGABLE PLUS END
24c
INDICATOR
22d
SMALL FORM-FACTOR PLUGGABLE PLUS END
24d
INDICATOR
18a
CABLE 1
18b
CABLE 2
CABLE 3
18c
CABLE 4
18d
BREAKOUT
30
28
QUAD SMALL FORM-FACTOR PLUGGABLE PLUS CABLE
42
INDICATOR ACTIVATOR
QUAD SMALL FORM-FACTOR PLUGGABLE PLUS END
20

FIG. 1B

FIG. 2

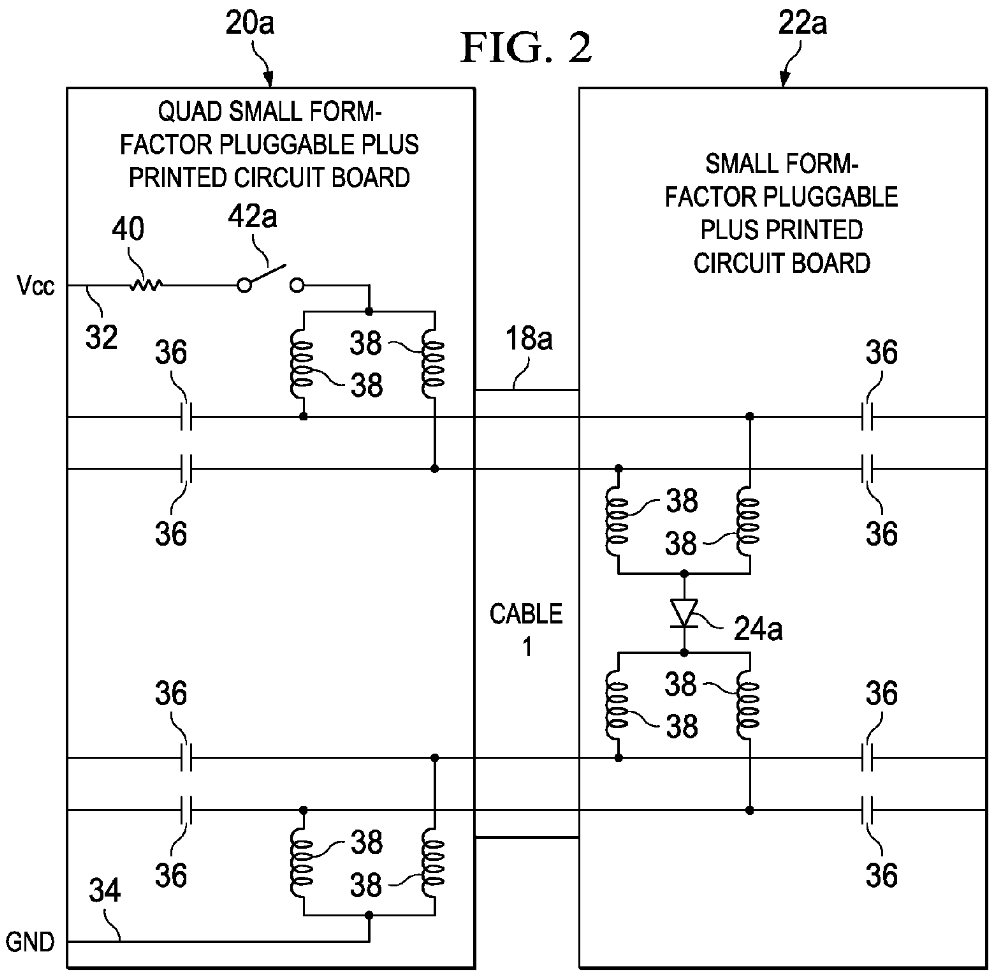
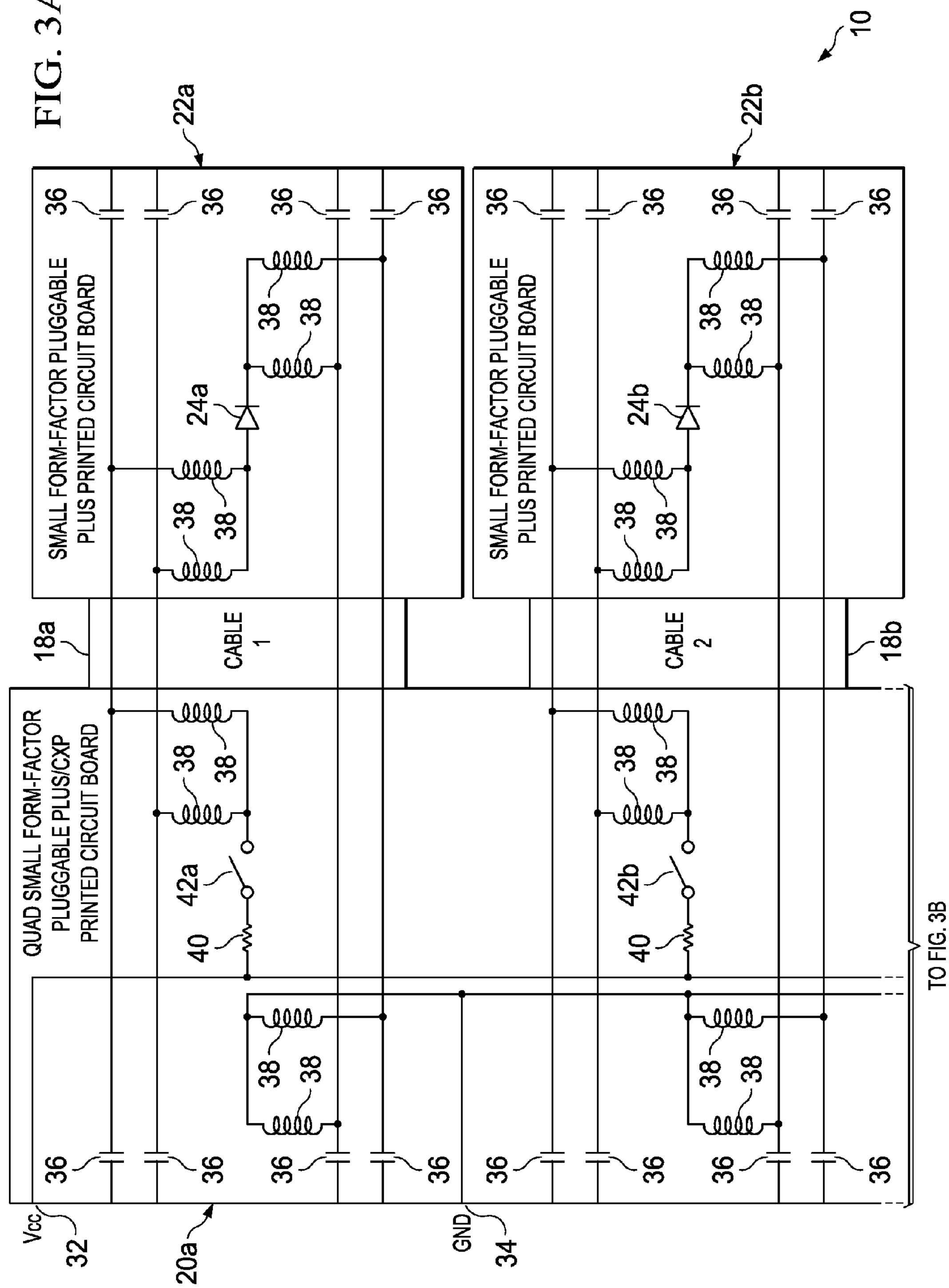
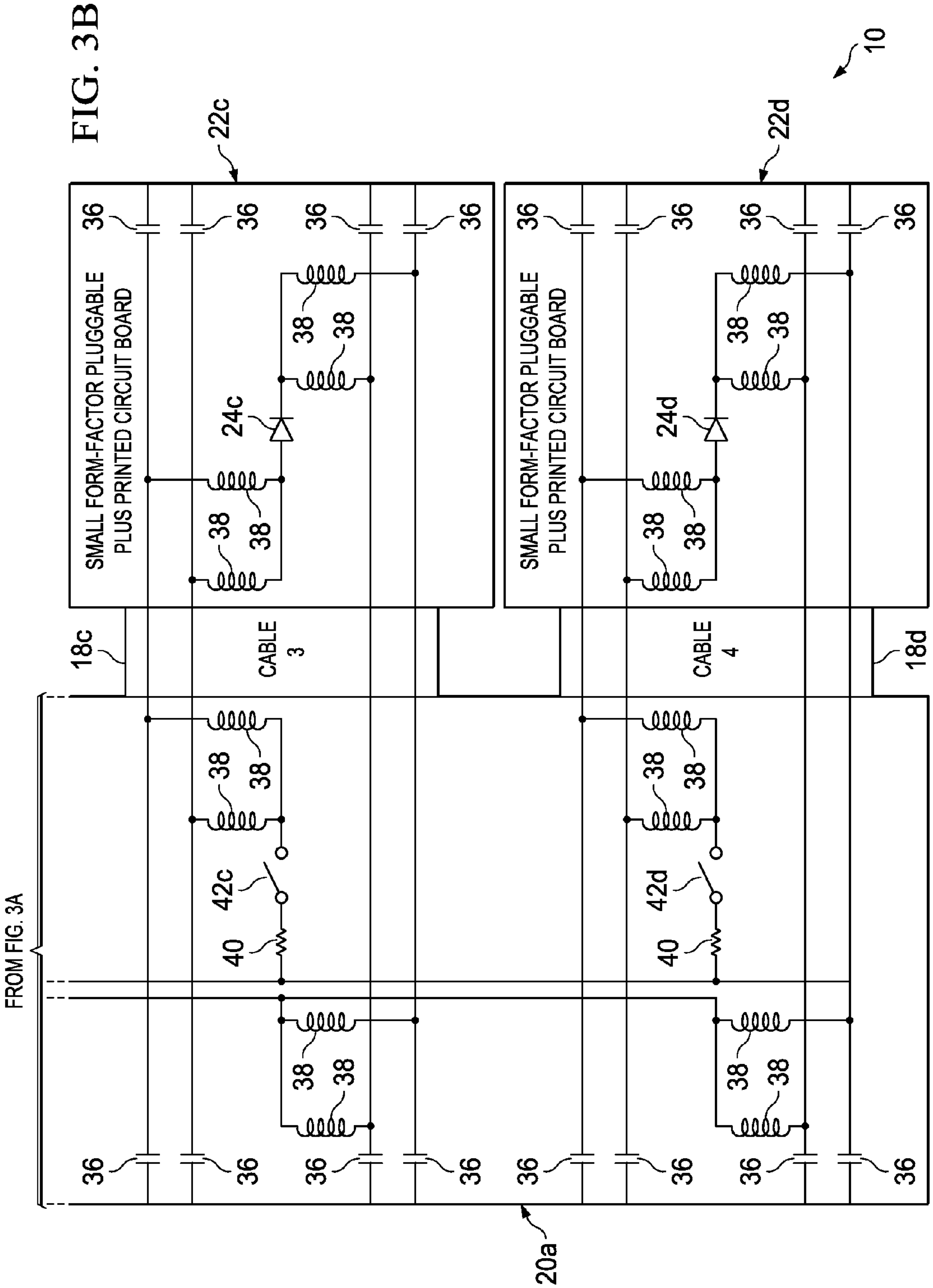

20a
22a
QUAD SMALL FORM-FACTOR PLUGGABLE PLUS PRINTED CIRCUIT BOARD
SMALL FORM-FACTOR PLUGGABLE PLUS PRINTED CIRCUIT BOARD
40
42a
Vcc
32
36
38
18a
CABLE 1
24a
34
GND

FIG. 3A


10
22a
22b
SMALL FORM-FACTOR PLUGGABLE PLUS PRINTED CIRCUIT BOARD
SMALL FORM-FACTOR PLUGGABLE PLUS PRINTED CIRCUIT BOARD
36
38
24a
24b
18a
18b
CABLE 1
CABLE 2
QUAD SMALL FORM-FACTOR PLUGGABLE PLUS/CXP PRINTED CIRCUIT BOARD
42a
42b
40
TO FIG. 3B
Vcc
32
20a
GND
34



10
22c
22d
SMALL FORM-FACTOR PLUGGABLE PLUS PRINTED CIRCUIT BOARD
SMALL FORM-FACTOR PLUGGABLE PLUS PRINTED CIRCUIT BOARD
36
38
24c
24d
18c
18d
CABLE 3
CABLE 4
FROM FIG. 3A
42c
42d
40
20a

FIG. 3B

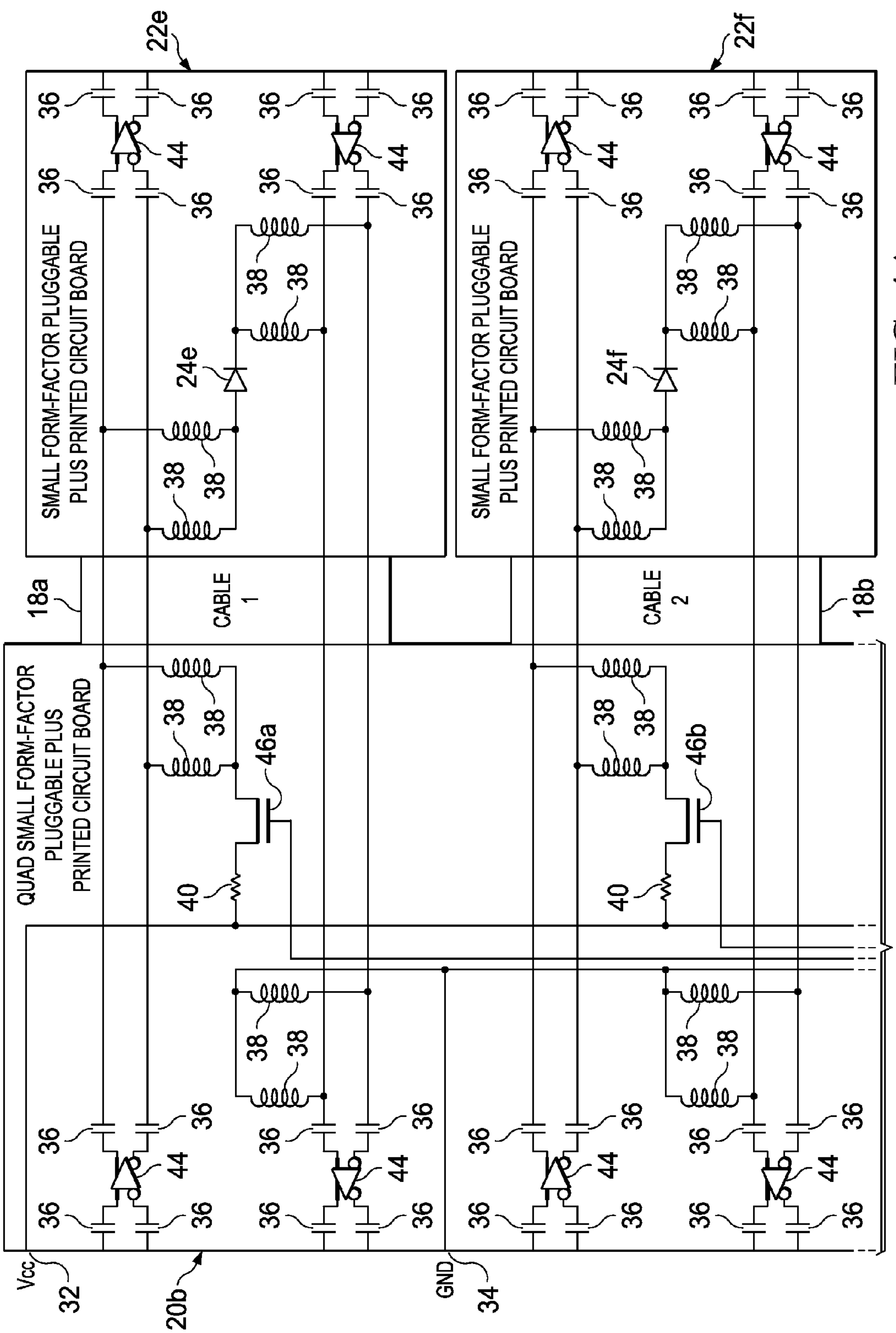

SMALL FORM-FACTOR PLUGGABLE PLUS PRINTED CIRCUIT BOARD
SMALL FORM-FACTOR PLUGGABLE PLUS PRINTED CIRCUIT BOARD
QUAD SMALL FORM-FACTOR PLUGGABLE PLUS PRINTED CIRCUIT BOARD
CABLE 1
CABLE 2
TO FIG. 3B
Vcc
GND
22e
22f
24e
24f
18a
18b
20b
32
34
36
38
40
44
46a
46b

FIG. 4A

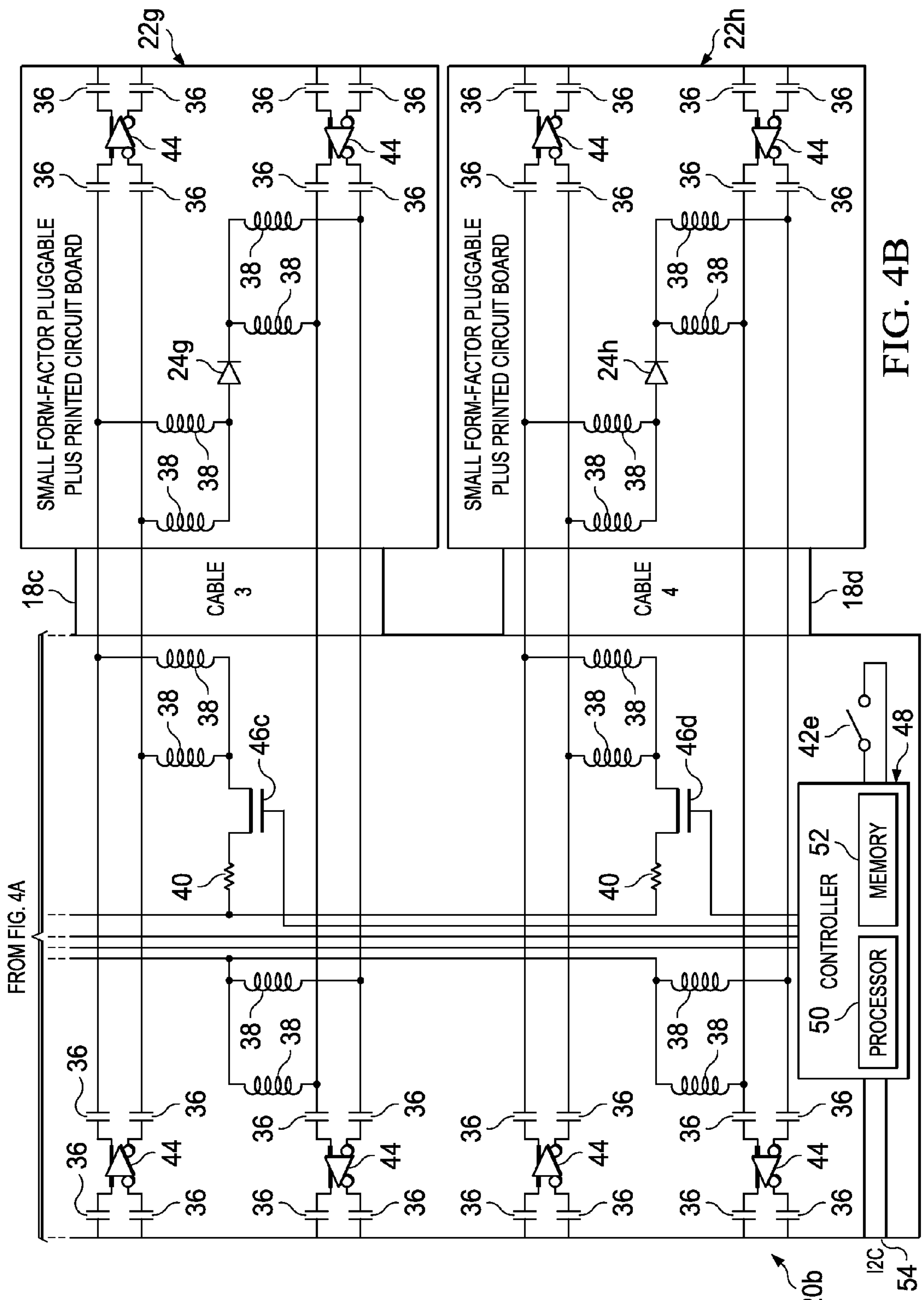

22g
22h
SMALL FORM-FACTOR PLUGGABLE PLUS PRINTED CIRCUIT BOARD
SMALL FORM-FACTOR PLUGGABLE PLUS PRINTED CIRCUIT BOARD
36
44
38
24g
24h
18c
18d
CABLE 3
CABLE 4
FROM FIG. 4A
40
46c
46d
42e
48
52
50
CONTROLLER
PROCESSOR
MEMORY
20b
I2C
54

FIG. 4B

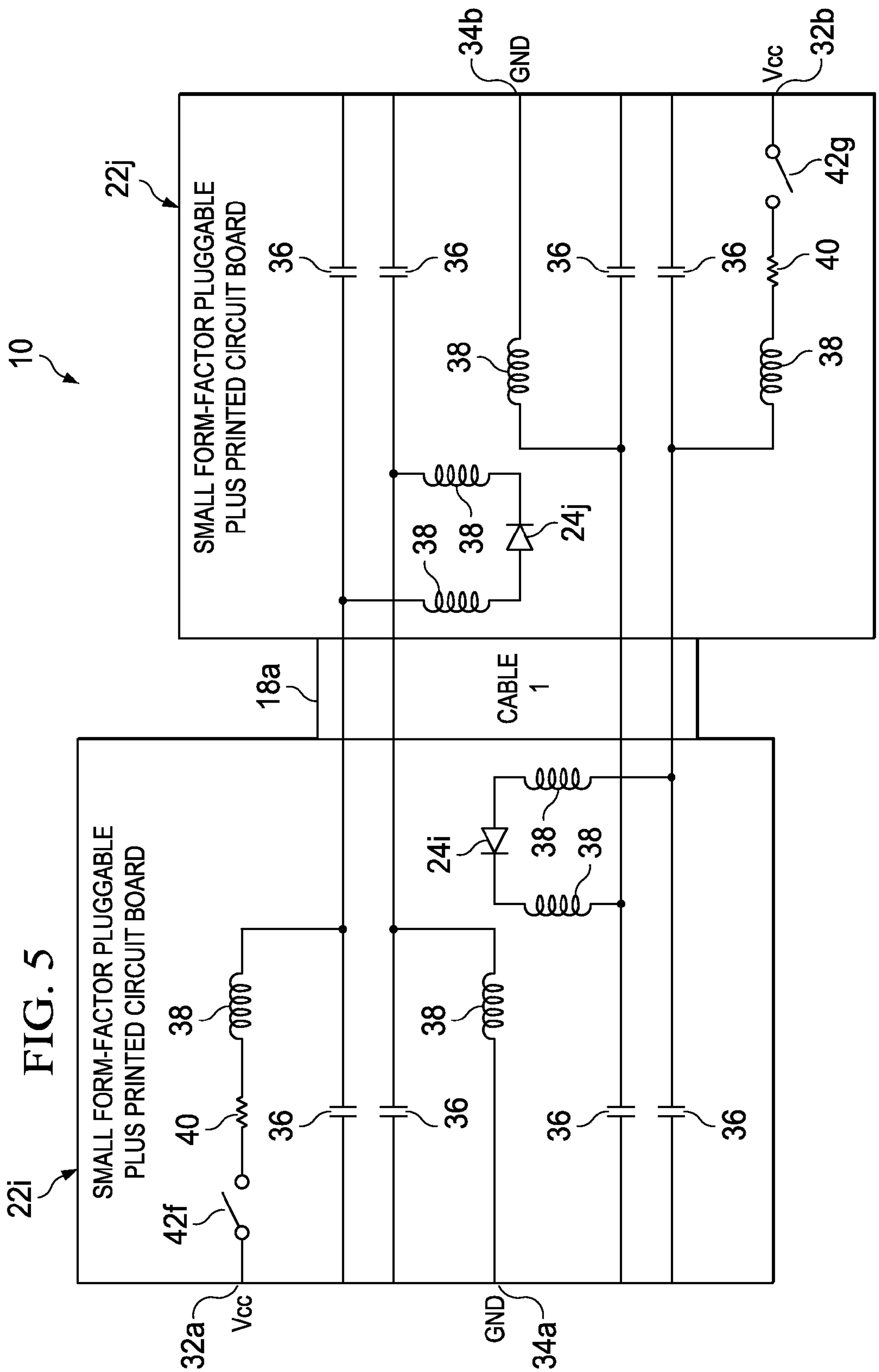

10
22j
SMALL FORM-FACTOR PLUGGABLE PLUS PRINTED CIRCUIT BOARD
34b
GND
Vcc
32b
42g
36
40
38
24j
18a
CABLE 1
22i
SMALL FORM-FACTOR PLUGGABLE PLUS PRINTED CIRCUIT BOARD
42f
24i
32a
34a

FIG. 5

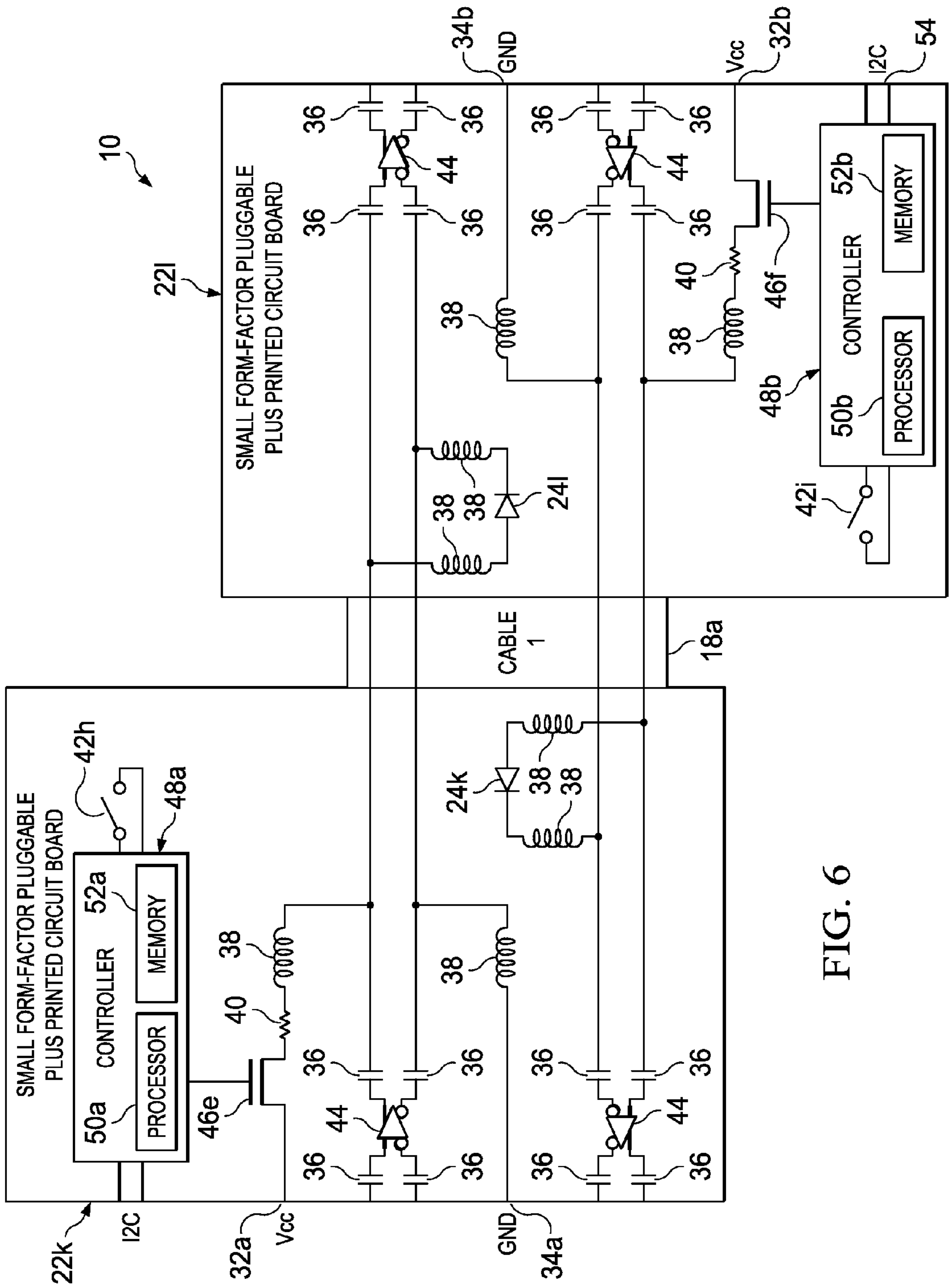

10
22l
SMALL FORM-FACTOR PLUGGABLE PLUS PRINTED CIRCUIT BOARD
34b
GND
Vcc
32b
I2C
54
36
44
38
40
46f
24l
42i
48b
50b
PROCESSOR
CONTROLLER
52b
MEMORY
CABLE 1
18a
22k
SMALL FORM-FACTOR PLUGGABLE PLUS PRINTED CIRCUIT BOARD
42h
48a
50a
PROCESSOR
CONTROLLER
52a
MEMORY
46e
24k
I2C
32a
Vcc
GND
34a

FIG. 6

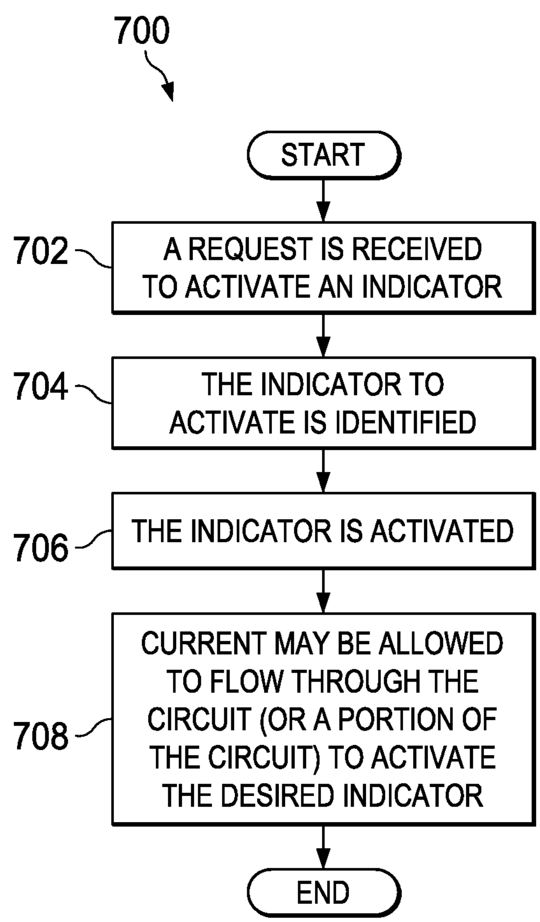

700
START
702
A REQUEST IS RECEIVED TO ACTIVATE AN INDICATOR
704
THE INDICATOR TO ACTIVATE IS IDENTIFIED
706
THE INDICATOR IS ACTIVATED
708
CURRENT MAY BE ALLOWED TO FLOW THROUGH THE CIRCUIT (OR A PORTION OF THE CIRCUIT) TO ACTIVATE THE DESIRED INDICATOR
END

FIG. 7

SYSTEM AND METHOD FOR PROVIDING A VISUAL INDICATOR FOR CABLES

TECHNICAL FIELD

[0001] This disclosure relates in general to the field of communications and, more particularly, to providing a visual indicator for cables.

BACKGROUND

[0002] Networking architectures have grown increasingly complex in communication environments. The routing and management of sessions and data flows often requires multiple pieces of computer hardware (e.g., server, router, switch, storage, etc.). The computer hardware is typically stored in a server rack, chassis, or tower server. The rack may include multiple mounting slots (sometimes referred to as bays) that are designed to hold a hardware unit securely in place. Each piece of hardware should be connected to another piece of hardware, which is typically done with high-speed cables. For systems with multiple pieces of hardware, the amount of cable used in the system can create a tangled mess of cable. The tangling issue can create a problem when the end point of each cable cannot be readily identified because of the difficultly in tracing individual cables through the nested cable jumble.

BRIEF DESCRIPTION OF THE DRAWINGS

[0003] To provide a more complete understanding of the present disclosure and features and advantages thereof, reference is made to the following description, taken in conjunction with the accompanying figures, wherein like reference numerals represent like parts, in which:

[0004] FIG. **1**A is a simplified block diagram of an example data cable;

[0005] FIG. **1**B is a simplified block diagram of an example octopus data cable;

[0006] FIG. **2** is a simplified schematic diagram illustrating possible example details associated with the data cable;

[0007] FIG. **3**A is another simplified schematic diagram illustrating possible example details associated with the data cable;

[0008] FIG. **3**B is another simplified schematic diagram illustrating possible example details associated with the data cable;

[0009] FIG. **4**A is another simplified schematic diagram illustrating possible example details associated with the data cable;

[0010] FIG. **4**B is another simplified schematic diagram illustrating possible example details associated with the data cable;

[0011] FIG. **5** is another simplified schematic diagram illustrating possible example details associated with the data cable;

[0012] FIG. **6** is another simplified schematic diagram illustrating possible example details associated with the data cable; and

[0013] FIG. **7** is a simplified flowchart illustrating potential operations associated with the data cable.

DETAILED DESCRIPTION OF EXAMPLE EMBODIMENTS

Overview

[0014] A method is provided in one example and includes receiving a signal at an indicator activator provided on a first end of a data cable. The data cable comprises a second end that includes an indicator. The method also includes activating the indicator such that at least a portion of the data cable is illuminated (e.g., the second end of the data cable is illuminated, the indicator itself is illuminated, some other portion of the data cable is illuminated, etc.). In more particular embodiments, the indicator activator is a switch, and the signal causes the switch to close such that a current is provided to the indicator. In specific instances, the indicator is a light emitting diode (LED).

[0015] In more detailed instances, the first end is a small form-factor pluggable plus (SFP+) end, the second end is a SFP+ end, and the cable is a twinaxial copper cable. In addition, the first end can be a quad small form-factor pluggable (QSFP) end, and the second end can include at least four small form-factor pluggable plus (SFP+) ends. The method can also include activating a selected one of a plurality of indicator activators on the first end, where each of the plurality of indicator activators corresponds to a unique indicator on the four SFP+ ends. In certain implementations, the selected indicator activator is activated, each of the four SFP+ ends are illuminated at a different blinking rate. In addition, activating the indicator can cause portions of the data cable to be illuminated at different illumination intensities.

Example Embodiments

[0016] Turning to FIG. **1**A, FIG. **1**A is a simplified block diagram illustrating one example implementation of a data cable **10** in accordance with one embodiment of the present disclosure. Data cable **10** can be configured to allow connectivity options for a data center, enterprise wiring closet, service provider transport applications, or any other suitable application. In specific instances, data cable **10** can allow ten (10) Gigabit Ethernet connectivity options for an associated system. In another example instance, data cable **10** is a twinaxial cable. In yet another embodiment, data cable **10** may be a small form-factor pluggable plus (SFP+)/quad small form-factor pluggable (QSFP) twinaxial copper cable.

[0017] FIG. **1**A includes a first transceiver **12** and a set of SFP+ end transceivers **14***a-d*. SFP+ end transceivers **14***a-d* may be one transceiver, four separate transceivers, or any combination of one or more transceivers associated with any one or more other transceivers. First transceiver **12** and SFP+ end transceivers **14***a-d* can operate as both a transmitter and a receiver. Data cable **10** may include a QSFP end **20**, a first cable **18***a*, a second cable **18***b*, a third cable **18***c*, a fourth cable **18***d*, a first SFP+ end **22***a*, a second SFP+ end **22***b*, a third SFP+ end **22***c*, and a fourth SFP+ end **22***d*. First SFP+ end **22***a* may include a first SFP+ indicator **24***a*, second SFP+ end **22***b* may include a second SFP+ indicator **24***b*, third SFP+ end **22***c* may include a third SFP+ indicator **24***c*, and fourth SFP+ end **22***d* may include a fourth SFP+ indicator **24***d*. QSFP end **20** may include an indicator activator **42**.

[0018] QSFP end **20** is configured to integrate four (4) transmit and four (4) receive channels (e.g., first cable **18***a*, second cable **18***b*, third cable **18***c*, and fourth cable **18***d*) and can also support a variety of 10 Gigabit Ethernet connectivity options (e.g., 10G Ethernet, Fiber Channel, etc.) with different data rate options. First cable **18***a* may extend from QSFP end **20** to first SFP+ end **22***a*. Second cable **18***b* may extend from QSFP end **20** to second SFP+ end **22***b*. Third cable **18***c* may extend from QSFP end **20** to third SFP+ end **22***c*. Fourth cable **18***d* may extend from QSFP end **20** to fourth SFP+ end **22***d*.

[0019] When QSFP end **20** is connected to first transceiver **12** and first SFP+ end **22***a*, second SFP+ end **22***b*, third SFP+ end **22***c*, and fourth SFP+ end **22***d* are connected to SFP+ end transceivers **14***a-d* respectively. First transceiver **12** and SFP+ end transceivers **14***a-d* can communicate with each other using first cable **18***a*, second cable **18***b*, third cable **18***c*, and fourth cable **18***d*. If QSFP end **20** is connected to first transceiver **12** and only first SFP+ end **22***a* is connected to SFP+ end transceiver **14***a*, second SFP+ end **22***b* is connected to SFP+ end transceiver **14***b*, third SFP+ end **22***c* is connected to SFP+ end transceiver **14***c*, and/or fourth SFP+ end **22***d* is connected to SFP+ end transceiver **14***d* (or any combination of a SFP+ end being connected to a SFP+ end transceiver), then first transceiver **12** and SFP+ end transceivers **14***a-d* can communicate with each other only using a cable associated with a connected SFP+ end. For example, if only first SFP+ end **22***a* is connected to SFP+ end transceivers **14***a* (and QSFP end **20** is connected to first transceiver **12**), then first transceiver **12** and SFP+ end transceiver **14***a* can communicate with each other only using first cable **18***a*. Because second SFP+ end **22***b*, third SFP+ end **22***c*, and fourth SFP+ end **22***d* are not connected to SFP+ end transceivers **14***b-d*, first transceiver **12** cannot communicate with SFP+ end transceivers **14***b-d* using second cable **18***b*, third cable **18***c*, or fourth cable **18***d*.

[0020] First SFP+ indicator **24***a*, second SFP+ indicator **24***b*, third SFP+ indicator **24***c*, and fourth SFP+ indicator **24***d* are configured to provide an indication that may allow a user to identify first SFP+ end **22***a*, second SFP+ end **22***b*, third SFP+ end **22***c*, and fourth SFP+ end **22***d* respectively. For example, first SFP+ indicator **24***a*, second SFP+ indicator **24***b*, third SFP+ indicator **24***c*, and fourth SFP+ indicator **24***d* may each be a light emitting diode (LED). Each indicator may be activated individually or as a group. For example, first SFP+ indicator **24***a* may blink fast then slow to identify first SFP+ end **22***a*, second SFP+ indicator **24***b* may blink fast, fast, then slow to identify second SFP+ end **22***b*, third SFP+ indicator **24***c* may blink fast, fast, fast, then slow to identify third SFP+ end **22***c*, and fourth SFP+ indicator **24***d* may blink fast, fast, fast, fast, then slow to identify fourth SFP+ end **22***d*.

[0021] In other embodiments, each indicator may have a unique color (e.g., first SFP+ indicator **24***a* may be red, second SFP+ indicator **24***b* may be yellow, etc.), have a unique number of indicators (e.g., first SFP+ indicator **24***a* may have one LED, second SFP+ indicator **24***b* may have two LEDs, etc.), have a unique shape, have a unique blinking rate, have a unique illumination intensity, or any other differentiation quality that would help identify a specific SFP+ end. Power for first SFP+ indicator **24***a*, second SFP+ indicator **24***b*, third SFP+ indicator **24***c*, and fourth SFP+ indicator **24***d* can be supplied from first transceiver **12** when QSFP end **20** is connected to first transceiver **12** (i.e., current flows from first transceiver **12**, across QSFP end **20**, over first cable **18***a*, second cable **18***b*, third cable **18***c*, and fourth cable **18***d*, to first SFP+ indicator **24***a*, second SFP+ indicator **24***b*, third SFP+ indicator **24***c*, and fourth SFP+ indicator **24***d* respectively). In one particular instance, first transceiver **12** and SFP+ end transceivers **14***a*-d can be associated with an enterprise or data center deployment that has short (or limited) reach interconnections.

[0022] Turning to FIG. **1**B, FIG. **1**B is a simplified block diagram illustrating one example implementation of an octopus cable **26**. Octopus cable **26** is somewhat similar in form and function to data cable **10**, except octopus cable **26** may offer different features, as detailed below. In a general sense, octopus cable **26** is a cable that is spliced into several branches. Octopus cable **26** may include a connector on one end and multiple connectors on the other, as is illustrated in FIG. **1**B.

[0023] In this particular example implementation, octopus cable **26** may include QSFP end **20**, a QSFP cable **28**, a breakout **30**, first cable **18***a*, second cable **18***b*, third cable **18***c*, fourth cable **18***d*, first SFP+ end **22***a*, second SFP+ end **22***b*, third SFP+ end **22***c*, and fourth SFP+ end **22***d*. First SFP+ end **22***a* may include first SFP+ indicator **24***a*, second SFP+ end **22***b* may include second SFP+ indicator **24***b*, third SFP+ end **22***c* may include third SFP+ indicator **24***c*, and fourth SFP+ end **22***d* may include fourth SFP+ indicator **24***d*. QSFP end **20** may include an indicator activator **42**. Breakout **30** separates QSFP cable **28** into first cable **18***a*, second cable **18***b*, third cable **18***c*, and fourth cable **18***d*. Alternatively, breakout **30** joins first cable **18***a*, second cable **18***b*, third cable **18***c*, and fourth cable **18***d* into QSFP cable **28**. Octopus cable **26** is configured to integrate four (4) transmit and four (4) receive channels and can support a variety of 10 Gigabit Ethernet connectivity options (e.g., 10G Ethernet, Fiber Channel, etc.) with different data rate options.

[0024] For purposes of illustrating certain example techniques of data cable **10** and octopus cable **28**, the following foundational information may be viewed as a basis from which the present disclosure may be properly explained. As networks become larger with growing port density, the demand for acceptable cable management becomes apparent. This issue is even more prominent when attempting to identify a particular cable (e.g., in the context of troubleshooting, repairing a system, testing, etc.). For example, one of the solutions to increase faceplate density is to utilize a data cable or an octopus cable, such as a quad small form-factor pluggable to four small form-factor pluggable plus (QSFP to 4×SFP+) or an active CXP to twelve SFP+ end (CXP to 12×SFP+), (i.e., to fan-out the 40G (QSFP) or 120G (CXP) port to N×10G ports). If multiple cables are employed, there is a challenge in identifying the proper SFP+ end and its associated QSFP end. The challenge becomes even more difficult when multiple data cables (or octopus cables) are haphazardly bundled. Making this problem even more pejorative, labels on each cable may not be visible, obstructed from view, or simply inaccurate.

[0025] In accordance with one example implementation of the present disclosure, data cable **10** and octopus cable **26** can resolve the aforementioned issues associated with identifying specific ends. More specifically, data cable **10** and octopus cable **26** may include an indicator (e.g., a visual indicator, an audible indicator, a vibrational indicator, etc.) that is integrated into the QSFP or SFP+ end cable assemblies. The indicator can allow a user (i.e., installer, operator, etc.) to identify the correct SFP+ ends via the indicator (e.g., LED visual indicator). The indicator may become active with a press of a button or activation of a switch (i.e., indicator activator **42**) on QSFP end **20**. Once the indicator is active, a specific SFP+ end may be easily located such that the correct SFP+ end can be selected in a crowed cabling environment.

[0026] For example, a specific SFP+ end of data cable **10** or octopus cable **26** (e.g., QSFP-CR**4** and CXP-CR**12**) or a remote end of a straight SFP+ end cable assembly (CR**1**) may be identified via a visual LED indicator. In an example embodiment, data cable **10** or octopus cable **26** may be passive and have four (4) independent switches in indicator activator **42** to control a respective indicator (e.g., first SFP+ indicator **24***a*) on a SFP+ end side (e.g., first SFP+ **22***a*). Only the near-end QSFP/CXP assembly would need to be plugged into the cage to provide power to the far-end SFP+ indicator. Upon activation of one of the four (4) independent switches, a corresponding indicator on a SFP+ end can become activated, thus allowing for an effective identification of a specific SFP+ end.

[0027] In another example, data cable **10** or octopus cable **26** may be active and indicator activator **42** may be a single switch on the QSFP/CXP assembly to control the indicators (or a specific indicator) on each SFP+ end. An electronic signal or command via an I2C interface received at a controller may also be used to control all (or a specific indicator) on each SFP+ end. In one embodiment (after activation), each indicator on each SFP+ end may blink at different rates to indicate a specific SFP+ end. For example, fast, slow for a first SFP+ end; fast, fast, slow for a second SFP+ end; fast, fast, fast, slow for a third SFP+ end; and fast, fast, fast, fast, slow for a fourth SFP+ end. Each indicator may be automatically shut off after a predetermined amount of time (e.g., 5 minutes) by the controller. In another embodiment, indicator activator **42** may be a four way switch that allows for activation of only one specific indicator. Only the near-end QSFP/CXP assembly have to be plugged in (e.g., into a cage, rack, housing, etc.) to provide power to each indicator. Upon activation of indicator activator **42**, all of the indicators or only a specific indicator on a SFP+ end can become activated, thus allowing for identification of a specific SFP+ end.

[0028] In another embodiment, a passive or an active CX**1** cable (i.e., a cable with an SFP+ end on both sides) may have an indicator activator and a corresponding indicator available on either end of data cable **10**. Activation of the indicator activator on one end would cause the indicator on the other end of data cable **10** to become active. In one embodiment, the activate indicator may be automatically shut off after a predetermined amount of time (e.g., 5 minutes). An electronic signal or command via an I2C interface received at a controller may also be used to control all or a specific indicator on each SFP+ end. Only the near-end SFP+ end assembly have to be plugged into the cage to provide power to the far-end SFP+ end.

[0029] In various operational configurations, different types of visual indicator schemes are possible, which may depend on the type of data cable **10** or octopus cable **26**. In an example embodiment, for passive QSFP to 4×SFP+ or CXP to 12×SFP+ straight or octopus cables, indicator activators (i.e., switches) on the QSFP assembly can be used to identify a specific SFP+ end by activation of an indicator on the specific SFP+ end. For example, an indicator activator corresponding to a first cable can activate an indicator on the SFP+ end that corresponds to the first cable.

[0030] In another embodiment, for active QSFP to 4×SFP+ or CXP to 12×SFP+ cable **10** or octopus cable **26**, a single switch on the QSFP end can activate one or more indicators on the SFP+ end(s) to enable identification of a specific SFP+ end assembly (e.g., a single indicator on a specific SFP+ end is activated, or all indicators are activated with each having a unique blinking frequency). For example, all the indicators may be activated or a specific indicator for a specific SFP+ end may be activated. An auto shut off may terminate the activation of the indicator.

[0031] Turning to FIG. **2**, FIG. **2** is a simplified schematic diagram illustrating one possible set of details associated with data cable **10**. [Note that the circuits discussed with reference to data cable **10** would equally apply to octopus cable **26**, or to any other cable arrangement.] In an example embodiment, data cable **10** is a passive twinaxial copper cable and, further, does not contain any active components. [Note that another example of an active twinaxial copper cable is detailed below.] FIG. **2** includes QSFP end **20***a*, first cable **18***a*, and first SFP+ end **22***a*. In a particular example of FIG. **2**, QSFP end **20***a* includes a voltage input **32**, a ground **34**, capacitors **36**, inductors **38**, a resistor **40**, and an indicator activator **42***a*. In an example embodiment, indicator activator **42***a* is a switch. First SFP+ end **22***a* includes capacitors **36**, inductors **38**, and first SFP+ indicator **24***a*.

[0032] When QSFP end **20***a* is connected to first transceiver **12** (e.g., using a QSFP housing), current flows through voltage input **32** and resistor **40**, but the current cannot flow through the rest of the circuit. When indicator activator **42***a* is activated (e.g., a switch is closed), current is permitted to flow through the circuit, across first cable **18***a*, and first SFP+ indicator **24***a* is activated. For example, if first SFP+ indicator **24***a* is a LED, then the LED may begin to glow.

[0033] Turning to FIG. **3**A, FIG. **3**A is a simplified schematic diagram illustrating one possible set of details associated with a first portion of data cable **10** (FIG. **3**B illustrates one possible set of details associated with a second portion of data cable **10**). In an example embodiment, data cable **10** illustrated in FIGS. **3**A and **3**B is a passive twinaxial copper cable and does not include any active components. FIG. **3**A includes QSFP end **20***a*, first cable **18***a*, second cable **18***b*, first SFP+ end **22***a* and second SFP+ end **22***b*.

[0034] In a particular example of FIG. **3**A, QSFP end **20***a* includes voltage input **32**, ground **34**, capacitors **36**, inductors **38**, resistors **40**, indicator activator **42***a*, and indicator activator **42***b*. In an example embodiment, indicator activator **42***a* and indicator activator **42***b* are switches. First SFP+ end **22***a* includes capacitors **36**, inductors **38**, and first SFP+ indicator **24***a*. Second SFP+ end **22***b* includes capacitors **36**, inductors **38**, and second SFP+ indicator **24***b*.

[0035] Before discussing the operation details of FIG. **3**A, and because of the interrelationship between FIG. **3**A and FIG. **3**B, FIG. **3**B is introduced. FIG. **3**B is a simplified schematic diagram illustrating one possible set of details associated with the second portion of data cable **10**. FIG. **3**B includes QSFP end **20***a*, third cable **18***c*, fourth cable **18***d*, third SFP+ end **22***c* and fourth SFP+ end **22***d*. In a particular example of FIG. **3**B, QSFP end **20***a* includes capacitors **36**, inductors **38**, resistors **40**, an indicator activator **42***c*, and an indicator activator **42***d*. In an example embodiment, indicator activator **42***c* and indicator activator **42***d* are switches. Third SFP+ end **22***c* includes capacitors **36**, inductors **38**, and third SFP+ indicator **24***c*. Fourth SFP+ end **22***d* includes capacitors **36**, inductors **38**, and fourth SFP+ indicator **24***d*. Voltage input **32** and ground **34** shown in FIG. **3**A are electrically connected to the electrical components shown in FIG. **3**B.

[0036] In one example illustration, when QSFP end **20***a* is connected to first transceiver **12**, current flows through voltage input **32** and each resistor **40**, but it cannot flow through the rest of the circuit. When indicator activator **42***a* is activated (e.g., a switch is closed), current is allowed to flow through a portion of the circuit, across first cable **18***a*, and first SFP+ indicator **24***a* is activated (e.g., if first SFP+ indicator **24***a* is a LED, then the LED may begin to glow). Similarly, when indicator activator **42***b* is activated, current is allowed to flow through a portion of the circuit, across second cable **18***b*, and second SFP+ indicator **24***b* is activated (e.g., if second SFP+ indicator **24***b* is a LED, then the LED may begin to glow). Also, when indicator activator **42***c* is activated, current is allowed to flow through a portion of the circuit, across third cable **18***c*, and third SFP+ indicator **24***c* is activated (e.g., if third SFP+ indicator **24***c* is a LED, then the LED may begin to glow). In addition, when indicator activator **42***d* is activated, current is allowed to flow through a portion of the circuit, across fourth cable **18***d*, and fourth SFP+ indicator **24***d* is activated (e.g., if fourth SFP+ indicator **24***d* is a LED, then the LED may begin to glow). By selectively activating either first SFP+ indicator **24***a*, second SFP+ indicator **24***b*, third SFP+ indicator **24***c*, or fourth SFP+ indicator **24***d*, a user (e.g., installer or operator) may be able to identify a specific SFP+ end (i.e., either SFP+ end **22***a*, SFP+ end **22***b*, SFP+ end **22***c*, or SFP+ end **22***d*) without having to trace or follow first cable **18***a*, second cable **18***b*, third cable **18***c*, or fourth cable **18***d*.

[0037] Turning to FIG. **4**A, FIG. **4**A is a simplified schematic diagram illustrating one possible set of details associated with a first portion of data cable **10** (FIG. **4**B illustrates one possible set of details associated with a second portion of data cable **10**). In an example embodiment, data cable **10** illustrated in FIGS. **4**A and **4**B is an active twinaxial copper cable and may include active components. FIG. **4**A includes QSFP end **20***b*, first cable **18***a*, second cable **18***b*, first active SFP+ end **22***e*, and second active SFP+ end **22***f*. In a particular example of FIG. **4**A, QSFP end **20***b* includes voltage input **32**, ground **34**, capacitors **36**, inductors **38**, resistors **40**, a signal driver **44** (e.g., clock and data recovery (CDR)), first active switch **46***a* (e.g., metal-oxide-semiconductor field-effect transistor (MOSFET)), and second active switch **46***b* (e.g., MOSFET). First active SFP+ end **22***e* includes capacitors **36**, inductors **38**, signal driver **44**, and first active SFP+ indicator **24***e*. Second active SFP+ end **22***f* includes capacitors **36**, inductors **38**, signal driver **44**, and second active SFP+ indicator **24***f*.

[0038] FIG. **4**B is a simplified schematic diagram illustrating one possible set of details associated with the second portion of data cable **10**. FIG. **4**B includes QSFP end **20***b*, third cable **18***c*, fourth cable **18***d*, third active SFP+ end **22***g*, and fourth active SFP+ end **22***h*. In a particular example of FIG. **4**B, QSFP end **20***b* includes capacitors **36**, inductors **38**, resistors **40**, signal driver **44** (e.g., CDR), third active switch **46***c* (e.g., MOSFET), fourth active switch **46***d* (e.g., MOSFET), a controller **48**, an I2C input **54**, and an indicator activator **42***e*. In an example embodiment, indicator activator **42***e* may be a mechanical switch (e.g., dual in-line package (DIP) switch, four way switch, etc.). I2C **54** is a multi-master serial single-ended computer bus that uses two bidirectional open-drain lines. Controller **48** may include a processor **50** and a memory **52**. Third active SFP+ end **22***g* includes capacitors **36**, inductors **38**, signal driver **44**, and a third active SFP+ indicator **24***g*. Fourth active SFP+ end **22***h* includes capacitors **36**, inductors **38**, signal driver **44**, and a fourth active SFP+ indicator **24***h*.

[0039] Voltage input **32** and ground **34** (shown in FIG. **4**A) are electrically connected to the electrical components shown in FIG. **4**B. Controller **48** is electrically connected to (and is configured to control) first active switch **46***a*, second active switch **46***b*, third active switch **46***c*, and fourth active switch **46***d*.

[0040] In one example illustration, when QSFP end **20***b* is connected to first transceiver **12**, current flows through voltage input **32** and resistors **40**, but it cannot flow through the rest of the circuit. If indicator activator **42***e* is positioned to close first active switch **46***a*, current is allowed to flow through a portion of the circuit, across first cable **18***a*, and first active SFP+ indicator **24***e* is activated (e.g., if first active SFP+ indicator **24***e* is a LED, then the LED may glow). Similarly, when indicator activator **42***e* is positioned to close second active switch **46***b*, current is allowed to flow through a portion of the circuit, across second cable **18***b*, and second active SFP+ indicator **24***f* is activated (e.g., if second active SFP+ indicator **24***f* is a LED, then the LED may begin to glow). Also, when indicator activator **42***e* is positioned to close third active switch **46***c*, current is allowed to flow through a portion of the circuit, across third cable **18***c*, and third active SFP+ indicator **24***g* is activated (e.g., if third active SFP+ indicator **24***g* is a LED, then the LED may begin to glow). In addition, when indicator activator **42***e* is positioned to close fourth active switch **46***d*, current is allowed to flow through a portion of the circuit, across fourth cable **18***d*, and fourth active SFP+ indicator **24***h* is activated (e.g., if fourth active SFP+ indicator **24***h* is a LED, then the LED may begin to glow).

[0041] Indicator activator **42***e* (through controller **48**) may be configured to close first active switch **46***a*, second active switch **46***b*, third active switch **46***c*, and fourth active switch **46***d* individually or simultaneously. By selectively activating either first SFP+ indicator **24***e*, second active SFP+ indicator **24***f*, third active SFP+ indicator **24***g*, or fourth active SFP+ indicator **24***h*, or (if all indicators are activated simultaneously) by causing each indicator to blink or glow at a unique pattern or frequency, a user (e.g., installer or operator) may be able to identify a specific SFP+ end (i.e., either first active SFP+ end **22***e*, second active SFP+ end **22***f*, third active SFP+ end **22***g*, or fourth active SFP+ end **22***h*) without having to trace or follow first cable **18***a*, second cable **18***b*, third cable **18***c*, or fourth cable **18***d*.

[0042] Turning to FIG. **5**, FIG. **5** is a simplified schematic diagram illustrating one possible set of details associated with data cable **10**. In an example embodiment, data cable **10** is a passive twinaxial cable with two SFP+ ends, where the cable is integrated into the SFP+ end (e.g., CX-1 cables). FIG. **5** includes fifth SFP+ end **22***i*, first cable **18***a*, and sixth SFP+ end **22***j*. In a particular example of FIG. **5**, fifth SFP+ end **22***j* includes voltage input **32***a*, ground **34***a*, capacitors **36**, inductors **38**, resistor **40**, indicator activator **42***f*, and indicator **24***i*. In an example embodiment, indicator activator **42***f* is a switch. Sixth SFP+ end **22***j* includes voltage input **32***b*, ground **34***b*, capacitors **36**, inductors **38**, resistor **40**, indicator activator **42***g*, and sixth SFP+ indicator **24***j*. In an example embodiment, indicator activator **42***g* is a switch.

[0043] When fifth SFP+ end **22***i* is connected to first transceiver **12** (e.g., using a SFP+ end housing), current flows through voltage input **32***a*, but it cannot flow through the rest of the circuit. When indicator activator **42***f* is activated, current is allowed to flow through the circuit, across first cable **18***a*, and sixth SFP+ indicator **24***j* is activated. For example, if sixth SFP+ indicator **24***j* is a LED, then the LED may begin to glow. Sixth SFP+ end **22***j* does not need to be connected to second transceiver **14**.

[0044] When sixth SFP+ end **22***j* is connected to second transceiver **14** (e.g., using a SFP+ end housing), current flows through voltage input **32***b*, but it cannot flow through the rest of the circuit. When indicator activator **42***g* is activated, current is allowed to flow through the circuit, across first cable **18***a*, and fifth SFP+ indicator **24***i* is activated. For example, if fifth SFP+ indicator **24***i* is a LED, then the LED may begin to glow. Fifth SFP+ end **22***i* does not need to be connected to first transceiver **12**.

[0045] Turning to FIG. **6**, FIG. **6** is a simplified schematic diagram illustrating one possible set of details associated with data cable **10**. In an example embodiment, data cable **10** is an active twinaxial cable with two SFP+ ends, where the cable is integrated into the SFP+ ends (e.g., CX-1 cables). Data cable **10** includes fifth active SFP+ end **22***k*, first cable **18***a*, and sixth active SFP+ end **22***l*. In a particular example of FIG. **6**, fifth active SFP+ end **22***k* includes voltage input **32***a*, ground **34***a*, capacitors **36**, inductors **38**, resistor **40**, signal drivers **44** (e.g., CDR), fifth active switch **46***e* (e.g., MOSFET), controller **48***a*, indicator activator **42***h*, I2C **54**, and fifth active SFP+ indicator **24***k*. Controller **48***a* includes processor **50***a* and memory **52***a*. Sixth active SFP+ **22***l* may include capacitors **36**, inductors **38**, signal driver **44**, sixth active switch **46***f*, controller **48***b*, indicator activator **42***i*, I2C input **54**, and sixth active SFP+ indicator **24***l*. Controller **48***b* may include processor **50***b* and memory **52***b*.

[0046] When fifth active SFP+ end **22***k* is connected to first transceiver **12** (e.g., using a SFP+ end housing), current flows through voltage input **32***a*, but it cannot flow through the rest of the circuit. When indicator activator **42***h* is activated, current is allowed to flow through the circuit, across first cable **18***a*, and sixth active SFP+ indicator **24***l* is activated. For example, if sixth active SFP+ indicator **24***l* is a LED, then the LED may begin to glow. Sixth active SFP+ end **22***l* does not need to be connected to any one of SFP+ end transceivers **14***a-d*.

[0047] When sixth active SFP+ end **22***l* is connected to second transceiver **14** (e.g., using a SFP+ end housing), current flows through voltage input **32***b*, but it cannot flow through the rest of the circuit. When indicator activator **42***i* is activated, current is allowed to flow through the circuit, across first cable **18***a*, and indicator **24***k* is activated. For example, if indicator **24***k* is a LED, then the LED may begin to glow. Fifth active SFP+ end **22***k* does not need to be connected to first transceiver **12**.

[0048] FIG. **7** is a simplified block diagram illustrating one potential operation associated with the present disclosure. At **702**, a signal is received to activate an indicator. For example, the request may be received by the activation of indicator activator **42***a-i*. The signal itself can include any suitable request, software trigger, hardware trigger (e.g., pressing a button coupled to the indicator activator), etc. If activation indicator **42***a*-**11***s* a switch, then the switch may be closed (e.g., by pressing a button coupled to the switch, or that surrounds the switch, etc.). Note that the activation indicator can be any suitable mechanism that can trigger, or otherwise foster a signal being provided to the indicator. This includes any suitable circuitry, hardware, software, button configuration, etc.

[0049] At **704**, the actual indicator is identified, where this indicator is used to activate some identification property for the cable. For example, in an active cable, a single indicator activator (e.g., indicator activator **42***e*) may be used to activate a single indicator, which provides some type of illumination. This illumination may include any suitable lighting mechanism, light energy, LED configuration, etc. In certain instances, the illumination may be powered by closing a switch such that a circuit is completed, or the illumination may be powered by solar energy, powered by some type of battery configuration, or powered by any other suitable power source.

[0050] Controller **48** may be used to determine which indicator to activate based on the position of the indicator activator. In another example, controller **48** may process a signal received from I2C input **54** to determine which indicator to activate. At **706**, the indicator is activated. At **708**, current may be allowed to flow through the circuit (or a portion of the circuit) to activate the desired indicator. In one particular example, the current is allowed to flow through the entire circuit such that all the indicators are active (where each indicator gives a unique identification for each SFP+ end). In another particular example, only one indicator is activated.

[0051] Note that in certain example implementations, the functions outlined herein may be implemented by non-transitory logic encoded in one or more tangible media (e.g., embedded logic provided in an application specific integrated circuit [ASIC], digital signal processor [DSP] instructions, software [potentially inclusive of object code and source code] to be executed by a processor, or other similar machine, etc.). In some of these instances, a memory element [as shown in FIGS. **4**B and **6**] can store data used for the operations described herein. This includes the memory element being able to store code (e.g., software, logic, or processor instructions) executed to carry out the activities described in this Specification. A processor can execute any type of code associated with the data to achieve the operations detailed herein in this Specification. In one example, the processor [as shown in FIGS. **4**B and **6**] could transform an element or an article (e.g., data) from one state or thing to another state or thing. In another example, the activities outlined herein may be implemented with fixed logic or programmable logic (e.g., software/computer instructions executed by a processor) and the elements identified herein could be some type of a programmable processor, programmable digital logic (e.g., a field programmable gate array [FPGA], an erasable programmable read only memory (EPROM), an electrically erasable programmable ROM (EEPROM)) or an ASIC that includes digital logic, software, code, electronic instructions, or any suitable combination thereof.

[0052] Note that with the examples provided above, as well as numerous other examples provided herein, interaction may be described in terms of two, three, or four electrical components (i.e., capacitors **36**, inductors **38**, resistors **40**, etc.). However, this has been done for purposes of clarity and example only. In certain cases, it may be easier to describe one or more of the functionalities of a given set of flows by only referencing a limited number of electrical components. It should be appreciated that data cable **10** and octopus cable **26** (and their teachings) are readily scalable and can accommodate a large number of components, as well as more complicated/sophisticated arrangements and configurations. Accordingly, the examples provided should not limit the scope or inhibit the broad teachings of data cable **10** and octopus cable **26**, as potentially applied to a myriad of other architectures. Any cable can benefit from the teachings of the present disclosure. The cable can include any type of wire configuration, and any type of conducive material for propagating data, energy, light, etc. This would include computer applications, lighting fixtures (e.g., lamps, track lighting, etc.), residential appliance configurations, enterprise applications (e.g., server farms, wiring closets, HVAC systems, etc.). Virtually any cable type could be used in conjunction with the present disclosure.

[0053] It is also important to note that the steps in the preceding flow diagrams illustrate only some of the possible signaling scenarios and patterns that may be executed by, or within, data cable **10** and octopus cable **26**. Some of these steps may be deleted or removed where appropriate, or these steps may be modified or changed considerably without departing from the scope of the present disclosure. In addition, a number of these operations have been described as being executed concurrently with, or in parallel to, one or more additional operations. However, the timing of these operations may be altered considerably. The preceding operational flows have been offered for purposes of example and discussion. Substantial flexibility is provided by data cable **10** and octopus cable **26** in that any suitable arrangements, chronologies, configurations, and timing mechanisms may be provided without departing from the teachings of the present disclosure.

[0054] Although the present disclosure has been described in detail with reference to particular arrangements and configurations, these example configurations and arrangements may be changed significantly without departing from the scope of the present disclosure. For example, although the present disclosure has been described with reference to particular exchanges involving certain electrical components, data cable **10** and octopus cable **26** may be applicable to other cable arrangements. Moreover, the present disclosure is equally applicable to various technologies, aside from the disclosed architectures, as these have only been offered for purposes of discussion.

[0055] Numerous other changes, substitutions, variations, alterations, and modifications may be ascertained to one skilled in the art and it is intended that the present disclosure encompass all such changes, substitutions, variations, alterations, and modifications as falling within the scope of the appended claims. In order to assist the United States Patent and Trademark Office (USPTO) and, additionally, any readers of any patent issued on this application in interpreting the claims appended hereto, Applicant wishes to note that the Applicant: (a) does not intend any of the appended claims to invoke paragraph six (6) of 35 U.S.C. section 112 as it exists on the date of the filing hereof unless the words "means for" or "step for" are specifically used in the particular claims; and (b) does not intend, by any statement in the specification, to limit this disclosure in any way that is not otherwise reflected in the appended claims.

What is claimed is:

1. A method, comprising:

receiving a signal at an indicator activator provided on a first end of a data cable, wherein the data cable comprises a second end that includes an indicator; and

activating the indicator such that at least a portion of the data cable is illuminated.

2. The method of claim **1**, wherein the indicator activator is a switch, and wherein the signal causes the switch to close such that a current is provided to the indicator.

3. The method of claim **1**, wherein the first end is a small form-factor pluggable plus (SFP+) end, the second end is a SFP+ end, and the data cable is a twinaxial copper cable.

4. The method of claim **1**, wherein the first end is a quad small form-factor pluggable (QSFP) end, and the second end comprises at least four small form-factor pluggable plus (SFP+) ends.

5. The method of claim **4**, further comprising:

activating a selected one of a plurality of indicator activators on the first end, wherein each of the plurality of indicator activators corresponds to a unique indicator on the four SFP+ ends.

6. The method of claim **4**, wherein when the selected indicator activator is activated, each of the four SFP+ ends are illuminated at a different blinking rate.

7. The method of claim **1**, wherein activating the indicator causes portions of the data cable to be illuminated at different illumination intensities.

8. Logic encoded in non-transitory media that includes code for execution and when executed by a processor operable to perform operations, comprising:

receiving a signal at an indicator activator provided on a first end of a data cable, wherein the data cable comprises a second end that includes an indicator; and

activating the indicator such that at least a portion of the data cable is illuminated.

9. The logic of claim **8**, wherein the indicator activator is a switch, and wherein the signal causes the switch to close such that a current is provided to the indicator.

10. The logic of claim **8**, the operations further comprising:

activating a selected one of a plurality of indicator activators on the first end, wherein each of the plurality of indicator activators corresponds to a unique indicator.

11. The logic of claim **10**, wherein when the selected indicator activator is activated, respective ends of the data cable are illuminated at different blinking rates.

12. The logic of claim **10**, wherein when the selected indicator activator is activated, respective ends of the data cable are illuminated at different illumination intensities.

13. A cable, comprising:

a first end that includes an indicator activator; and

a second end that includes an indicator, wherein activating the indicator causes at least a portion of the cable to be illuminated.

14. The cable of claim **13**, wherein the indicator activator is a switch, and wherein the signal causes the switch to close such that a current is provided to the indicator.

15. The cable of claim **13**, wherein the first end is a small form-factor pluggable plus (SFP+) end, the second end is a SFP+ end, and the cable is a twinaxial copper cable.

16. The cable of claim **13**, wherein the first end is a quad small form-factor pluggable (QSFP) end, and the second end comprises at least four small form-factor pluggable plus (SFP+) ends.

17. The cable of claim **16**, wherein when a selected one of a plurality of indicator activators is activated, each of the four SFP+ ends are illuminated at a different blinking rate.

18. The cable of claim **13**, wherein each of a plurality of indicator activators on the first end corresponds to a unique indicator.

19. The cable of claim **13**, wherein activating the indicator causes portions of the cable to be illuminated at different illumination intensities.

20. The cable of claim **13**, wherein the cable is an active quad small form-factor pluggable to four small form-factor pluggable plus (QSFP to 4×SFP+), or an active CXP to twelve SFP+ end (CXP to 12×SFP+).

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