



The PSX-1, 2, 3, 4 Series

*DCC Circuit Breaker
Intelligent, Solid State*

Block Detection and Network Feed Back

Manual Rev M [10.17], Software Rev K [4.15]

**800.671.0641 info@dccspecialties.com*

**Designed by Larry Maier*

**Developed by DCC Specialties*

**US Patent 7,810,435*

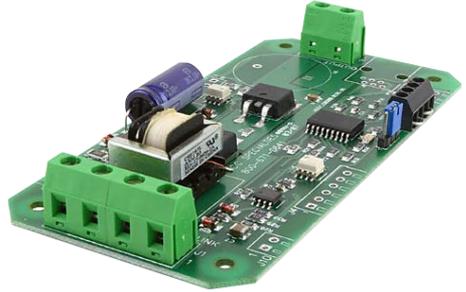
New Exclusive Digitrax Configuration

New Timing Delay Features

New Programmable Power Up Status

New Auto Stop

For DCC Use Only



The PSX series is a product of years of research into problems dealing with false overloads that cause premature shut down of DCC Boosters and other Circuit Breakers. These false overloads are caused by large capacitors used in sound systems, decoders and lighted passenger cars. The overload appears as a short circuit until the capacitors are charged. The logic on the PSX Series determines if the load is a true short or just an overload due to a discharged capacitor.

PSX Versions Available: PSX-1, PSX-2, PSX-3 & PSX-4

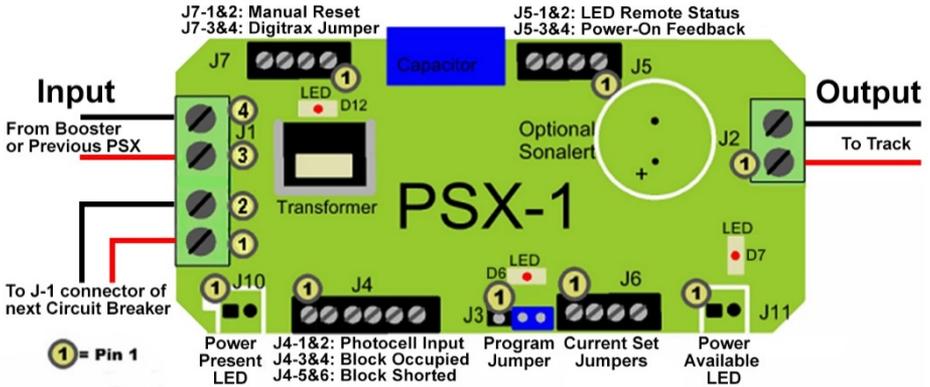
- *PSX circuit boards are perforated with score lines so you can physically separate and divide PSX-2, PSX-3 and PSX-4 into individual units if needed.*
- *All Solid State Operation: Fast, solid state design with reliable quiet action....no clicks or sparks.*
- *Adaptive Load Reset: Electronically determines if the overload is a real short or due to excess capacitance in sound decoders or lighted passenger cars.*
- *Special Digitrax Configuration Jumper: Optimize functionality with all Digitrax systems*
- *Programmable timing delay: Use the PSX as a fast blow or an adjustable slow blow fuse*
- *Auto Stop with DCC Reset: A photocell can be connected to a PSX input. Normally, covering the photocell will not cause any action. If the photocell is armed with a DCC command, the PSX will turn off the next time the photocell is covered. A DCC command can restore the track power when desired.*
- *Block Detection: Either a photo cell or block current draw can be used to detect a train in a block and to trigger a Block Occupied output. The current trigger level is programmable.*
- *Over Voltage Protection: The PSX incorporates a voltage suppression diode that limits voltage spikes on your layout.*
- *Wide Range of Current Trip Setting: The breaker trip current can be adjusted over a range of 1.27 to 10.2 amperes. With additional cooling, the PSX can handle up to 19.1 amperes.*

Trip current values are selected by setting a CV. Certain selected values can be set by placing jumpers on the board. Default trip current is about 4 amperes, which will work correctly for most layouts.

- **Very Low Voltage Drop:** Total breaker on resistance is less than 0.060 ohms, so the PSX has a very low voltage drop even at high currents. Better than detectors that use a diode voltage drop.
- **Manual or Automatic Reset:** Automatic reset: Breaker tries to reset every 2 seconds. The reset delay can be set to a different value by changing a CV. Manual reset: Once the breaker trips, it remains off, ensuring complete isolation of the faulty block. The breaker is reset either by a switch or by a DCC command.
- **Power On/Off by DCC:** Turn on/off output track power with your DCC Throttle!
- **Programmable Power Up Status:** When power is applied to the layout, the PSX can be set to always turn on, always remain off [power on as needed by DCC command], or to use the power status present when the layout was last shut down.
- **Outputs for LED Indicators:** Remote LEDs can be added to monitor the input/output power and the status.
- **Network Feedback:** Isolated outputs designed to provide Block Occupied, Block Shorted, and Power Status to a discrete interface for remote display or computer control. Will work with Digitrax LocoNet, NCE Cab Bus, ESU ECoS, and Lenz XpressNet interfaces.
- **System Reset:** CV63=42 sets all CVs and addresses to original factory values.
- **Output for Audio Alert:** An audible sounder can be added to the card to provide an audible alert if there is a short.
- **No Power Supply Needed:** The PSX uses the track DCC to supply its operating power. Each PSX draws less than 0.04 amperes.
- **Easy to install:** Board size is 4.75 by 2.25 inches with 4 mounting holes sized for a #6 screw.
- **Flash Programmable:** The PSX firmware can be updated as new features become available or if older units need to be matched to a recent purchase.

Instruction Manual Contents

- A. Quick Start
- B. User Guidelines
- C. How to Determine Power Districts
- D. PSX-1, 2, 3, 4 Wiring
- E. Terminal Wiring Descriptions
- F. Terminal Functions
- G. PSX Accessory Addresses
- H. Programming CV's & Values
- I. CV Settings
- J. Special Programming Instructions
- K. DCC System Sequential Programming Instructions



A. Quick Start

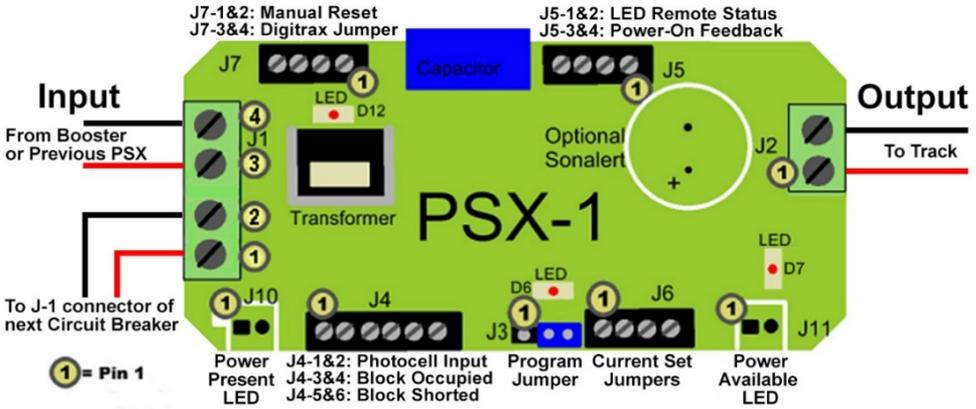
1. All connections involve two wire inputs from the DCC Booster [or Main DCC Power Bus] into a PSX and two wire Outputs to the isolated track block
2. All PSX circuit breakers are ready to operate without programming
3. **Digitrax users should install the Digitrax Configuration Jumper wire from Terminal J7-3 to J7-4. Once installed, move the program jumper to cover pins J3.1 and J3.2 and apply DCC power to J1. Wait until D6 stops flashing, remove power, and restore the Program Jumper to cover J3-2 and J3-3.**
4. NCE Power Cab users must do one [**NOT both**] of the following:
 - a. Install a jumper from J6-1 to J6-2
 - b. Program CV49=1
5. PSX are not compatible with Digitrax Analog Address [00] or any method that adjusts the "0" bit timing to allow operation of an analog engine.
6. Test the PSX for functionality:
 - a. Turn on DCC power to the PSX.
 - b. Verify D7 LED and D12 LED are ON and D6 LED is OFF.
 - c. Connect a wire from J2.1 to J2.2
 - d. Verify D12 is ON, D7 is OFF, and D6 is ON. You may see D12 and D6 pulse OFF periodically [VERY short time], this is the automatic reset.
 - e. Remove the wire from J2.
 - f. Verify D7 and D12 return to ON and D6 turns OFF.

Programming CV's & Values: Optional/Not Required!

Specific DCC Systems need to follow specific programming sequences to reliably program a PSX circuit breaker. See Section K for specific system instruction

The easiest way to program PSX circuit breakers is at your work bench. Programming CV values is done using the Programming On Main [POM] function. Refer to your DCC system manual for specific directions on how to perform Program On Main functions.

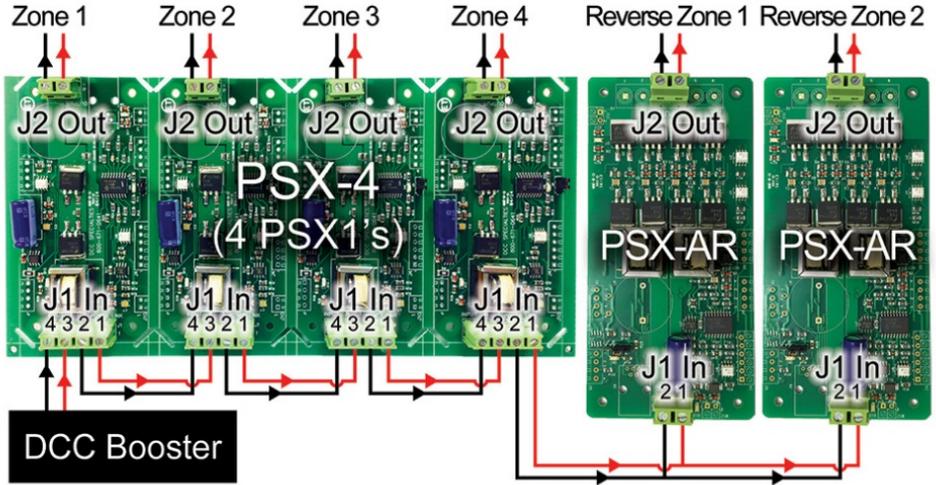
Determining the software revision of your PSX: The software revision of the PSX is easily determined. Simply place the unit in the program mode and turn it on. D6 will flash the Morse code pattern of the software revision letter. The PSX will flash long-short-long for revision K.



B. User Guidelines

- Before wiring, ensure the Programming Jumper is on pins J3.2 & J3.3 to operate [Pin J3.1 is nearest to the J4 connector]
- Cut isolating gaps in the rails between PSX zones, and stagger the gaps by about 0.75" [21mm]
- If you are using both PSX circuit breakers and PSX-AR auto reversers on a layout and the locomotive hesitates when crossing a reverse gap, program the PSX controlling the track adjacent to the PSX-AR:
 - Program CV55=1 [enable delay]
 - Program CV65=128 [delay=16ms]. CV65 may be any value from 1 to 255. The delay in milliseconds is the CV65 value divided by 8. Ideally CV65 should be the smallest value that consistently works correctly. CV65=128 should work for most layouts.
- Input and Output connectors J1 and J2 are designed to use 12 AWG to 22 AWG wire.
 - Turn the screw on the connector counter-clockwise while looking at the connector opening
 - Make sure the wire clamp is at the bottom of the connector opening.
 - Insert wire you are connecting, turn the connector screw clockwise to tighten.
- When wiring more than one PSX [PSX-2, PSX-3 PSX-4, etc.] insure all input/output polarities are the same
- If you are using a heavier bus wire such as 10 AWG, solder a short length of 12 or 14 AWG wire to your heavier bus to connect to the PSX terminal.
- We recommend rail drops to the track bus every 3-5 feet. Insufficient feeders can cause your track voltage to be significantly lower than your booster output voltage.
- The PSX Circuit breaker is designed to operate by opening one side of the two input leads when an overload is detected.
 - J1-1 and J1-3 are connected to J2-1 by a copper trace.
 - Any application where a common rail is used should connect the common rail to these terminals.
 - The connection from J1-2 and J1-4 to J2-2 is opened when the breaker trips or is turned off.

Wiring PSX Using Daisy Chain



9. Connect the two wires from the DCC Booster to the PSX J1-3 & J1-4 INPUT terminal
10. When Power is applied to the PSX, the D12 LED near the J1 Input and the D7 LED near the J2 Output should be on.
11. If the D6 LED near the J3 Programming Jumper is on solid, you may have a short between the two wires from the J2 Output or in the track section.
12. Test the PSX installation prior to running a train:
 - a. Observe your DCC booster is not shorted.
 - b. Use a suitable metal object to short the track.
 - c. The status LED D6 should come on and D7 near the output should be off.
 - d. Your booster should not trip during this test [D12 stays on].
13. If your booster does trip during this test [D12 goes off or flashes on and off], it may not be able to support automatic reset.
 - a. Install the Manual Reset jumper [J7-1 to J7-2] and repeat the test. Your booster should now remain on [D12 stays lit].
 - b. With the Manual Reset jumper in place, you can reset the PSX by sending an accessory ON command [check your system manual for correct key sequence] to accessory address 2042 [997 if you installed the Digitrax Jumper as defined in Section A].
 - c. With the Manual Rest jumper in place, you can also reset the PSX by connecting a Normally Closed push button in series with the Manual Reset jumper. Pressing the button will reset the PSX.

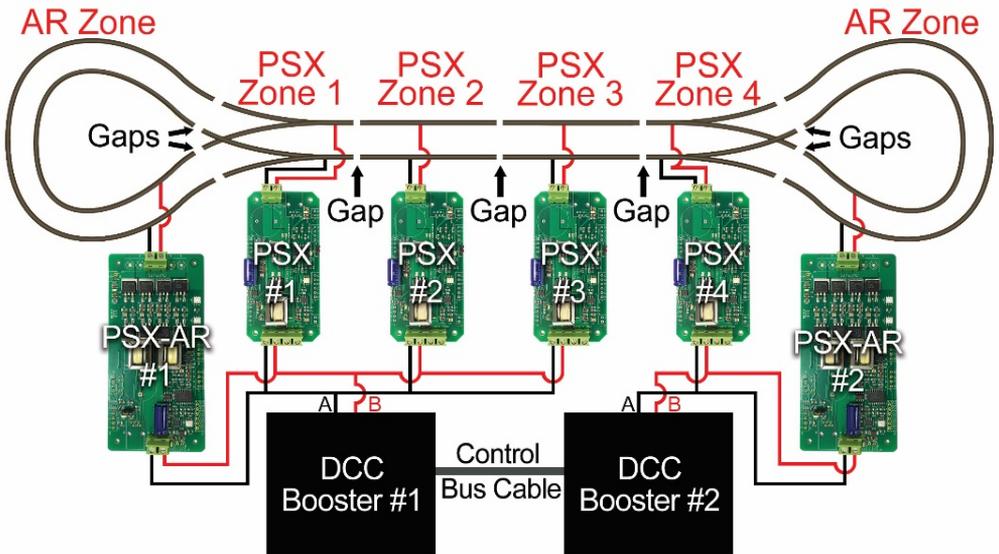
C. How to Determine Power Districts

There are two types of power districts: Single power district per booster or multiple power districts on a single booster. In either case, you want a PSX protecting each power district. If you have a single booster for a power district, you still want a PSX-1 protecting that district. The reason is that the protective circuitry in the booster is designed to protect the

booster, NOT your \$1000 fully lit, full sound, decoder equipped, fully detailed scale model. The PSX series IS designed to protect your models. For the multiple power district per booster, you want to use a PSX-2, PSX-3, or PSX 4. Each PSX feeds a district, and the inputs of the PSX are daisy chained together to a single booster.

Probably the best way to determine where to place power districts is to take a look at the expected current draw [primarily locomotive motors which use power] for each operating location on the layout. For example, a busy yard might have several 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 local working nearby 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. Assuming all the locomotives have efficient motors, this type of power requirement [amps] may be large enough to overload a DCC system powered from one 5 Amp booster. For example, if you have four PSX set to the default current, each PSX will trip at about 4 amperes. If each power district draws 3.5 amperes, that is a total of 14 amperes. None of the PSX will trip, but your 5 amp booster will certainly shut down. You can solve this by lowering the trip current on each of the four PSX, getting a booster with a higher current rating, or splitting the four districts on one booster to two districts on each of two boosters.

Multi-Booster Power District Schematic



Based on our experience, a typical HO scale 5 Amp system can support up to 10 operators using a 12-14 AWG bus and 20 AWG feeders. Many users overestimate the amount of Booster power needed. Try using the PSX Series first. If your DCC Booster overloads from excess current draw, you need to add an extra DCC Booster to support the concentration of trains in this location. By dividing a layout into power districts in this manner, and using a combination of boosters and circuit breakers, you can make the most efficient use of available power on any mid-size or large-size layout.

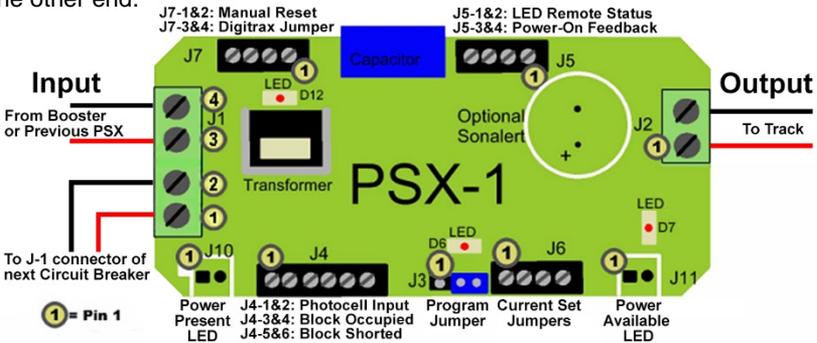
Another thing you want to keep in mind while designing power districts is how each district is used. In a yard area, for example, there is a higher risk of derailments occurring with their associated shorts. You might want to isolate this area into a separate district so that a short in the yard will not stop mainline operations.

D. PSX-1, 2, 3, 4 Wiring

Wire to the PSX should be heavy enough to carry the current efficiently. The size of wire depends on your scale. Too much resistance in the wire or rails can result in faulty short sensing, voltage drop and poor performance. At a minimum, we recommend the following stranded gauge wires to prevent potential problems:

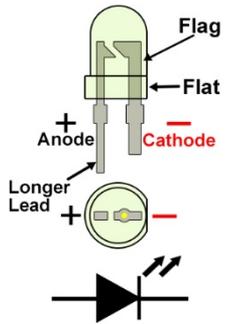
- N Scale 18 AWG bus, 22 AWG rail feeders
- HO Scale 14 AWG bus, 18 AWG rail feeders
- O Scale 12 AWG bus, 16 AWG rail feeders

We recommend using stranded pair wire such as speaker or lamp cord wire for bus wiring. If you're using two individual stranded wires, make sure to twist the wire 4 to 6 times every foot. You can make your own twisted pair wire by placing two ends of the wire in a drill bit, chuck the drill tight, and then turn on while you or something else holds the other end.



E. Terminal Wiring Descriptions

LED Orientation



J1 Input Power Connector

- J1-1 Connect to next PSX J1-3 [Power Link]
- J1-2 Connect to next PSX J1-4 [Power Link]
- J1-3 DCC Power Input 2 [from DCC Booster]
- J1-4 DCC Power Input 1 [from DCC Booster]

J2 Output Power Connector

- J2-1 DCC Power Output 2 [to track/bus]
- J2-2 Switched DCC Power Output 1 [to track/bus]

J3 Program Jumper

- J3-1 & J3-2 Place jumper on pins 1 & 2 for Programming
- J3-2 & J3-3 Place jumper on pins 2 & 3 for Operations

PSX LED Outputs do not require resistors

J4 Block Occupancy

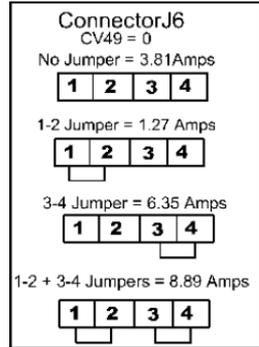
- J4-1 Photo Sensor Input [active]
- J4-2 Photo Sensor Input [return]
- J4-3 + [collector] Block Occupied Output [Network Feedback]
- J4-4 - [emitter] Block Occupied Output [Network Feedback]
- J4-5 + [collector] Block Shorted Output [Network Feedback]
- J4-6 - [emitter] Block Shorted Output [Network Feedback]

J5 Status Outputs [Remote]

- J5-1 + [anode] Remote Status LED
- J5-2 - [cathode] Remote Status LED
- J5-3 + [collector] Power On [Network Feedback]
- J5-4 - [emitter] Power On [Network Feedback]

J6 Trip Current Settings by Jumpers

- See Table to the right and also CV 49
- **Set trip current using either Jumpers or CV 49: NOT BOTH**



J7 Auto/Manual Reset & Digitrax Loconet Special Configuration

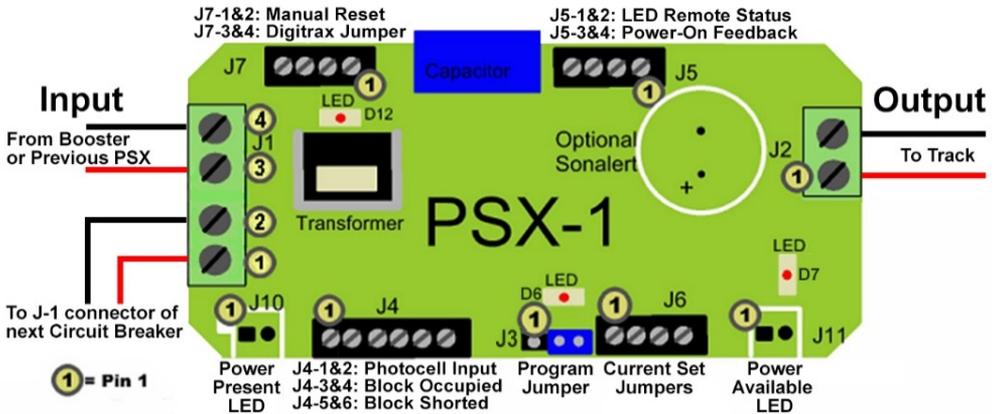
- J7-1 to J7-2 with No Jumper: Auto Reset [default]
- J7-1 to J7-2 with Jumper: Manual Reset [open to reset] The user can install a normally closed switch in series with the jumper. Open the switch to reset the PSX or send an accessory ON command to the PSX on-off command address [see Section B item 11]
- **J7-3 to J7-4 with Jumper: Digitrax Loconet Special Configuration [see Section A item 3]**

J10 DCC Power In Remote LED Indicator Output

- J10-1 + [anode] DCC Power In, LED Remote
- J10-2 - [cathode] DCC Power In, LED Remote

J11 Track Power On Remote LED Indicator Output

- J11-1 + [anode] Track On LED Remote
- J11-2 - [cathode] Track On LED Remote



*****PSX LED Outputs do not require resistors*****

F. Terminal Functions

J1 – DCC power input connections from the DCC booster. The J1 can be branched out to allow multiple connections to other PSX breakers and PSX-AR reversers. The Power Link [J1-1 & J1-2] makes it easier to connect to another PSX circuit breaker or PSX-AR auto reverser.

J2 – DCC track power output terminal from the PSX circuit breaker to the track.

J3 – Programming & Operation jumper. Normal operating configuration is when the jumper is in the J3-2 to J3-3 position. Place the jumper in the J3-1 to J3-2 position to enter programming mode.

J4-1 and J4-2 are the inputs for the photocell detector used for the stopping function and/or the block occupancy function. Note: Be sure there is sufficient light above the cell to trigger the circuit. The photocell sensitivity is calibrated to the local light intensity each time the photocell is armed. You can order the photocell sensor through Tony's Train Exchange.

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 optically isolated open collector transistor 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 during normal operation. This is an optically isolated open collector transistor 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. The remote LED will duplicate the state of D6.

J5-3 [+] and J5-4 [-] are for network power status reporting. They are connected together [up to 5 mA] when the PSX output switch is ON. This is an optically isolated open collector transistor and provides no power.

J6 – Sets the current trip level. When CV49=00 [default] the trip current is 3.81 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 1.27 amperes. This is the correct setting for the NCE Power Cab. If J6-4 is connected to J6-3 and J6-2 to J6-1 is open, then the current trip is 6.35 amperes. If J6-4 is connected to J6-3 and J6-2 is connected to J6-1, then the current trip is 8.89 amperes.

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 [default]. If the terminals are connected together with a SPST toggle switch or N/C push button switch, then the breaker will remain off after a short until the connection from J7-1 to J7-2 is momentarily opened or an accessory ON command is sent to the PSX on-off accessory address [see Section B item 13].

J7-4 to J7-3 is the **Digitrax Loconet Special Configuration** jumper. By installing this connection, all aspects of the PSX series are optimized to operate with Digitrax equipment. This includes the DCS50 and DCS51 as well as the DCS100, DCS200, DCS 210, DCS240 and the associated booster units. On Digitrax systems, setting OPSW #18

to “CLOSED” will extend the short circuit shutdown to 0.5 seconds. This will help prevent the booster from shutting down during a short circuit. See Section A item 3 for correct use of this jumper. Note: this jumper DOES NOT affect the PSX trip current. Depending on your device, you may also need to set the trip current by adjusting CV49 or installing jumpers in J6.

J10-1 [+] and J10-2 [-] are for a remote LED indicator showing DCC power is available to the breaker.

J11-1 [+] and J1 1-2 [-] are for a remote LED indicator showing track DCC power status [on or off].

G. PSX Accessory Addresses

See Section K: DCC System Sequential Programming Instructions for Setting Address and Programming CV's

Digitrax users install the Digitrax Configuration Jumper wire from Terminal J7-3 to J7-4 [see Section A]

The easiest way to address a PSX circuit breaker is at your work bench. The PSX's addresses are SET by moving the program jumper as described below and issuing an accessory command like operating an accessory by using your DCC Throttle.

There are three [3] accessory addresses used by the PSX. The third address is reserved for future functions.

G.1 Setting the Three Accessory Addresses:

1. Turn off power to the PSX
2. Place the J3 programming jumper on pins J3-1 & J3-2
3. Connect the DCC track power output of your DCC system to pins J1-4 and J1-3.
4. Turn power on to the PSX.
5. The next accessory command issued by the DCC system will be stored as the first address [track on/off].
6. Key in the first address you want to use and press either the ON or OFF accessory command [or the appropriate key for your throttle – see the chart below]
7. By default, the PSX will store the next two sequential addresses as the second and third PSX address.
8. If you don't want to use these values, then key in an address that you want to use for the second address and issue an ON or OFF command.
9. Repeat for the third address you want to use.
10. Each time you press the ON or OFF key with a new address, you should see D6 flash indicating that the PSX received the address and stored it.
11. Once you are happy with the addresses that you want to use, turn off the DCC power to the PSX.
12. Put the program jumper back to J3-2 and J3-3 unless you are going to program CV settings.

13. Note the default addresses are 2042, 2043, and 2044 unless you followed the Digitrax jumper directions in which case the defaults are 997, 998, and 999. If these are acceptable, you do not need to program the address.

Reference Chart for the Two Accessory Commands

Function	Default Address	New
Arm Photocell	2043 [998]	?
Track Power On/Off	2042 [997]	?

System	Normal [Clear]	Thrown
Digitrax	c or Closed	t or Thrown
Lenz	+	-
MRC	ON	OFF
NCE	Normal/ON/ 1	Reverse/OFF/ 2

The Table above shows how the DCC Manufactures identify the **Normal [Clear]** and/or the **Thrown** Route to operate accessories.

G.2 Using Accessory Addresses:

1. **The first PSX accessory address** [Default address 2042, 997 for Digitrax] lets you use DCC Accessory Commands to turn the PSX DCC output on and off.
2. **The second PSX accessory address** [Default address 2043, 998 for Digitrax] is used to arm the photocell circuit.
 - a. If the photocell is not armed [power on condition] then covering or uncovering the photocell has no effect.
 - b. Sending an ON accessory command to the second address [default 2043, 998 for Digitrax] arms the photocell.
 - c. When armed, the ambient light level at the photocell is measured.
 - d. If the ambient light level drops significantly [e.g. a train covers the photocell], the output of the PSX is turned off removing power from the track.
 - e. Once the output has turned off, the photocell reverts to being unarmed until the next arming command.
 - f. Track power can be restored by issuing an accessory ON command to the first PSX accessory address.
 - g. This is designed to allow you to stop a train at a known point on a hidden staging track. As the train enters the staging [or other] track, you issue the photocell arming command. When the train just covers the photocell, the PSX will turn off and the train will stop exactly at the photocell.
 - h. In order to leave the staging area, simply issue an accessory ON command to the first PSX accessory address. The PSX will apply power to the track and the train can be moved. Since the photocell is now disarmed, you can move the train over the cell without affecting the power status.

For all systems, whenever you enter an address or CV value, you should see D6 flash. This indicates the PSX has received the information, stored it, and verified the stored data match the data you sent.

3. **Advanced staging control** The photocell can act as a block occupied detector and a staging control at the same time.
- Connect a photocell between J4-1 and J4-2.
 - Connect the cathode [-] of an LED to J4-2 and the anode [+] to J4-4.
 - Install a wire between J4-3 and J6-2
 - Set CV50=1 and CV66=0.
 - This will set the photocell to also control the block detector output [which has the LED connected now] and will have the PSX power up with the output OFF so staging areas don't normally draw current.
 - When you arm the photocell with these settings, the LED will slowly flash indicating it is waiting for a train.
 - When a train enters the block and covers the photocell, the track power will turn off and the LED will change from flashing to steady indicating that a train is now in the block.
 - Further, the PSX has stored the last photocell calibration values, so you can shut down the layout with a train in the staging, and the PSX will remember to show block occupied the next time you power on.
 - As in the basic photocell control, simply send an accessory ON command to the first PSX accessory address and the block power will turn on. The occupied LED will remain on until the end of the train clears the photocell while the train is leaving the block.

H. Programming CV's & Values: Optional/Not Required!

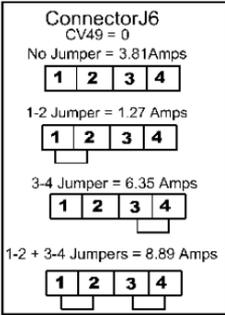
Specific DCC Systems need to follow specific programming sequences to reliably program a PSX circuit breaker. See Section K for specific system instruction

The easiest way to program PSX circuit breakers is at your work bench. Programming CV values is done using the Programming On Main [POM] function. Refer to your DCC system manual for specific directions on how to perform Program On Main functions.

- Turn off power to the PSX
- Place the J3 programming jumper on pins J3-1 & J3-2
- Connect the DCC track power output of your DCC system to pins J1-4 and J1-3.
- Turn power on to the PSX.
- Go into Program On Main mode [POM] for your particular DCC system.
- Enter any address NOT in use on the layout. The PSX does NOT use this address, but the POM function requires an address.
- Enter the CV number followed by the value. The small red LED [D6] on the PSX will blink each time a command is accepted and the CV value is stored correctly in the CV.
- If you make a mistake, don't worry, just go back and program the CV to the desired value.
- If you are hopelessly lost, set CV63 to 42 and you can start over again with factory default values.
- When done, turn power off
- Replace the program J3 jumper to pins 2-3.
- Turn power on to the PSX.

I. CV Settings

CV49 – sets the current trip value. If CV49=0, then the Trip Current jumpers on J6 are enabled. **Remember to use either the Jumpers or the CV settings, NOT BOTH!** The following trip currents can be set by programming:



CV49	Trip Current [Amps]	Continued	
		CV	Trip Current
00	3.81 or Per Jumper Chart		
01	1.27	08	10.2
02	2.54	09	11.4*
03	3.81	10	12.7*
04	5.08	11	14.0*
05	6.35	12	15.2*
06	7.62	13	16.5*
07	8.89	14	17.8*
		15	19.1*

***Caution:** continuous operations at a value higher than CV49=08, [10.2 amps] without the addition of heat sinks to the output transistors may overheat or damage the PSX. Heat sinks are available from DCC Specialties. PSX's can also be ordered with heat sinks installed by DCC Specialties.

Low Power System Trip Current Settings:

- For the Digitrax Zephyr [DCS50 & DCS51], setting values of CV49=01 or CV49=02 is OK.
- The NCE Power Cab should use a value of CV49=01.
- Most 5 amp boosters should be happy with CV49=03 or CV49=04.
- The default current is 3.81Amps.

CV50 is the block detection source selection.

- CV50=0 selects block current as the parameter to activate the Block Occupied [J4-3 and J4-4] output. See CV54.
- CV50=1 will use the photocell to activate the Block Occupied output when the photocell is covered. Note the photocell is self-calibrating and will adjust itself to the ambient light level at the time that the unit is turned on. [See also CV66 and CV67].
- The CV50 default is 0.

CV54 sets the current level at which the PSX turns on the Block Occupied output. This allows you to set a level above the leakage current on the track to prevent false indications.

- Valid CV54 values are 0 to 212 [4mA to 51mA].
- The CV54 default is 0 which will turn the Block Occupied output on at about 4mA block current
- Each increment [+1] of CV54 will increase the Block Occupied trip point by approximately 0.22mA

For all systems, whenever you enter an address or CV value, you should see D6 flash. This indicates the PSX has received the information, stored it, and verified the stored data match the data you sent.

CV55 determines the time between the occurrence of an over current condition [e.g. short circuit] and the removal of power from the PSX J2 Power Output Terminal.

- CV55=0. The PSX trip time is equivalent to a fast blow fuse. The output will turn off in less than 1ms after the over current condition occurs.
- CV55=1 The PSX will insert a delay between the time the over current condition occurs and the output turns off. If the current drops below the trip current set point [CV49] during the delay time, the output will not turn off. This is equivalent to the behavior of a slow blow fuse.
- If CV55=1, the length of the delay is determined by CV65.
- The CV55 default is 0 [see CV65 for default delay].

CV57 determines the amount of time in seconds that the Automatic Reset function will wait before trying to restore track power after an over current condition is detected and the PSX has tripped.

- The CV57 default value is 2.
- If you notice that your booster shuts down after several automatic reset cycles, try increasing the time between resets.
- If increased reset time does not solve the problem, you may need to use the Manual Reset mode [see Section B item 13].

CV63 initiates a PSX Factory Reset.

- Using the Program On Main programming mode of your DCC system, set CV63=42.
- You will see D6 flash.
- After D6 flashes, all CVs and addresses are returned to their original factory values.
- The CV63 default is 0. Setting CV63=42 will not change the CV value, but it will reset the PSX.

CV65 controls the length of delay enabled by CV55.

- Valid CV65 values are 1 to 255.
- The delay in milliseconds is the CV65 value divided by 8 [e.g. a value of 80 = 10ms delay].
- The ideal value for CV65 is the smallest value that still results in reliable layout operation.
- If you are experiencing nuisance trips, try increasing CV65 by 8 until the nuisance trips stop.
- A value of CV65=128 should work for almost all layout problems. Remember, the PSX is supposed to turn off when it sees too much current. A “nuisance” trip is still an over current condition. Make sure the “nuisance” condition is acceptable before you increase the trip delay of the PSX and hide a real layout issue.
- The CV65 default is 24 which will be a delay of approximately 3ms. It is selected as the minimum delay to use in conjunction with a PSX-AR, although your layout may require more delay.

CV66 controls how the PSX outputs power to the track when the associated booster is turned on.

- CV66=0 The PSX output will always be OFF after the booster powers up. This is useful for staging and storage yards or similar layout sections where there is no point in using booster power for equipment that will not be running. When needed, the PSX is turned ON by an Accessory Command.
 - If a photocell is connected and CV50=0, then the photocell will always be calibrated and disarmed. It will only control power output.
 - If a photocell is connected and CV50=1, the photocell is enabled to control both the PSX power output and the PSX Block Occupied output. With this option, the photocell remembers its calibration at booster shutdown so that the next power on session it will correctly identify if the block is occupied [photocell covered] or not [photocell uncovered]. The photocell is NOT calibrated and is disarmed
 - If CV50=1, Block Occupied will flash when the photocell is armed. It will become steady [on without flashing] when the photocell is covered and the PSX output is switched OFF [stopping train over photocell; Block Occupied indicating OCCUPIED].
- CV66=1 The PSX output will always be ON after the booster power up.
 - If a photocell is connected, it will always be calibrated and disarmed regardless of the value in CV50
- CV66=2 The PSX output will assume the same state it was in when the connected booster was last turned off.
 - If the stored power down state is OFF, the PSX will behave the same as if CV66=0
 - If the stored power down state is ON, the PSX will behave the same as if CV66=1
- CV66 default is 1. The PSX will always power up and the photocell [if present] will always calibrate and be disarmed.
- In the event that the photocell is calibrated while covered, it will mis-calibrate [it assumes it is uncovered]. In most cases, simply waiting until the next time the photocell is armed will solve the problem since it will perform a calibration before arming. If you want to calibrate the photocell but NOT arm it, send an accessory OFF command to the second PSX address. Make sure the photocell is uncovered when you issue the command. This is useful if you are using the photocell for block occupancy detection.

CV67 is used to inhibit flashing of the Block Occupied output when the photocell is armed.

- If CV50=1 and CV66=0, the Block Occupied output will flash whenever the photocell is armed. The PSX power output is on.
- The flashing can be inhibited by setting CV67=1. Any other value of CV67 will enable the flashing.
- CV67 default is 0 [flashing enabled].

Determining the software revision of your PSX: The software revision of the PSX is easily determined. Simply place the unit in the program mode and turn it on. D6 will flash the Morse code pattern of the software revision letter. For example, the PSX breaker will flash long-short-long for software revision K.

For all systems, whenever you enter an address or CV value, you should see D6 flash. This indicates the PSX has received the information, stored it, and verified the stored data match the data you sent.

J. Special Programming Instructions

Specific DCC Systems need to follow specific programming sequences to reliably program a PSX. See Section K for specific system instruction

All systems: Program CV's using POM. Do not use Program track or accessory programming.

Digitrax: Install the Digitrax Configuration Jumper wire from Terminal J7.3 to J7.4

By installing the Digitrax Configuration jumper connection, all aspects of the PSX series are optimized to operate with Digitrax equipment. This includes the DCS50, DCS51, DCS100, DCS200, DCS210, DCS240 and the associated booster only units. As a result of these changes, it is recommended that any layout using Digitrax equipment should install this jumper. Note that the configuration jumper does NOT affect the trip current setting. You will still need to select the trip current you want to use.

When the J7-3 & J7-4 jumper is installed and the PSX is placed in Program mode, the default addresses of the PSX are automatically changed to allow the Digitrax system to access these functions directly:

- 997 [on/off – first address]
- 998 [photo cell arm – second address]
- 999 [switch control PSX-AR only – third address]

If the PSX is reset [CV63=42], the default address will be 2042, 2043 & 2044. These addresses are not accessible to the Digitrax equipment. Under this condition it is necessary to:

1. Remove power from the PSX while in Program mode
2. Re-apply the power in Program mode with the Digitrax Configuration jumper on pins J7-3 & J7-4
3. This will program the Digitrax default addresses again [997, 998, 999]

Note that if the J7-3 & J7-4 jumper is absent and the PSX is placed in program mode, the 997, 998, & 999 sequence will be changed back to the normal default of 2042, 2043, & 2044. If the PSX has been programmed to an address other than one of the two default address sequences, the presence or absence of the jumper will have no effect on the stored addresses.

For all systems, whenever you enter an address or CV value, you should see D6 flash. This indicates the PSX has received the information, stored it, and verified the stored data match the data you sent.

At power up, Digitrax systems place several commands on the track bus intended for use by other Digitrax accessories. These signals appear to the PSX as an accessory address. In order to prevent these addresses from incorrectly programming the PSX, a PSX will not accept a command to program an accessory address above 999 when the Digitrax Configuration Jumper is installed.

With the Digitrax Configuration Jumper installed, the PSX uses a different turn on algorithm that enhances the ability of the Digitrax equipment to turn on multiple sound decoders without difficulty.

Lenz:

The Lenz system sends repeat accessory commands as long as you hold down the 1 or 4 command key. This ensures that the accessory decoder sees the message, but can result in the same address stored multiple times while programming a PSX. The solution is simple:

1. Hold the 1 or 4 key down for only a short time.
2. Release the control key Once you see the PSX's D10 LED flash indicating an address has been stored.
3. If you see multiple flashes, you have stored the same address more than once.
4. Since the PSX will flash D10 each time you send it an accessory address, you can easily get a feel for the timing involved.
5. In normal operating mode [not programming mode], select an accessory address that has not been programmed into the PSX.
6. Send an accessory command to this address and hold down the 1 or 4 control key.
7. D10 will flash each time the command station repeats the accessory address. This will give you a feel of how long to hold the control key while you are programming to avoid storing multiple addresses.

For all systems, whenever you enter an address or CV value, you should see D6 flash. This indicates the PSX has received the information, stored it, and verified the stored data match the data you sent.

K. DCC System Sequential Programming Instructions for Setting Address and Programming CV's

Digitrax Using the DT400/402/500 Setting PSX Addresses:

1. Disconnect PSX from DCC power
2. Move PSX Jumper to Program Position Pins 1 & 2
3. Turn DCC power on "PWR" + "Y+"
4. After 30 seconds, reconnect DCC power
5. Press "SWCH" key to enter Switch Mode
6. Select the switch number to be set using the keypad or RH knob.
7. Press either the "OPTN" or "CLOC" key to set address.
8. Repeat steps 6 and 7 until all addresses set.
9. Press "EXIT" key to return to LOCO mode.
10. Turn DCC power off "PWR" "N-".
11. Move PSX J3 Jumper to Run Position
12. Turn track power on.
13. Test the switch address setting by using the "SWCH" key and switch addresses.

Digitrax Programming PSX CVs: Using DT400/402/500 Do Setting Addresses First

1. Disconnect PSX from DCC power.
2. Move PSX J3 Jumper to Program Position Pins 1 & 2
3. Turn DCC power on "PWR" "Y+"
4. After 30 seconds, connect DCC power to the PSX
5. Select an unused locomotive number with the keypad or RH knob.
6. Press "PROG" key until you get from Pg to Po
7. Use LH throttle dial to set the CV # and the RH throttle for the CV value.
8. Press ENTER
9. Repeat steps 7 & 8 until all the CV values are set.
10. Press EXIT
11. Turn DCC power off "PWR" "N-".
12. Move PSX J3 Jumper to Run Position
13. Turn track power on.

Lenz Setting PSX Addresses: Using the LH100

1. Turn DCC power off.
2. Move PSX J3 Jumper to Program Position Pins 1 & 2
3. Turn DCC power on
4. Press "F5" key to select "SW" mode.
5. Enter the switch number to be set using the keypad
6. Press ENTER.
7. Press either the "+" or "-" key to set the address. Let LED blink once.
8. Press the "CI" key to enter another address.
9. Repeat steps 5-7 until all addresses are set.
10. Press "ESC" key to return to normal.
11. Turn DCC power off.
12. Move PSX J3 Jumper to Run position Pins 2 & 3
13. Turn track power on.
14. Test the switch address setting using "SW" mode and the new switch address[es].

For all systems, whenever you enter an address or CV value, you should see D6 flash. This indicates the PSX has received the information, stored it, and verified the stored data match the data you sent.

Lenz Programming PSX CVs: Using the LH100

1. Turn DCC power off.
2. Move PSX J3 Jumper to Program Position Pins 1 & 2
3. Turn DCC power on.
4. Select a locomotive number with the keypad that is unused on your layout.
5. Press the "F" keys and the "+" or "-" key to select "POM" mode then hit "Enter".
6. Press "+" or "-" until "CV" is displayed then press "Enter".
7. Press the desired CV number
8. Press "Enter"
9. Enter the CV value to change
10. Press "Enter".
11. The display will show the CV number and value to be programmed.
12. Press "Enter" to program the CV, note the LED on the PSX flashes when the key is released
13. Press "Esc" key to return to Step 7] or press "Esc" three times to exit CV programming
14. Turn power off
15. Move PSX J3 Jumper to Run position Pins 2 & 3

NCE Setting PSX Addresses: Using Pro Cab or Power Cab

1. Turn DCC Power off.
2. Move PSX J3 Jumper to Program Position Pins 1 & 2
3. Turn DCC Power on.
4. Press SELECT ACCY.
5. Enter the new switch number using the numerical keypad.
6. Press ENTER
7. Press either 1 or 2 to set the address.
8. Repeat steps 4 thru 6 until all of the switch addresses are set.
9. Turn DCC Power off.
10. Move PSX J3 Jumper to Run position Pins 2 & 3
11. Turn DCC Power on.
12. Test the switch setting using the SELECT ACCY key.

NCE Programming PSX CV's: NCE Pro Cab or Power Cab

1. Turn DCC Power off.
2. Move PSX J3 Jumper to Program Position Pins 1 & 2
3. Turn DCC Power on.
4. Use SELECT LOCO to address an unused locomotive number.
5. Press PROG/ESC key to enter PROGRAM ON MAIN mode.
6. Press ENTER to select any unused locomotive number
7. Press ENTER again.
8. Press 2 to enter PROG CV NUM.
9. Enter CV number
10. Press ENTER.
11. Enter value to be stored
12. Press ENTER.
13. Repeat steps 8 and 9 until finished.
14. Press PROG/ESC to return to normal operation.
15. Turn power off
16. Move PSX J3 Jumper to Run position Pins 2 & 3
17. Turn power on.
18. Test the PSX using the SELECT ACCY key.

For all systems, whenever you enter an address or CV value, you should see D6 flash. This indicates the PSX has received the information, stored it, and verified the stored data match the data you sent.

MRC Setting PSX Addresses: Using the Prodigy Advance Cab

1. Turn DCC Power off.
2. Move PSX J3 Jumper to Program Position Pins 1 & 2
3. Turn DCC Power on.
4. Press ACCY key.
5. Enter the new switch number using the numerical keypad.
6. Press ENTER
7. Press either 1 or 2 to set the address.
8. Repeat steps 4 thru 6 until all of the CV value are set.
9. Turn DCC Power off.
10. Move PSX J3 Jumper to Run Position Pins 2 & 3
11. Turn DCC Power on.
12. Test the switch setting using the ACCY key.

MRC Programming PSX CVs: Prodigy Advance Cab

1. Turn DCC Power off.
2. Move PSX J3 Jumper to Program Position Pins 1 & 2
3. Turn DCC Power on.
4. Press LOCO to address an unused locomotive number.
5. Press PROG key to enter PROG MAIN TRACK mode
6. Press ENTER.
7. Continue to press ENTER until CV# is in the display.
8. Enter the CV number
9. Press ENTER.
10. Enter the value to be stored in the CV
11. Press ENTER.
12. Repeat steps 8 and 9 until finished.
13. Press ENTER to return to normal operation.
14. Turn power off
15. Move PSX J3 Jumper to Run position Pins 2 & 3
16. Turn DCC power on.
17. Test the PSX using the ACCY key.

For all systems, whenever you enter an address or CV value, you should see D6 flash. This indicates the PSX has received the information, stored it, and verified the stored data match the data you sent.

Audible Short Indication The two holes inside the circle [U8] on the top of the board are for use with an audible short indicating device. It is designed for use with part no. ttxsonalert. The device is installed with the [+] terminal in the square hole.

**You can obtain these components for all PSX devices from
American Hobby Distributors: 800.671.0641 info@dccspecialties.com**



Part no. ttxsonalert
Audio Alert



Part no. screwtermkitpsx1
Screw Terminal Kit for PSX



Part no. dsppsx.pb
Reset Push Button Switch