The PSX-1,2,3,4 AC Series (Rev:H)*

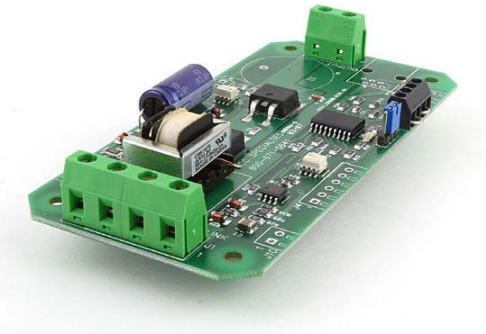
Intelligent, High Power AC, Solid State Circuit Breakers
Compatible with AC, TMCC and DCS
Quick Start: see Pg-6

★ Designed by Larry Maier ★ Developed by AHD ★ Patent Pending

PowerShield X Series

Versions Available:

PSX-1AC: One Output, PSX-2AC: Two Outputs, PSX-3AC: Three Outputs, PSX-4AC: Four Outputs:



All Solid State Operation: **Fast, solid state design with reliable quiet action….no clicks or sparks.**

Adaptive Load Reset: **Electronically determines if the overload is a real short or due to excess load in sound units or lighted passenger cars.**

Block Detection: **Either a photo cell or current can be used to detect a train in a block. The photocell can turn off the block.**

Over Voltage Protection: **If there is an over voltage on the track caused by a AC System failure or other power inputs the PSX will shut down and protect your locomotives.**

Range of Current Trip Setting: **The currents can be adjusted over a range of 4.8 to 17.8 amps. Values can be set using jumpers.**

Very Low Voltage Drop: **Breaker On resistance is less than 0.060 ohms, so the PSX has a low voltage drop even at high currents. Much better than detectors that use a diode voltage drop.**

Manual or Automatic Reset: **Automatic reset of the breaker after 2 seconds. A switch can be used for a manual reset.**

Outputs for LED Indicators: **LEDs can be added to monitor the input/output power and the status.**

Output for Audio Alert: **An audible sounder can be added to the card to alert if there is a short.**

No Power Supply Needed: Board size: **is 4.75 by 2.25 inches**

Flash Programmable: **Micro Processor can accept updated software if needed.**

Note: The PSX-1 operates by opening one side of the two inputs leads when an overload is sensed. If you have a situation where both sides of the input line need to be opened on an overload, use the PSX-AR instead of the PSX-1. The PSX-1 opens the path from J1-4 to J2-2 when the breaker senses an over load. Additional power to the PSX-2, 3, & 4 is connected by daisy chaining from J1, 1 and 2 to the next PSX J1, 3 and 4.

*Instructions by Don Fiehmann

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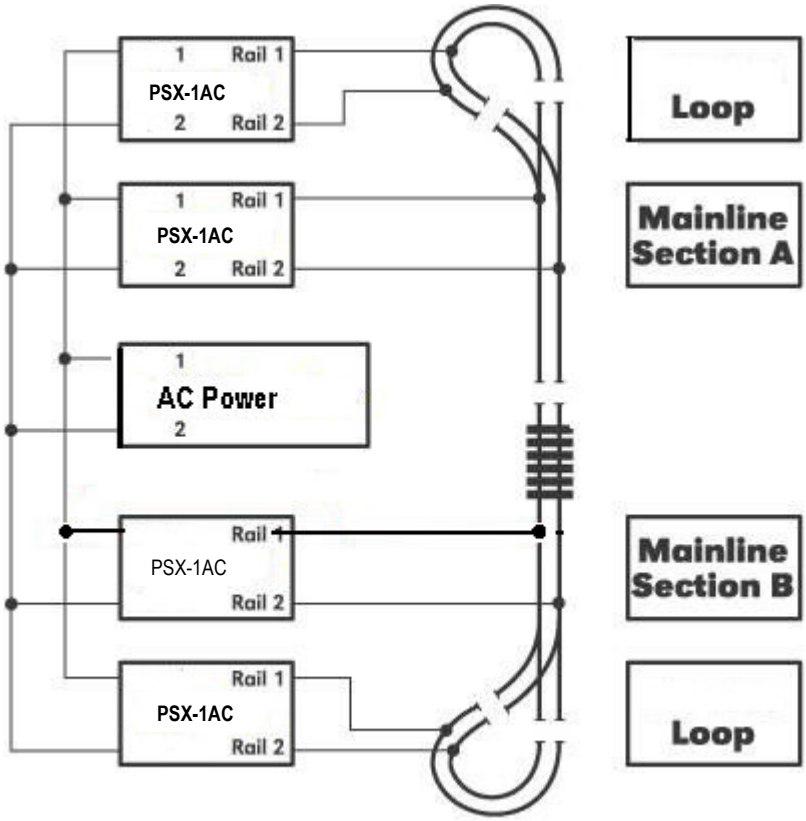
Why Divide my Layout? (Courtesy of Kalmbach Publications)

Though Command Control offers a more realistic type of train control – being able to run multiple locomotives independently on the same track – the electricity running through the rails of your layout still needs to be properly managed and distributed. Since one of the big selling points of Command Control is that you don't need to divide your layout into individual electrical blocks for independent train control, you're probably asking yourself, "why should I do it?" In addition to minimizing operating disruptions, power districts are also a key to AC power regulation. If you're running a lot of trains, you'll need to make sure your AC system can supply all your power needs efficiently and safely. Adding power districts to your layout by using Circuit Breakers can help with that. By separating your layout into districts, you divide the total track power available into smaller, more manageable units.

How do I Determine Power Districts?

There are really two types of power districts: those that are circuit breaker protected zones on the layout and those that have their own independent AC Power (also breaker protected). Probably the best way to determine where to place power districts is to take a look at the expected current draw, (Traffic), for each operating location on the layout. For example, a busy yard might have two switchers, one or more trains on the arrival and departure tracks, another train or two passing the yard on the main, and maybe a peddler working nearby local industries. If some or all of these trains have more than one locomotive, you could have 10 to 15 current-drawing units all competing for power in a fairly small area. Even assuming that the locomotives have efficient motors, this type of load may be heavy enough to slow down a AC system running on a common AC System. Generally, our experience has shown that in "O" if you have for a 12-14 awg buss and 18 awg feeders, that a 5 Amp system can support up to 5 0perators. Many users overestimate the amount of power needed. Try using the PSX Series first, then if your trains start to slow down you may need to add extra AC Power to support the concentration of trains in this location. By dividing a layout into power districts in this manner, and using a combination of AC Power Units and/or circuit breakers, you can make the most efficient use of available power on any mid-size or large-size layout.



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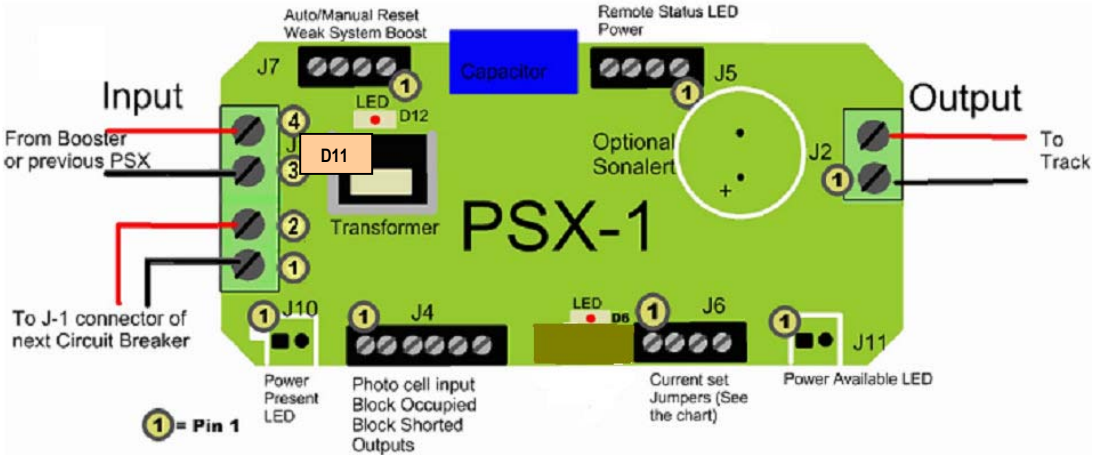
Power Shield X-1, 2, 3, 4 AC, Wiring:

Wire to the Power Shield should be heavy enough to carry the current. Size of wire depends on your scale. Too much resistance in the wire or rails can result in faulty short sensing. At a minimum, use, 12 Awg for O and G.

Note: The small black screw terminals shown in picture are optional accessories available from your dealer. The large green input/output terminals come with units. Generally the small terminals are not needed as most of these are one time connections and are easily soldered to the bd. Use a small iron (20W-40W) for soldering jumpers to the bd.



Connector Description

J1 Input Power Connector

J1-1 Connections for Daisy
J1-2 Chaining to next PSX
J1-3 AC Input 2
J1-4 AC Input 1

J2 Output Power Connector

J2-1 AC Output 2
J2-2 AC Output 1

J4 Block Occupancy

J4-3 + Block Occupied Output
J4-4 - Block Occupied Output
J4-5 + Block Shorted Output (A)
J4-6 - Block Shorted Output (A)

J5 Status Outputs (Remote)

J5-1 + Status LED Remote
J5-2 - Status LED Remote
J5-3 + Remote, power on output (A)
J5-4 - Remote, power on output (A)

J6 Trip Current Settings by Jumpers

J6-1-4 See Table Below

J7 Weak System Boost

J7-1 to J7-2 Open: Auto Reset
J7-1 to J7-2 Jumpered: Manual Reset (open to reset)
J7-3 to J7-4 Open Block Occupied trips at 30mA
Jumpered Block Occupied trips at 300 mA

J10 Power In: Indicator (Remote)

J10-1 + AC Power In, LED Remote
J10-2 - AC Power In, LED Remote

J11 Track Power On: Indicator (Remote)

J11-1 + Track On LED Remote
J11-2 -Track On LED Remote

D11 Voltage Limiter See Pg-3.

(A) =Transistor Type Open Collector Output

Connector J6	Terminal #1	Terminal #2	Terminal #3	Terminal# 4
4.8 Amps	None	None	None	None
8.0 Amps	Connect	Connect		
12.2 Amps			Connect	Connect
15.4 Amps	Connect	Connect	Connect	Connect

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Wiring Connections:

J1 – AC power input connections. It can be branched out to allow multiple connections to other breakers The **Power Link** makes it easier to connect to another breaker or See the diagram on previous page.

J2 –Circuit Breaker output to the track.

J4-1 and **J4-2** are the inputs for the photocell detector used for the stopping function. Note: Be sure there is sufficient light above the cell to trigger the circuit. The photocell sensitivity is calibrated each time it is armed. Silonex, NSL-6112

J4-3 (+) and **J4-4** (-) are open if the block is not occupied and are connected together (up to 5 mA) if the block is occupied. This is an opto-isolated output switch and provides no power.**J4-5** (+) and **J4-6** (-) are connected together (up to 5 mA) when the breaker has detected a short circuit and open with no short. This is an opto-isolated output switch and provides no power.

J5-1 (+) and J5-2 (–) are for a remote status LED. The LED is connected directly to the terminals. No resistor is required. ***Off*** means normal– ***Solid on*** means a short circuit.
J5-3 (+) and **J5-4** (-) are the remote power on output (open collector transistor)

J6 – Sets the current trip level. The (default) trip current is 4.8 amperes if no jumpers are installed. If J6-2 is connected to J6-1 and J6-4 to J6-3 is open, then the current trip is 8.0 amperes. If J6-4 is connected to J6-3 and J6-2 to J6-1 is open, then the current trip is 12.2 amperes. If J6-4 is connected to J6-3 and J6-2 is connected to J6-1, then the current trip is 15.4 amperes. See Table Pg-3. **Note:** Higher Amperages are available upon request.

J7-1 and **J7-2** are the auto/manual reset input. If the connections are open, the breaker will automatically try to reset every two seconds. If the terminals are connected together (like a SPST toggle switch or a N/C push button switch), then the breaker will remain off after a short until the connection is made.
J7-3 to J7-4 open Block Occupied (J4-3 +; J4-4 -) trips at 30mA. Jumpered Block Occupied trips at 300 mA

J10-1 (+) and J10-2 (-) are for a remote indicator showing AC power is available to the breaker.

J11-1 (+) and J1 1-2 (-) are for a remote indicator showing that the track outputs are on (or off).

D11 is a Transorb component near the input, it is a voltage limiter to protect for over voltage. It may start to clip/limit voltage if the input voltage approaches 20 volts AC. You may remove it at some point if you need higher voltage. If the Transorb fails, as evidenced by a burnt appearance, simply remove it.

User Guidelines:

Power Shields are designed so all input/output connections are made to the screw terminals. Use up to 12 AWG wire. If you are using heavier buss wire, then solder a short length of 12 AWG wire to your heavier buss. If your Power Sections and are greater than 10 Ft. long be sure to have at least 2 sets of track feeders for that section. Insufficient feeders will cause a voltage drop.
When setting up gaps for power sections, we recommended that the gaps be staggered about1/8".

Test your **PSX** installation prior to running a train as follows.

Observe that your AC System is not shorted. Use a suitable metal object to short the track.

If you short the output simulating a track short, the status **LED D6** should come on and **D7** near the output should be off.

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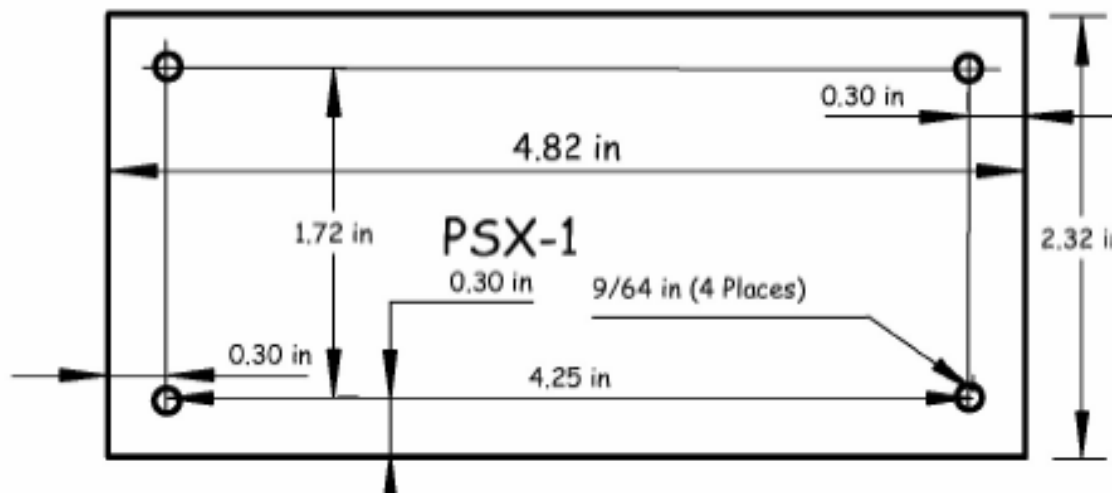
Mounting the PSX's

(1) The PSX's can be mounted using # 4 screws. Spacers or non-metal washers can also be used to provide clearance. There are four possible mounting holes, one in each corner



PSX Accessories:

(1) Photocells not shown, Silonex part number NSL-6112, Digikey.
(2) The Screw Terminals are available from your dealer.
(3) The Alarm is Digikey, 458-1005, also try your dealer.

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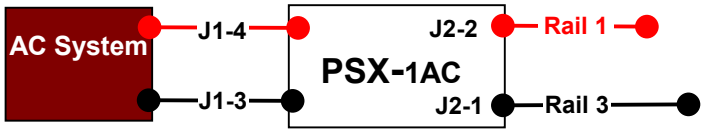
Quick Start

(A) All connections involve (2) Inputs from the AC System or the main line buss and (2) Outputs to the isolated track block!



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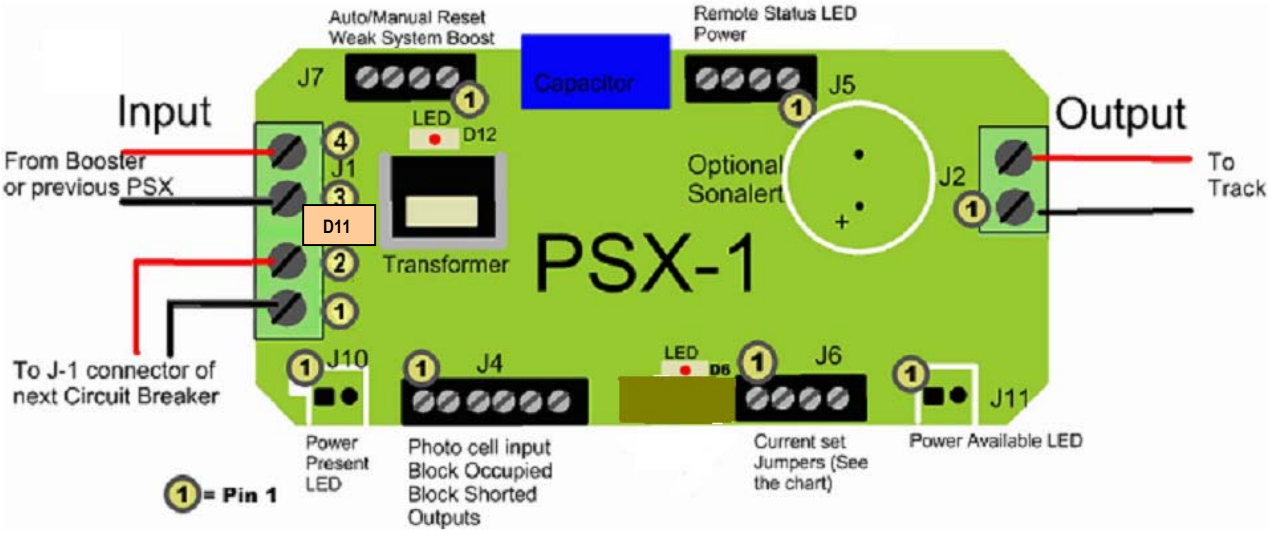
Also when wiring more that one PSX for multiple power districts insure that all input/output polarities are the same. The illustration above shows the polarity and matching connector pin #'s. For **Common Rail** wiring the J2-1 output (Lower) is common and not needed. Both J1 inputs are still required.

Be sure to connect the two wires from the AC System to the INPUT and the two wires to the track section to the OUTPUT connections. If you connect the AC Buss Power to the PSX's outputs you will damage the PSX!

When power is applied the red LED, D12 near the input and D7 near the output should be ***on.*** If the status LED D6 near the program jumper is ***on*** solid, you may have a short between the two wires from the output or in the track section.

If you short the output simulating a track short, the status LED D6 should come on and D7 near the output should be off.

Note: The small black screw terminals shown in picture are optional accessories available from your dealer. The large green input/output terminals come with units. Generally the small terminals are not needed as most of these are one-time connections and are easily soldered to the bd. Use a small iron (20W-40W) for soldering jumpers to the bd.



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