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Model PB-24 24-channel mounting board for standard-size solid-state relay modules

Packing List Manual

Introduction

This document provides safety and installation information for the PB-24 solid-state I/O module mounting board.

Description

The PB-24 is an industry-standard baseboard that holds 24 standard-size solid-state I/O modules. (It also can accommodate SM Series miniature solid-state I/O modules.) The PB-24 connects I/O modules to a Keithley PIO-SSR Series digital I/O board or to a KPCI-3107/3108 analog/digital I/O board, via an intermediate accessory.

Safety summary

WARNING **Read and follow the "Safety Precautions" discussed at the end of this manual.**

This product is intended for use by qualified personnel who recognize shock hazards and are familiar with the safety precautions required to avoid possible injury. Read the operating and safety information carefully before using the product.

Users of this product must be protected from electric shock at all times. The responsible body must ensure that users are prevented access and/or insulated from every connection point.

Do not connect switching boards directly to unlimited power circuits. When connecting sources to switching cards, install protective devices to limit fault current and voltage to the card.

Installation

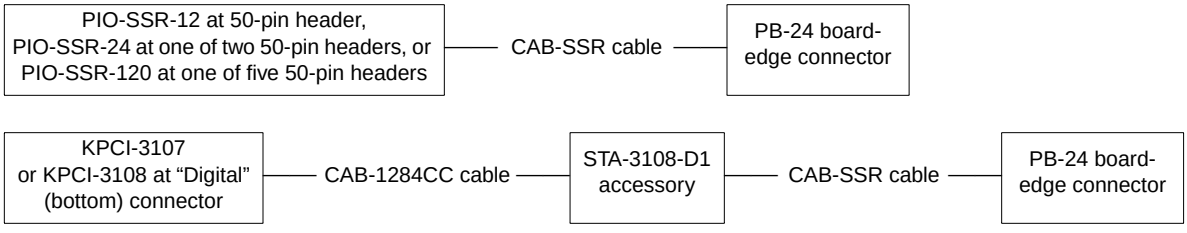
WARNING **Users of this product must be protected from electric shock at all times. The responsible body must ensure that users are prevented access and/or insulated from every connection point. In some cases, connections must be exposed to potential human contact. Product users in these circumstances must be trained to protect themselves from the risk of electric shock. If the circuit is capable of operating at or above 1000 volts, no conductive part of the circuit may be exposed.**

CAUTION **Ensure that computer power is turned OFF before installing the PB-24. Connecting the PB-24 to the computer while power is ON can damage your computer, the accessory, or both.**

Install your PB-24 accessory as follows:

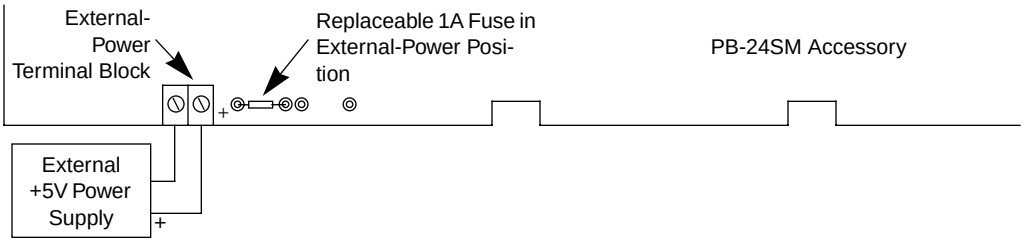
1. Shut down and turn OFF your computer, and turn OFF power to any circuits that are connected to the PB-24 accessory.
2. Connect the PB-24 accessory to your PIO-SSR Series board, KPCI-3107 board, or KPCI-3108 board as in Figure 1.

Figure 1
Connecting the PB-24 to PIO-SSR, KPCI-3107, and KPCI-3108 boards



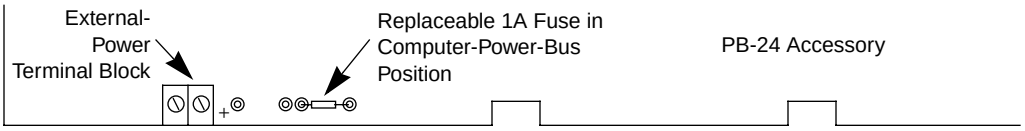
3. Inventory the spare current available at the computer +5V power bus. The spare current is the remaining current capacity that is not already used by the computer and all installed boards, including the PIO-SSR or KPCI-3107/3108 board.
4. Compare the spare current available at the computer +5V power bus with the total current required by the PB-24 and all modules that will be installed therein.
   - If the spare current available at the computer +5V power bus does not exceed the total current required by the PB-24 and all modules that will be installed—within a reasonable safety margin—do the following:
     a. Move the replaceable 1A fuse (Little Fuse 251001 or equivalent) to the position that is closest to the external-power terminal block. See Figure 2. This action disconnects the PB-24 accessory from the computer +5V power bus and connects it to the external-power terminal block.

Figure 2
Powering the PB-24 from an external +5V power supply



     b. Connect an unpowered (switch OFF) +5V power supply to the external-power terminal block, ensuring that you observe correct polarity. See Figure 2.
   - If the spare current available at the computer +5V power bus exceeds the total current required by the PB-24 and all modules that will be installed—within a reasonable safety margin—do the following: move the replaceable 1A fuse (Little Fuse 251001 or equivalent) to the position that is furthest from the external power terminal block. See Figure 3. This action connects the PB-24 accessory to the computer +5V power bus.

Figure 3
Powering the PB-24 from the computer +5V power bus



5. Install modules in the PB-24 according to Table 1, installing only input modules for ports that will be configured as input ports and only output modules for ports that will be configured as output ports.

CAUTION **Install only input modules or only output modules for all bits of any given port (port A, B, or C for the KPCI-3107/3108; port A, B, C-lower, or C-upper for the PIO-SSR.) The port configuration determines whether input or output modules are installed. For example, if port B is configured as an output port, the modules for bits PB0, PB1,... PB6, and PB7 must all be output modules. Failure to match all modules for a given port to the port configuration may result in damage to the PB-24, to the connected I/O board, or to both.**

6. Wire your external circuits to the PB-24 screw terminals according to Table 1, based on the input and output modules that you have installed.

Table 1

Correspondence between modules, wiring terminals, connector pins, and digital-I/O ports

Module number	Screw terminals connected to the external-circuit side of this module		Connector pins connected to the PIO-SSR or KPCI-3107/3108 side of this module (at module pin 4[1])		Corresponding digital-I/O bits at the PIO-SSR or KPCI-3107/3108 board	
	Screw terminal connected to pin 1 of module	Screw terminal connected to pin 2 of module	At the PB-24 end of the CAB-SSR cable (board-edge connector	At the 50-pin header end of the CAB-SSR cable	At the PIO-SSR board	At the KPCI-3107/3108 board
0	1	2	47	47	PA0	PB0
1	3	4	45	45	PA1	PB1
2	5	6	43	43	PA2	PB2
3	7	8	41	41	PA3	PB3
4	9	10	39	39	PA4	PB4
5	11	12	37	37	PA5	PB5
6	13	14	35	35	PA6	PB6
7	15	16	33	33	PA7	PB7
8	17	18	31	31	PB0	PC0
9	19	20	29	29	PB1	PC1
10	21	22	27	27	PB2	PC2
11	23	24	25	25	PB3	PC3
12	25	26	23	23	PB4	PD4
13	27	28	21	21	PB5	PD5
14	29	30	19	19	PB6	PD6
15	31	32	17	17	PB7	PD7
16	33	34	15	15	PC0	PA0
17	35	36	13	13	PC1	PA1
18	37	38	11	11	PC2	PA2
19	39	40	9	9	PC3	PA3
20	41	42	7	7	PC4	PA4
21	43	44	5	5	PC5	PA5
22	45	46	3	3	PC6	PA6
23	47	48	1	1	PC7	PA7

[1] Pin 4 of each module inputs/outputs the digital I/O signal to/from the module. Pin 4 is also connected to a 3.3kΩ pull-up resistor, which is in turn connected to +5V power.

Table 2 indicates how +5V power and the digital ground is connected to the PB-24 accessory and its installed modules.

Table 2
Correspondence between +5V power and digital grounds, connector pins, and module pins

+5V power and digital ground from the computer power bus (through the connected PIO-SSR, KPCI-3107, or KPCI-3108 board)	**Connector pins connected to computer +5V power bus and digital ground[1]**		**Pins of each module wired to +5V power and digital ground**
	At the 50-pin header end of the CAB-SSR cable	**At the PB-24 end of the CAB-SSR cable (board-edge connector)**	
+5V power	Pin 49	Pin 49	Pin 3, through LED[2] Pin 4, through 3.3kΩ pull-up resistor
Digital ground	All even-numbered pins	All even-numbered pins	Pin 5, directly

[1] Alternatively, the PB-24 can be hardware-configured such that +5V power is supplied from an external power supply. Refer to step 4 of the procedure above.
[2] The LED lights when the module has been actuated.

Safety Precautions

The following safety precautions should be observed before using this product and any associated instrumentation.

This product is intended for use by qualified personnel who recognize shock hazards and are familiar with the safety precautions required to avoid possible injury. Read the operating information carefully before using the product.

The types of product users are:

Responsible body is the individual or group responsible for the use and maintenance of equipment, for ensuring that the equipment is operated within its specifications and operating limits, and for ensuring that operators are adequately trained.

Operators use the product for its intended function. They must be trained in electrical safety procedures and proper use of the instrument. They must be protected from electric shock and contact with hazardous live circuits.

Maintenance personnel perform routine procedures on the product to keep it operating, for example, setting the line voltage or replacing consumable materials. Maintenance procedures are described in the manual. The procedures explicitly state if the operator may perform them. Otherwise, they should be performed only by service personnel.

Service personnel are trained to work on live circuits, and perform safe installations and repairs of products. Only properly trained service personnel may perform installation and service procedures.

Exercise extreme caution when a shock hazard is present. Lethal voltage may be present on cable connector jacks or test fixtures. The American National Standards Institute (ANSI) states that a shock hazard exists when voltage levels greater than 30V RMS, 42.4V peak, or 60VDC are present. **A good safety practice is to expect that hazardous voltage is present in any unknown circuit before measuring.**

Users of this product must be protected from electric shock at all times. The responsible body must ensure that users are prevented access and/or insulated from every connection point. In some cases, connections must be exposed to potential human contact. Product users in these circumstances must be trained to protect themselves from the risk of electric shock. If the circuit is capable of operating at or above 1000 volts, **no conductive part of the circuit may be exposed.**

Do not connect switching cards directly to unlimited power circuits. They are intended to be used with impedance limited sources. NEVER connect switching cards directly to AC mains. When connecting sources to switching cards, install protective devices to limit fault current and voltage to the card.

Inspect the connecting cables, test leads, and jumpers for possible wear, cracks, or breaks before each use.

For maximum safety, do not touch the product, test cables, or any other instruments while power is applied to the circuit under test. ALWAYS remove power from the entire test system and discharge any capacitors before: connecting or disconnecting cables or jumpers, installing or removing switching cards, or making internal changes, such as installing or removing jumpers.

Do not touch any object that could provide a current path to the common side of the circuit under test or power line (earth) ground. Always make measurements with dry hands while standing on a dry, insulated surface capable of withstanding the voltage being measured.

The instrument and accessories must be used in accordance with its specifications and operating instructions or the safety of the equipment may be impaired.

Do not exceed the maximum signal levels of the instruments and accessories, as defined in the specifications and operating information, and as shown on the instrument or test fixture panels, or switching card.

When fuses are used in a product, replace with same type and rating for continued protection against fire hazard.

Chassis connections must only be used as shield connections for measuring circuits, NOT as safety earth ground connections.

If a  screw is present, connect it to safety earth ground using the wire recommended in the user documentation.

The  symbol on an instrument indicates that the user should refer to the operating instructions located in the manual.

The  symbol on an instrument shows that it can source or measure 1000 volts or more, including the combined effect of normal and common mode voltages. Use standard safety precautions to avoid personal contact with these voltages.

The **WARNING** heading in a manual explains dangers that might result in personal injury or death. Always read the associated information very carefully before performing the indicated procedure.

The **CAUTION** heading in a manual explains hazards that could damage the instrument. Such damage may invalidate the warranty.

Instrumentation and accessories shall not be connected to humans.

Before performing any maintenance, disconnect the line cord and all test cables.

To maintain protection from electric shock and fire, replacement components in mains circuits, including the power transformer, test leads, and input jacks, must be purchased from Keithley Instruments. Standard fuses, with applicable national safety approvals, may be used if the rating and type are the same. Other components that are not safety related may be purchased from other suppliers as long as they are equivalent to the original component. (Note that selected parts should be purchased only through Keithley Instruments to maintain accuracy and functionality of the product.) If you are unsure about the applicability of a replacement component, call a Keithley Instruments office for information.

To clean an instrument, use a damp cloth or mild, water based cleaner. Clean the exterior of the instrument only. Do not apply cleaner directly to the instrument or allow liquids to enter or spill on the instrument. Products that consist of a circuit board with no case or chassis (e.g., data acquisition board for installation into a computer) should never require cleaning if handled according to instructions. If the board becomes contaminated and operation is affected, the board should be returned to the factory for proper cleaning/servicing.