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(54) **REMOVABLE CARD GUIDANCE BLOCK**

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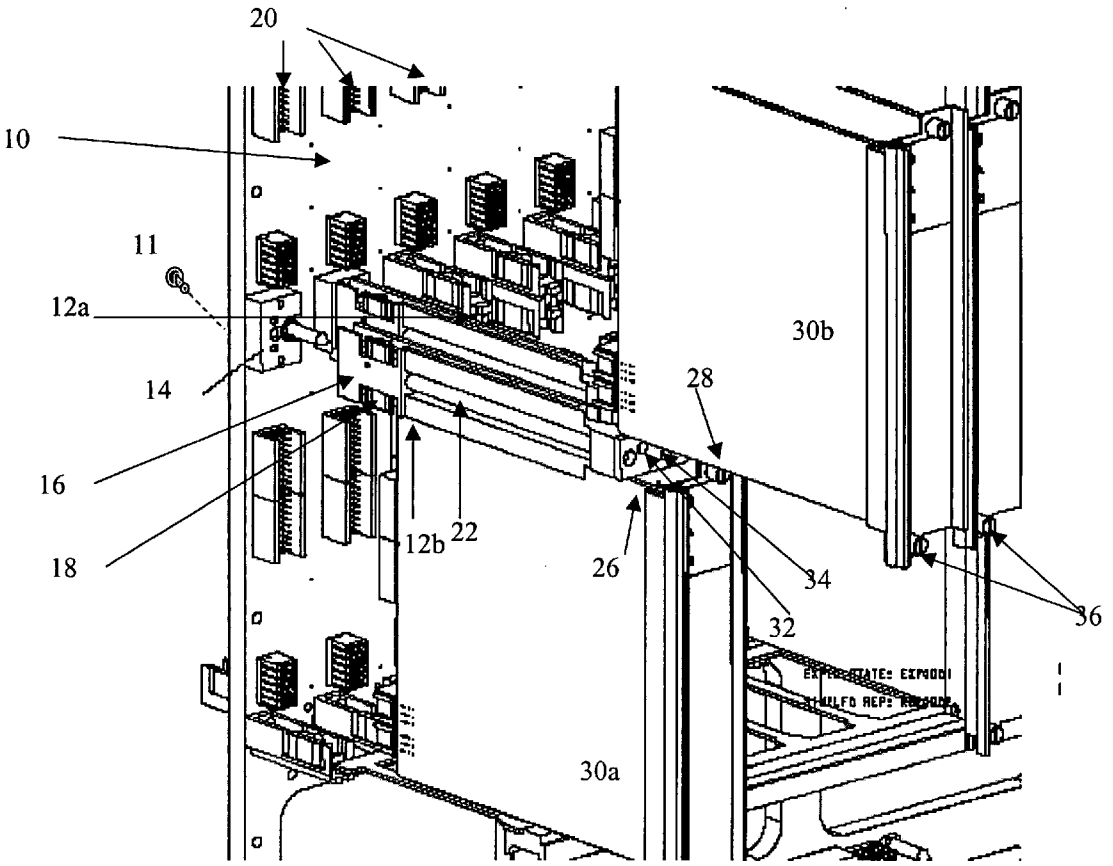
(57) **ABSTRACT**

A guidance block includes a base and a pair of opposing sides. A first set of opposing sides are attached to a top side of the base and provide a first separation configured to accept a first circuit card. A second set of opposing sides are attached to a bottom side of the base and provide a second separation configured to accept a second circuit card.



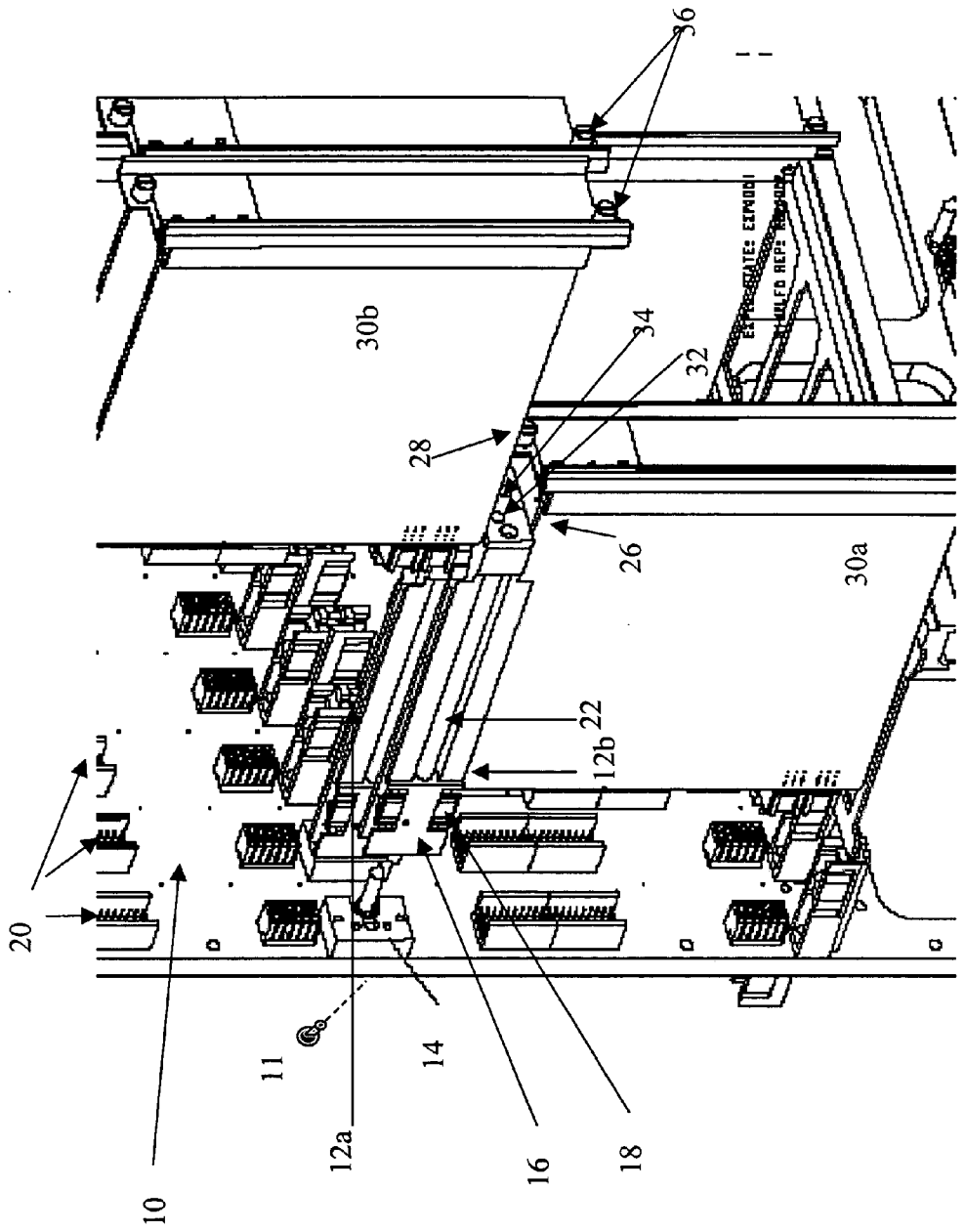
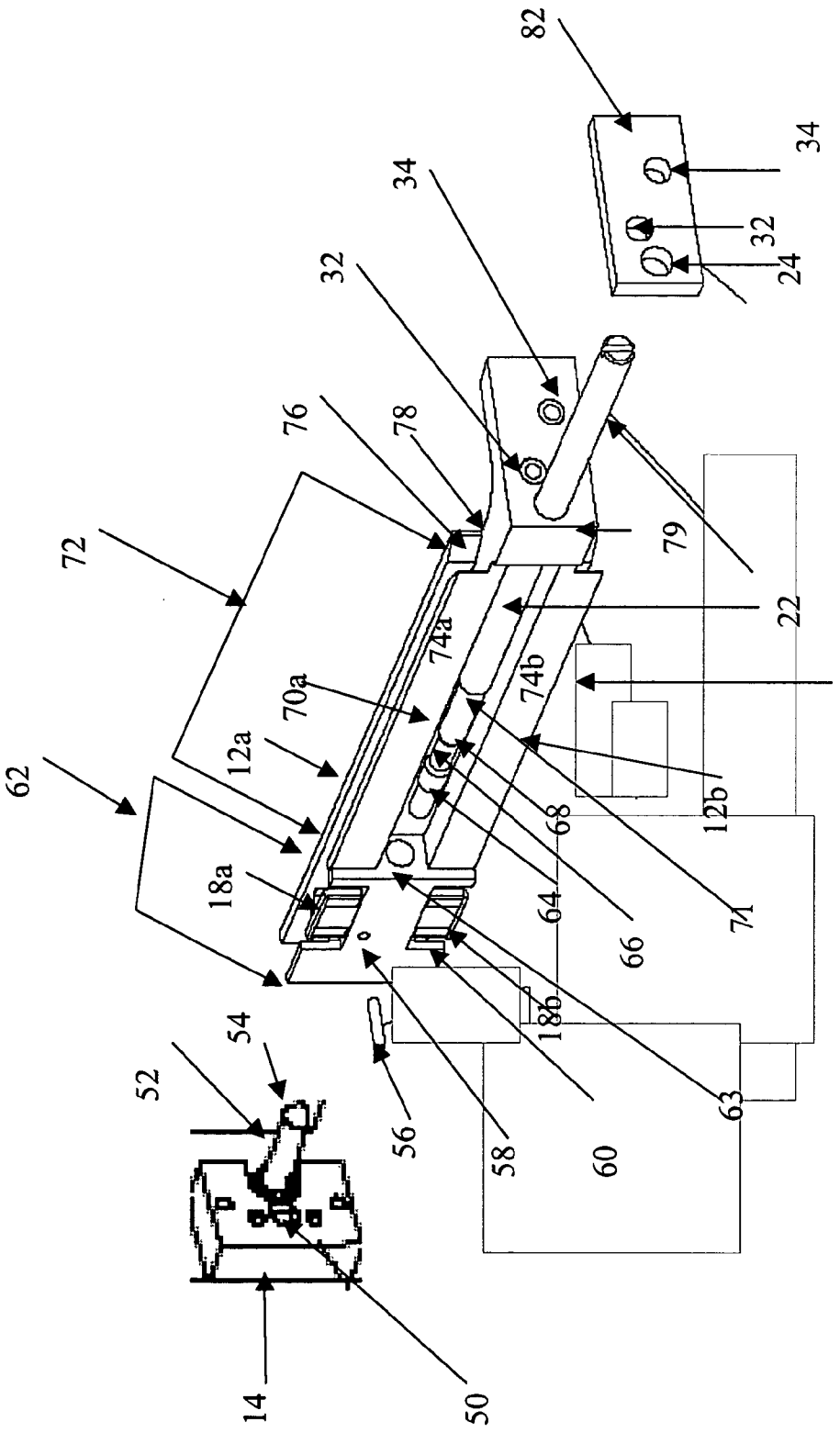


FIG. 1


82
34
34
32
32
24
76
78
72
79
22
74a
74b
70a
16
12a
62
12b
68
18a
64
71
66
18b
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14
50

FIG. 2

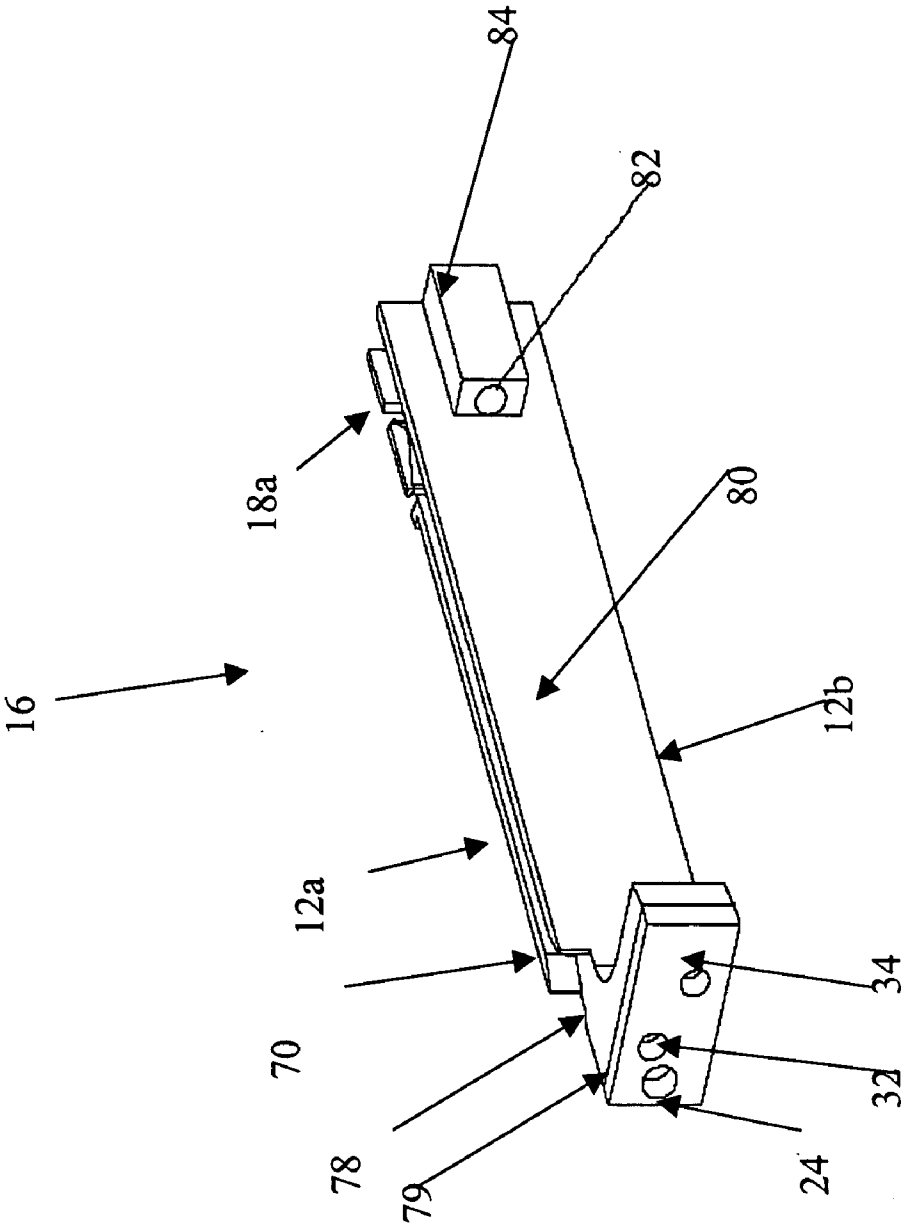

FIG. 3

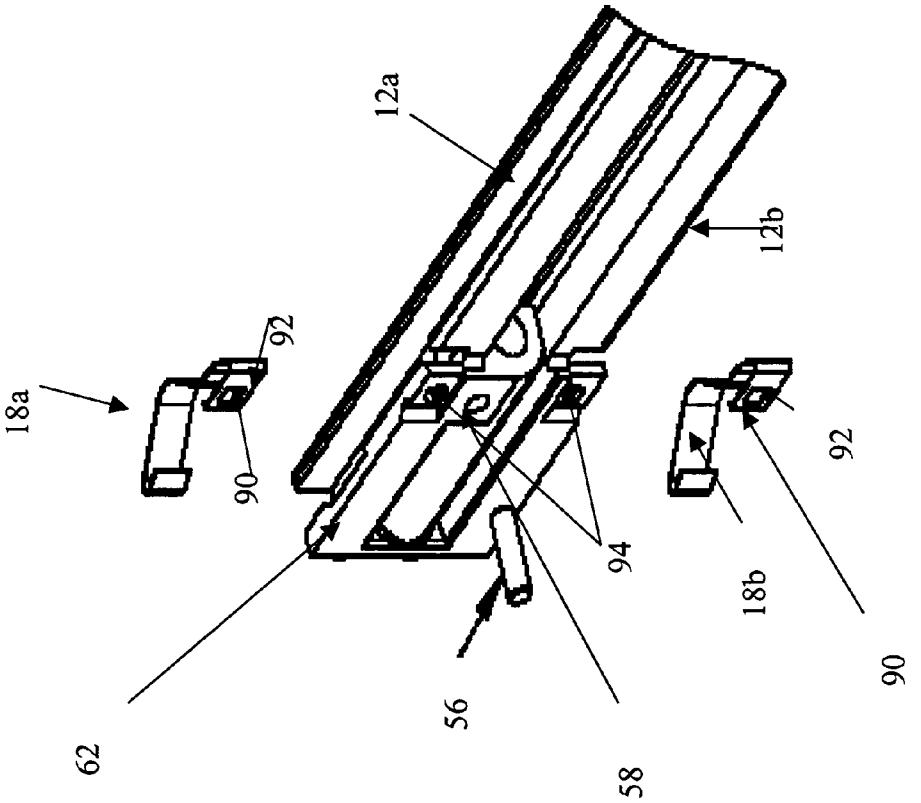

FIG. 4

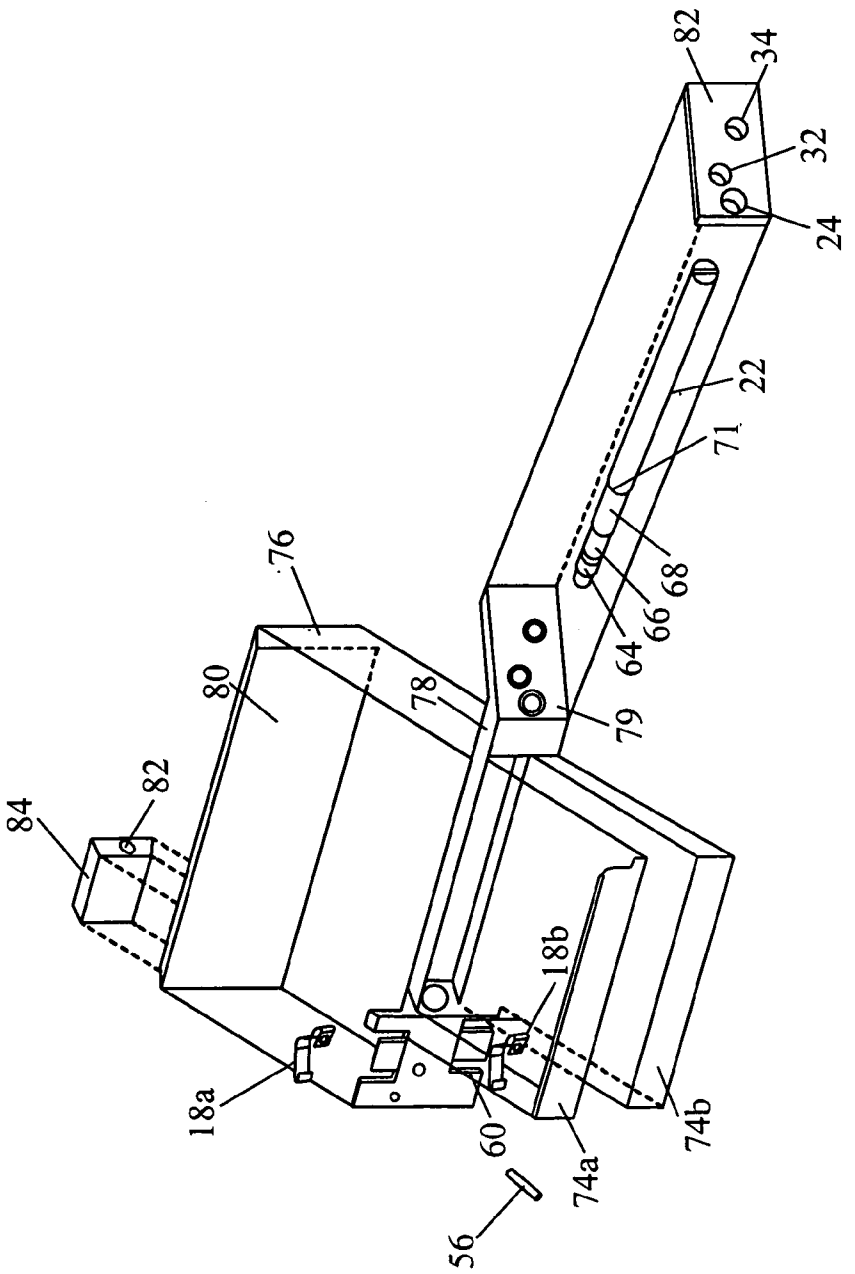

FIG. 5

REMOVABLE CARD GUIDANCE BLOCK

BACKGROUND

[0001] A backplane or midplane (hereafter called backplane) is an electronic circuit board that may include circuits and sockets into which other circuit boards or cards are plugged. For instance, in a computer the backplane (sometimes referred to as a motherboard) is a circuit board that includes sockets (also referred to as expansion slots) for cards. The cards (also referred to as expansion cards, boards, adapters and so forth) include circuits that provide a functional capability to the computer. The card is typically made of a rigid material and is plugged into one of the computer's expansion slots in the backplane. Cards have a variety of sizes to match corresponding socket dimensions. A card can be of full height, half height, or some other height. For example, two half-height cards would fit into one full height card slot.

SUMMARY

[0002] In one aspect, the invention features a guidance block that includes a base. The guidance block also includes a first set of opposing sides attached to a top side of the base, the first set of opposing sides provide a first separation configured to accept a first circuit board. The guidance block also includes a second set of opposing sides attached to a bottom side of the base, the second set of opposing sides provide a second separation configured to accept a second circuit board.

[0003] Embodiments may include one or more of the following. The first set of opposing sides can accept the bottom edge of a first circuit pack and the second set of opposing sides can accept the top edge of a second circuit pack. The sides can accept multiple thicknesses of circuit packs.

[0004] The guidance block can also include a spring member. The spring member can provide alignment of a primary side of the circuit pack. The spring member and the guidance block can be comprised of an electrically conductive material.

[0005] The base can include apertures to allow the guidance block to be removably attached to a backplane or midplane. The guidance block can include a aperture in the base and a fastener. The fastener can be positioned in the aperture to attach the base to a backplane or midplane. The guidance block can also include a retaining pin, the retaining pin can prevent the complete removal of the fastener from the guidance block.

[0006] In another aspect, the invention features a guide pin retainer block and a guidance block. The guide pin retainer block includes an aperture configured to accept a fastener. The guidance block includes a base and a first set of opposing sides attached to a top side of the base, with the first set of opposing sides providing a first separation configured to accept a first circuit board. The guidance block also includes a second set of opposing sides attached to a bottom side of the base with the second set of opposing sides providing a second separation configured to accept a second circuit board.

[0007] Embodiments can include one or more of the following. The guide pin retainer block can include apertures to allow the guide pin retainer block to be removably attached to a backplane or midplane. The guide pin retainer block can include a guide pin and the guidance block can include a aperture configured to accept the guide pin and align the guidance block to the guide pin retainer block. The aperture can be conical shaped. Alternately, the guidance block includes a guide pin and the guide pin retainer block includes an aperture configured to accept the guide pin and align the guidance block to the guide pin retainer block. The aperture can be a conical shaped aperture. The guidance block can include a fastener such that the guidance block can be attached to the retainer block by inserting the fastener in the aperture configured to accept the fastener.

[0008] In another aspect, the invention features a guidance system comprising a backplane including a guidance block. The guidance block includes a base and a first set of opposing sides attached to a top side of the base, with the first set of opposing sides providing a first separation configured to accept a first circuit board. The guidance block also includes a second set of opposing sides attached to a bottom side of the base, with the second set of opposing sides providing a second separation configured to accept a second circuit board.

[0009] Embodiments may include one or more of the following. The first set of opposing-sides can accept the bottom edge of a first circuit pack and the second set of opposing sides can accept the top edge of a second circuit pack. The guidance block can include a spring member that provides alignment of a primary side of the circuit pack. The spring member and the guidance block can be comprised of an electrically conductive material. The guidance block can be grounded and the electrically conductive material can provide an electrostatic discharge (ESD) path.

[0010] In one aspect, the removable card guidance block provides the advantage of allowing a single full height card slot to be configured to accept cards of alternate heights. For example, placing one removable card guidance block in the middle of a full height slot allows two half-height cards to occupy a full height slot.

[0011] In another aspect, the removable card guidance block includes a spring to bias a card to the primary side of the removable card guidance block. This allows a user to insert a board into the device without regard for thickness of the board. The spring member aligns the connectors on the card with the connectors in the slot.

[0012] In another aspect, the removable card guidance block extends to the same extent as the card. This allows a user to insert and/or remove the removable card guidance block while cards remain active in adjacent slots.

[0013] The removable card guidance block also provides full guidance of the card from the card entry to the shelf to card termination. The removable card guidance block also permits for keying and faceplate side movement control.

[0014] The removable card guidance block provides the alignment for the top edge of a lower card, and the bottom edge of a higher card as the cards are cascaded within a single slot of a shelf. When removed, a full height card can be plugged into the same space as the cascade of smaller cards.

[0015] An integrated guide pin receptacle and a captivated extension fastener aligns and fastens the removable card

guidance block to a guide pin retainer block that is permanently or semi permanently attached to the backplane.

[0016] An EMI gasket and integrated threaded female fasteners attached to face of the removable card guidance block allows for the continuous EMI shield and lockdown of cascaded faceplates.

DESCRIPTION OF DRAWINGS

[0017] **FIG. 1** depicts a backplane and a removable card guidance block that divides a full height slot to accept two half-height cards.

[0018] **FIG. 2** is a diagram of the spring side of the removable card guidance block.

[0019] **FIG. 3** is a diagram of the primary side of the removable card guidance block.

[0020] **FIG. 4** is a diagram of the spring connection region of the removable card guidance block.

[0021] **FIG. 5** is a composite view of removable card guidance block.

DESCRIPTION

[0022] Referring to **FIG. 1**, a backplane **10** includes multiple slots **20**. A user aligns and plugs a card **30** into one of the slots **20**. Each slot fits a particular card thickness (typical card thicknesses range from 0.05 inches to 0.2 inches). In some situations, it can be advantageous to insert two half-height cards into one full height slot. For example, some applications do not require the board space of a full height card, two half-height cards can be used. By limiting the space necessary for such cards, a user can attach a greater number of cards (and greater amount of functionality) to the slots present in the backplane. The option for smaller cards also permits lower granularity per application. In order to accommodate two half-height cards **30***a* and **30***b* in a full height card slot **20**, a removable card guidance block **16** attaches to the backplane **10** in the middle of the full height card slot and divides the slot into two half-height slots. The removable card guidance block **16** provides alignment of two half-height cards **30***a* and **30***b* to the slot **20**. The removable card guidance block **16** includes a top slot **12***a* and a bottom slot **12***b*, each slot **12** accepts the edge of a card **30**. For example, a bottom slot **12***b* guides the topside **26** of a first card **30***a* while a top slot **12***a* guides the bottom edge **28** of a second card **30***b*. Fasteners **36** screw into apertures **32** and **34** to secure cards **30***a* and **30***b* to the removable card guidance block **16**.

[0023] Removable card guidance block **16** removably attaches to the backplane using a guide pin retainer block **14**. Retainer block **14** attaches to the backplane using fasteners or permanently attaches to the backplane for example by bonding or soldering. The guide pin retainer block **14** does not interfere with the use of the slot for a full height card. The placement of the guide pin retainer block **14** determines the number of slots the full height slot is divided into when a removable card guidance block **16** is attached to the guide pin retainer block **14**. For example, placing a single guide pin retainer block **14** in the middle of a slot **20** provides the option to divide the slot into two half-height slots. The guide pin retainer block **14** includes a threaded hole into which a fastener **11** fits to attach the guide pin retainer block to the backplane **10**. Fastener **22** secures removable card guidance block **16** to guide pin retainer block **14** and allows a user to insert and remove the removable card guidance block **16** based on the current system needs.

[0024] In this example, the removable card guidance block **16** is approximately the same length as card **30**. The length of the removable card guidance block **16** allows a user to attach and remove the removable card guidance block **16** while cards occupy adjacent slots. Since the fastener **22** extends past the other boards and the removable card guidance block is non-conductive (e.g., plastic), it is not necessary to insert a tool (e.g., a screwdriver) between the cards to tighten the fastener **22**. This allows other cards to remain in use while a single slot **20** configured to accept a full height card is re-configured to accept two half height cards or vice versa. While, in this example the removable card guidance block **16** is approximately the same length as card **30** the removable card guidance block **16** can be any length. If the removable card guidance block is much shorter than the card **30**, special tools or the removal of adjacent cards may be necessary to attach the removable card guidance block **16** to the backplane.

[0025] Referring to **FIGS. 2-5**, the removable card guidance block **16** has a spring side **60** (**FIG. 2**), a primary side **80** (**FIG. 3**), and a spring region **62** (**FIG. 4**). **FIG. 5** shows a composite view of the removable card guidance block **16**. The spring side **60** (**FIG. 2**) and primary side **80** (**FIG. 3**) attach to a body **78**. The sides **60** and **80** extend vertically from both the top-side and the bottom side of the body **78** to provide slots **12***a* and **12***b*. Slots **12***a* and **12***b* each provide a separation between the opposing sides **60** and **80** into which a card can be inserted. When a user inserts a card into slot **12***a* or **12***b*, a spring **18***a* or **18***b* biases the primary side of the card to the primary side **80** of the removable card guidance block **16**.

[0026] The body **78** extends the length of the device and forms the bottom of slot **12***a* and the top of slot **12***b*. Body **78** includes a card attachment piece **79** on an end not attached to the backplane. The card attachment piece **79** has three apertures **24**, **32**, and **34** for fasteners such as screws. A user inserts an extension fastener, e.g., fastener **22** through aperture **24** to fasten the removable card guidance block **16** to the backplane **10** (described in detail below). While aperture **24** is used to secure the removable card guidance block **16** to the backplane **10**, apertures **32** and **34** are used to secure card **30** to the removable card guidance block **16**. When a user inserts a card **30** into slot **12**, the card is secured to body **78** by fasteners **36** (as seen in **FIG. 1**). Fasteners **36** placed through apertures **32** and **34** fasten a card **30** to the card attachment piece **79**. While in this example, card is attached to the body **78** using screws as the fasteners, other attachment devices can be used.

[0027] In order to fasten the removable card guidance block **16** to the backplane **10**, a user aligns the removable card guidance block **16** to the guide pin retainer block **14** and tightens fastener **22**. For alignment, the guide pin retainer block **14** includes a guide pin **52**. Guide pin **52** extends from the guide pin retainer block **14** and has a conical shaped end **54**. The conical end **54** provides easier insertion of the guide pin **52** into guide pin receptacle **84** (**FIG. 3**). Guide pin receptacle **84** is attached to the primary side **80** of removable card guidance block **16** and has a guide pin aperture **82**. The

insertion of guide pin **52** into the guide pin aperture **82** aligns fastener **22** with the aperture **50**. The fastener **22** extends the entire length of the removable card guidance block **16** so that a user may attach the removable card guidance block **16** to the backplane **10** without removing cards from adjacent slots. This allows a user to change a single slot from a full height card configuration to: dual half-height card configuration while other cards in adjacent slots are in use.

[**0028**] In the example above, the guide pin **52** includes a conical shaped end **54**. In another example, the aperture **82** could include a conical shaped region to guide the guide pin **52**. In another example, the guide pin attaches to the removable card guidance block **16** and the guide pin retainer block **14** includes guide aperture configured to accept the pin.

[**0029**] A roll pin **56** ensures that the fastener **22** does not fall out of the removable card guidance block **16**. The roll pin **56** passes through a aperture **58** in the body **78** of removable card guidance block **16**. The fastener **22** includes a region of lesser diameter **66** between two regions **64** and **68** of full diameter. By positioning the roll pin **56** through the roll pin aperture **58** in a location where the fastener is of lesser diameter (i.e. region **66**), the pin **56** forms an aperture of a smaller diameter than the full diameter regions of the fastener **22** (i.e. regions **64** and **68**). As a user inserts the fastener **22** into removable card guidance block **16**, the region of the fastener **22** with a limited diameter **66** allows the fastener to be pushed into removable card guidance block **16**. However, if the roll pin **56** reaches the end of the region of lesser diameter **66** and hits the region **68** of average diameter the roll pin prevents the fastener **22** from being further inserted. In a similar manner, the roll pin **56** prevents the fastener **22** from pulling out of the removable card guidance block **16** when the roll pin **56** hits region **64**.

[**0030**] Alternately, the force to lock or seat the removable card guidance block comes from the shoulder **71** of fastener **22** seating on surface **63** of removable card guidance block. This method provides a circumferential shoulder between the screw and removable card guidance block reducing the risk of tipping or bending the plastic.

[**0031**] Once the removable card guidance block **16** is secured to the backplane **10** using the fastener **22**, a user inserts a card **30** into a slot **12**. A primary side **80**, the base **78**, and the spring side **60** form slot **12** to provide a separation into which the card **30** fits. The base forms the bottom/top horizontal surface of the slot **12**, while spring side **60** and primary side **80** oppose each other forming parallel vertical extensions perpendicular to base **78** defining the separation into which the card fits (i.e. defining a card guide slot **12**).

[**0032**] Spring side **60** includes an extension card guide region **72** and a spring region **62**. The extension card guide region **72** of spring side **60** includes two side extension pieces **74***a* and **74***b* forming the spring side of slots **12***a* and **12***b* respectively. The extension region **72** includes an angled outer region **76** used to guide the card into the card guide slot **12**. Since the angled region **76** makes the slot wider on the outer end, (where the user inserts the card **30**) it provides a lead-in feature for the user to more easily insert the card **30** into the slot **12**.

[**0033**] A spring region **62** provides macro alignment of the card **30** to the connectors in the backplane. A spring **18** attaches to spring region **62** using a lip **92** on spring **18**. Lip **92** extends around a side of spring region **62** (**FIG. 4**). The lip **92** includes an attachment aperture **90** that snaps into a raised tab **94** on the spring region **62**. The locking of the raised tab **94** into the attachment aperture **90** secures the spring **18** to the removable card guidance block **16**. Spring **18** biases the card **30** toward the primary side **80** of the removable card guidance block **16**. This biasing aligns a connector on the primary side of a card **30** with a connector in the backplane **10**. Since the spring **18** can be depressed in varying amounts and slot **12** is wider than the card, removable card guidance block **16** can accept cards of varying thickness. Thus, if the cards are not thicker than the card guide slot **12** in the removable card guidance block **16**, the removable card guidance block **16** can be used with a backplane without concern for the card thickness the backplane was configured to accept.

[**0034**] The spring **18** can be made of an electrically conductive material, or plastic provided it acts as a spring, moves the card, and returns to its original position after deflection. For example, the spring **18** can be made of beryllium copper stainless steel or spring steel. When the spring **18** is composed of an electrically conductive material, the guidance block **16** is composed of an electrically conductive material, and the block is grounded, the electrically conductive material provides an electrostatic discharge path from the card **30** to backplane **10**. The exact shape and attachment of spring **18** can vary. For example, the spring **18** can be adhesively bonded or affixed via fasteners to spring region **62**.

[**0035**] An electro-magnetic interference (EMI) gasket **82** attaches to the face **79** of removable card guidance block **16** and provides a continuous EMI shield of cascaded faceplates (**FIG. 2**). EMI gasket **82** has apertures to allow screw down of the cards at the faceplate to threaded female fasteners that are press fitted in the removable card guidance block **16**. The EMI gasket can be attached to the surface using adhesive.

[**0036**] In one example, the spring side **60**, primary side **80** and body **78** are molded from plastic producing a unitary piece having the features discussed above. Base **78** and sides **60** and **80** could instead be composed of multiple parts bonded together to form the desired structure. In another example, the base **78** and sides could be composed of metal or another firm material.

[**0037**] While in the example described above, each removable card guidance block **16** individually attaches to a backplane **10**, multiple removable card guidance blocks **16** can be grouped to form a larger unit. For example, a backplane might include eight card slots. Thus, a grouping of eight removable card guidance blocks **16** provides splitting of each full height slot into two half-height slots.

[**0038**] While in the example above a single removable card guidance block **16** is used to divide a full height card slot into two half-height card slots, the removable card guidance blocks **16** could be used to divide the full height slot into a variety of heights allowed by the backplane. For example, two removable card guidance blocks **16** could be used to divide a full height slot into three ⅓-height slots or three removable card guidance blocks **16** could be used to divide a full height slot into four quarter-height slots.

[**0039**] A number of embodiments of the invention have been described. Nevertheless, it will be understood that

various modifications may be made without departing from the spirit and scope of the invention. Accordingly, other embodiments are within the scope of the following claims.

What is claimed is:

1. A guidance block comprising:

a base;

a first set of opposing sides attached to a top side of the base, the first set of opposing sides providing a first separation configured to accept a first circuit card; and

a second set of opposing sides attached to a bottom side of the base, the second set of opposing sides providing a second separation configured to accept a second circuit card.

2. The guidance block of claim 1 wherein the first set of opposing sides accepts the bottom edge of a first circuit card and the second set of opposing sides accepts the top edge of a second circuit card.

3. The guidance block of claim 1 further comprising a spring member.

4. The guidance block of claim 3 wherein the spring member provides alignment of a primary side of the circuit card.

5. The guidance block of claim 3 wherein the spring member and the guidance block are comprised of an electrically conductive material.

6. The guidance block of claim 3 wherein the separation can accept multiple thicknesses of circuit card.

7. The guidance block of claim 1 wherein the base includes has an aperture to allow the guidance block to be removably attached to a backplane.

8. The guidance block of claim 1 further comprising an aperture in the base, and

a fastener, the fastener positioned in the aperture to attach the base to a backplane or midplane.

9. The guidance block of claim 8 further comprising a retaining pin, the retaining pin configured to prevent the complete removal of the fastener from the guidance block.

10. A card guidance system comprising:

a guide pin retainer block, the guide pin retainer block including an aperture configured to accept a fastener; and

a guidance block having

a base;

a first set of opposing sides attached to a top side of the base, the first set of opposing sides providing a first separation configured to accept a first circuit card; and

a second set of opposing sides attached to a bottom side of the base, the second set of opposing sides providing a second separation configured to accept a second circuit card.

11. The card guidance system of claim 10 wherein the guide pin retainer block includes apertures to allow the guide pin retainer block to be removably attached to a backplane or midplane.

12. The card guidance system of claim 10 wherein the guide pin retainer block includes a guide pin and the guidance block includes an aperture configured to accept the guide pin and align the guidance block to the guide pin retainer block.

13. The card guidance system of claim 10 wherein the guidance block includes a guide pin and the guide pin retainer block includes an aperture configured to accept the guide pin and align the guidance block to the guide pin retainer block.

14. The card guidance block of claim 10 wherein the guidance block includes a fastener such that the guidance block can be attached to the retainer block by inserting the fastener in the aperture configured to accept the fastener.

15. A card guidance system comprising:

a backplane including a guidance block, the guidance block including

a base;

a first set of opposing sides attached to a top side of the base, the first set of opposing sides providing a first separation configured to accept a first circuit card; and

a second set of opposing sides attached to a bottom side of the base, the second set of opposing sides providing a second separation configured to accept a second circuit card.

16. The card guidance system of claim 15 wherein the first set of opposing sides accepts the bottom edge of a first circuit card and the second set of opposing sides accepts the top edge of a second circuit card.

17. The card guidance system of claim 15 wherein the guidance block further comprises a spring member.

18. The card guidance system of claim 17 wherein the spring member provides alignment of a primary side of the circuit card.

19. The card guidance system of claim 17 wherein the spring member and the guidance block are comprised of an electrically conductive material.

20. The card guidance system of claim 19 wherein the guidance block is grounded and the electrically conductive material provides an electrostatic discharge (ESD) path.

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