

PM4 INSTRUCTIONS

The PM4 can control 4 independent power sub-districts that can each be set up as either a "Short Circuit Manager" (default) or an "Auto-Reversing Controller." A separate booster can power each of these sub-districts or multiple boosters can power any combination. Each PM4 requires a 12 to 18 VAC or DC 125ma minimum power supply (sold separately such as Digitrax PS12). One power supply (125ma per PM4) can power more than one PM4 as long as it provides 125ma per PM4 and is not used to power any other device. **Note: Do not share a power supply between a booster and a PM4, use a separate power supply for the PM4.**

Terminology

Power District or District: The power wiring, components and equipment attached to that wiring that are driven from a single properly isolated booster. In the case of the PM4 a district is a part of the layout that is double gapped at both ends and powered by a single booster.

Sub-district: A subdivision of a district. With one PM4, you can create 4 sub-districts. These 4 sub-districts can all be within one district powered by one booster or they can be spread over more than one district.

Section: One fourth of a PM4. Each PM4 is divided into 4 sections. We call these Section 1, Section 2, Section 3, and Section 4. Each section of a PM4 can be set up either for short circuit management or auto-reversing.

PM4 WIRING (See Tables 1 & 2 and Wiring Examples)

- 1) Before installing the PM4 on your layout, be sure that your boosters shut down correctly when a short circuit occurs. To do this, short the track in each power district. Use a coin or screwdriver blade across the tracks in several locations within the district to create a short circuit. The booster in the shorted district should beep and shut down each time you short the track, the other boosters and districts will continue to run. Once the short is cleared, the booster that was shorted should automatically resume operation. If the booster does not shut down as described, then more or heavier feeder wires or bus wires may be necessary to correct this.
- 2) Connect the wires from the booster's Rail A & Rail B outputs to the Rail A & Rail B inputs for one section of the PM4 that will be powered by that booster. (See Tables 1 & 2 for connection details for each PM4 section). You can use a different booster to drive each of the PM4's four sections if desired.
- 3) Wire at least one of the PM4's ground connections (Pin B or X) to the Digitrax booster ground, common (or case) of the boosters.
- 4) Wire the PM4's Track Outputs A&B to the A&B rails of the track to be controlled.
- 5) To make a PM4 section "AutoReversing" first, connect the "REV" pins and adjacent "TRK OUTPUT" pins on the 44 -pin connector for that PM4 section as shown in the wiring examples. Then, set the related op switch (OPSW) for Auto-reversing. (See Table 3 for OPSW number). See PM4 OPSW Set Up on next page.
- 6) Connect a 12V-18V AC power supply to the AC1 (Pin 3) and AC2 (Pin C) terminals of the 44-pin connector. This powers the PM4(s). Multiple PM4 units can be supplied by a single power supply as long as you provide 125ma for each PM4. This supply should not power or be shared by any devices other than PM4s.

Tracks should be double gapped between adjacent power districts.

Be sure the 44-pin connector is plugged in to the PM4 with the numbered pin labels on the component side of the board.

PM4 OPSW SET UP

Table 3 shows how to use the PM4's Option Switches (OPSWs) to set up your PM4. Connect a DT series throttle (with battery installed) to the LocoNet connector on your powered PM4 to read back and make changes to the PM4's option switches (OPSWs). The factory default setting on all PM4 OPSWs is "thrown" or "t". This setting will operate each section of the PM4 as a short circuit manager. For parts locations refer to the drawing on the front page of these instructions. To change OPSWs:

- A) Enter Option Switch mode by pressing the "OPTION" button on the PM4 for about 1 second and then releasing it. The green "ID" LED and red "OPTION" LED will flash alternately to indicate that OPSW setup mode is active.
- B) Connect a DT series throttle to the PM4's LocoNet connector. If the PM4 is not connected to a working LocoNet, position the LocoNet termination jumper, located behind the RJ12 sockets, across both pins. If the PM4 is connected to a working LocoNet, the LocoNet termination jumper is not needed. Because we use the throttles' switch control mode to change the PM4's OPSWs, when you are connected to LocoNet and the layout, each time you change the PM4's option switch settings you will also send switch commands to the layout.
- C) Enter switch control mode on the throttle. Select the switch address that corresponds to the OPSW number you want to change. Press the "c" or "t" button to set the OPSW as desired.
- D) When OPSW set up is complete, press the "OPTION" button and the PM4 will exit OPTION mode. Open the LocoNet jumper behind the RJ12 sockets if it was used (leave the jumper attached to one pin so that you don't lose it.)

PM4 "BOARD ADDRESS"

The PM4 will operate with no connection to LocoNet. If connected to LocoNet, it sends information to the system as faults are detected, cleared, and when Auto-reversing occurs. If you wish to report PM4 status to LocoNet and attached devices or computers that can interpret these messages, you must set up a unique **Board Address** for each PM4. To set up the board address, connect a DT series throttle to the LocoNet port on your PM4. If the PM4 is not connected to a working LocoNet, position the LocoNet termination jumper, located behind the RJ12 sockets, across both pins. If the PM4 is connected to a working LocoNet, the LocoNet termination jumper is not needed.

- E) Press and hold the "ID" button behind the green LED for about 1 second. The green "ID" LED will blink when the button is released. This indicates that the PM4 is in board address setting mode.
 - F) Enter switch control mode on the throttle. Select the switch address that corresponds to the board address you want to assign to the PM4. Press the "c" button to issue a "closed" command. This will set the board address the same number as the switch address you selected. The green "ID" LED will change to steady green indicating PM4 Power ON and that address setting mode is complete. Be sure to reconnect to LocoNet and remove the jumper behind the RJ12 sockets, if you used it.
 - G) To exit address setting mode with no changes, press the "ID" button a second time and hold it for about 1 second. Be sure to reconnect to LocoNet and remove the jumper behind the RJ12 sockets, if you used it.
-

PM4 OPERATION

Short Circuit Management

When the PM4 detects a short circuit, it will shut down the sub-district where the short occurs. The "STATUS" LED for the district with the fault will light red. The other sub-districts will continue to operate.

Note: If running trains (like lighted passenger trains) with many incandescent light bulbs, it may be necessary to slow the short circuit detection time by "closing" the appropriate Option Switch for the each section of the PM4 (See Table 3 for OPSW details).

Auto-Reversing

When a train enters a PM4 reverse section sub-district that is set up for "Auto-Reversing" and there is a polarity mismatch, the PM4 will automatically change the polarity of that sub-district and the train will continue to run through the reversing track section. The "STATUS" LED for that sub-district will light red or go off, depending on the polarity needed to correct the auto-reverse polarity mis-match.

Note: When a sub-district of the PM4 is set up for "Auto-Reversing" it will no longer be a "Short Circuit Manager", however it can be protected by one of the other sections of the same PM4 . (See wiring example D)

Since the PM4 operates "downstream" of the Digitrax boosters it is *constrained* by the operating characteristics of the boosters; i.e. the current available during a short circuit and the timing setup of the boosters. A correctly wired and configured PM4 will operate before booster fault shutdown and disconnect a load it detects as a "short circuit". The PM4 will automatically attempt to reconnect a faulty circuit approximately every 2 seconds until the fault clears.

The PM4 factory default for trip current is set at 3 amps. This will work for most boosters and layouts. If you have many locomotives running or other large power draws in a sub-district or you need to use currents higher than 3 amps, you can modify the current threshold for the PM4 to any value between 3 amps and 12 amps, in increments of about 1.5 amps. Simply change Option Switches 01, 02 and 09 according to Table 3 to adjust PM4 operation on your layout.

PM4 Notes:

Use the two black LocoNet connectors on the PM4 to add it to LocoNet by using 6 conductor cables just like any other LocoNet device on your layout.

PM4 reconnection or automatic restart attempts may cause brief power interruptions to the booster output if the fault has not cleared.

Incandescent lamps may be hard to restart if they draw too much current before warming up.

Analog operation or zero stretching may adversely affect booster or PM4 detection times for auto-reversing and short circuit faults.

Auto-reversing may occur at any time on the layout and will affect the direction of analog locomotives (non decoder equipped or "conventional" locos).

Table 1: PM4 44-pin Connector: PCB Top (component side) connections

	Pin	Name	Connect To
	1		Do not connect
	2		Do not connect
	3	AC1	AC 12V to 16V power in for PM4 to operate
PM4 SECTION 1	4	RAIL A	Rail A connection to booster for PM4 Section 1
	5	REV A *	To make PM4 Sec. 1 Auto-reversing, connect to pin "E", set OPSW 06=c
	6	REV B *	To make PM4 Sec. 1 Auto-reversing , connect to pin "F", set OPSW 06=c
	7	RAIL B	Rail B connection to booster for PM4 Section 1
PM4 SECTION 2	8	RAIL A	Rail A connection to booster for PM4 Section 2
	9	REV A *	To make PM4 Sec. 2 Auto-reversing, connect to pin "K", set OPSW 14=c
	10	REV B *	To make PM4 Sec. 2 Auto-reversing, connect to pin "L", set OPSW 14=c
	11	RAIL B	Rail B connection to booster for PM4 Section 2
PM4 SECTION 3	12	RAIL A	Rail A connection to booster for PM4 Section 3
	13	REV A *	To make PM4 Sec. 3 Auto-reversing, connect to pin "P", set OPSW 22=c
	14	REV B *	To make PM4 Sec. 3 Auto-reversing, connect to pin "R", set OPSW 22=c
	15	RAIL B	Rail B connection to booster for PM4 Section 3
PM4 SECTION 4	16	RAIL A	Rail A connection to booster for PM4 Section 4
	17	REV A *	To make PM4 Sec. 4 Auto-reversing, connect to pin "U", set OPSW 30=c
	18	REV B *	To make PM4 Sec. 4 Auto-reversing, connect to pin "V", set OPSW 30=c
	19	RAIL B	Rail B connection to booster for PM4 Section 4
	20		Do not connect
	21		Do not connect
	22		Do not connect

*Note if Auto-reversing is not set up for any given PM4 section, do not connect REV A or REV B pins.

Table 2: PM4 44-pin Connector: PCB Bottom (solder side) connections.
Note some letters are not used on connector.

	Pin	Name	Connect To
	A		Do not connect
	B	GROUN D **	Connect to booster ground/case of DB100, DB150, DCS100, etc.
	C	AC2	AC 12V to 16V power in from power supply for PM4
PM4 SECTION 1	D	RAIL A	Rail A connection to booster for PM4 Section 1
	E	TRK OUTPU T A	Connect to rail A of track to be controlled by PM4 Section 1
	F	TRK OUTPU T B	Connect to rail B of track to be controlled by PM4 Section 1
	H	RAIL B	Rail B connection to booster for PM4 Section 1
PM4 SECTION 2	J	RAIL A	Rail A connection to booster for PM4 Section 2
	K	TRK OUTPU T A	Connect to rail A of track to be controlled by PM4 Section 2
	L	TRK OUTPU T B	Connect to rail B of track to be controlled by PM4 Section 2
	M	RAIL B	Rail B connection to booster for PM4 Section 2
PM4 SECTION 3	N	RAIL A	Rail A connection to booster for PM4 Section 3
	P	TRK OUTPU T A	Connect to rail A of track to be controlled by PM4 Section 3
	R	TRK OUTPU T B	Connect to rail B of track to be controlled by PM4 Section 3
	S	RAIL B	Rail B connection to booster for PM4 Section 3
PM4 SECTION 4	T	RAIL A	Rail A connection to booster for PM4 Section 4
	U	TRK OUTPU T A	Connect to rail A of track to be controlled by PM4 Section 4
	V	TRK OUTPU T B	Connect to rail B of track to be controlled by PM4 Section 4
	W	RAIL B	Rail B connection to booster for PM4 Section 4
	X	GROUN D **	Connect to booster ground/case
	Y		Do not connect
	Z		Do not connect

**The ground connection (Pin B or X) must be made to booster for correct PM4 operation.

Table 3: OPTION SWITCHES for PM4

Your PM4 is shipped from the factory with all OPSWs (option switches) set at the default value of “t” (thrown). This configures all four power sub-districts for "Short Circuit Management". The following tables show the effect of changing each OPSW to “c” (closed).

OPSW 01 & 02 settings determine the trip current threshold

OPSW 01 and OPSW 02 set the trip current for all 4 sections of the PM4. The default value is set at 3 amps. This is the current that all Digitrax boosters can provide briefly under fault conditions with adequate track wiring. Changing these 2 switches will change the trip current threshold as shown below. If OPSW 09 is made "c" or "closed", then the trip current will be lowered by about 1.5 amps from that shown here. This gives you the ability to select a trip range from 1.5 amps to 12 amps in 1.5 amp steps.

OPSW 01	t	c	t	c
OPSW 02	t	t	c	c
Trip Current (approx.)	3 amps	6 amps	9 amps	12 amps

The rest of the OPSWs are split into groups that setup each of the 4 sections of the PM4. OPSWs not listed are reserved for future use.

PM4 Section 1	OPSW 05	SLOW 1 c=SLOW fault detection time (approx. ½ second) for PM4 Section 1*
	OPSW 06	AUTOREV 1 c= PM4 Section 1 set up for Auto-reversing (connect Rail A, Pins E & 5, connect Rail B, Pins F & 6 on 44-pin connector)
Trip Current Adjustment	OPSW 09	Reduce trip current by 1.5A from the value set by OPSW 01 & 02
PM4 Section 2	OPSW 13	SLOW 2 c=SLOW fault detection time (approx. ½ second) for PM4 Section 2*
	OPSW 14	AUTOREV 2 c= PM4 Section 2 set up for Auto-reversing (connect Rail A, Pins K & 9, connect Rail B, Pins I & 10 on 44-pin connector)
PM4 Section 3	OPSW 21	SLOW 3 c=SLOW fault detection time (approx. ½ second) for PM4 Section 3 *
	OPSW 22	AUTOREV 3 c= PM4 Section 3 set up for Auto-reversing (connect Rail A, Pins P & 13, connect Rail B, Pins R & 14 on 44-pin connector)
PM4 Section 4	OPSW 29	SLOW 4 c=SLOW fault detection time (approx. ½ second) for PM4 Section 4*
	OPSW 30	AUTOREV 4 c= PM4 Section 4 set up for Auto-reversing (connect Rail A, Pins U & 17, connect Rail B, Pins V & 18 on 44-pin connector)

* Slow fault detection time is used when running many incandescent lamps like on a lighted passenger train.