



## PM74

**Power Manager with Occupancy and Transponding detection for 4 sub-districts.**

### Features:

- 4 Power manager sub-districts (or DS sections), similar to PM42.
- Each DS section configurable for Auto-reverse or intelligent short-circuit Power Management function.
- Each DS has Occupancy and Transponding detection capability.
- Occupancy usable by LocoNet compatible signal systems and e.g. PC-based track state monitoring.
- Transponding provides mobile decoder Mainline Operations Mode CV read/write programming on compatible Digitrax systems.
- Transponding identifies compatible Decoder addresses in each DS.
- All plug-in connectors for simple and easy installation and service.
- User defined as 4 DS reporting addresses in 2000+ DS range.
- Low-loss magnetic sensing of DCC track current.
- Easy setup with device Option Switches (OPSW) or LocoNet CV programming.
- Powered by DCC track and 2mm DC jack, 10V min to 22V max.
- Configured to operate with DCS52, DCS100, DCS210, DCS210+, DCS240 Command Stations, and DB210 and DB220 boosters.
- Optional Detection and Power status led connector for remote state indication, compatible with e.g. LT5.
- Additional LocoNet Configuration modes using DT602 throttles.

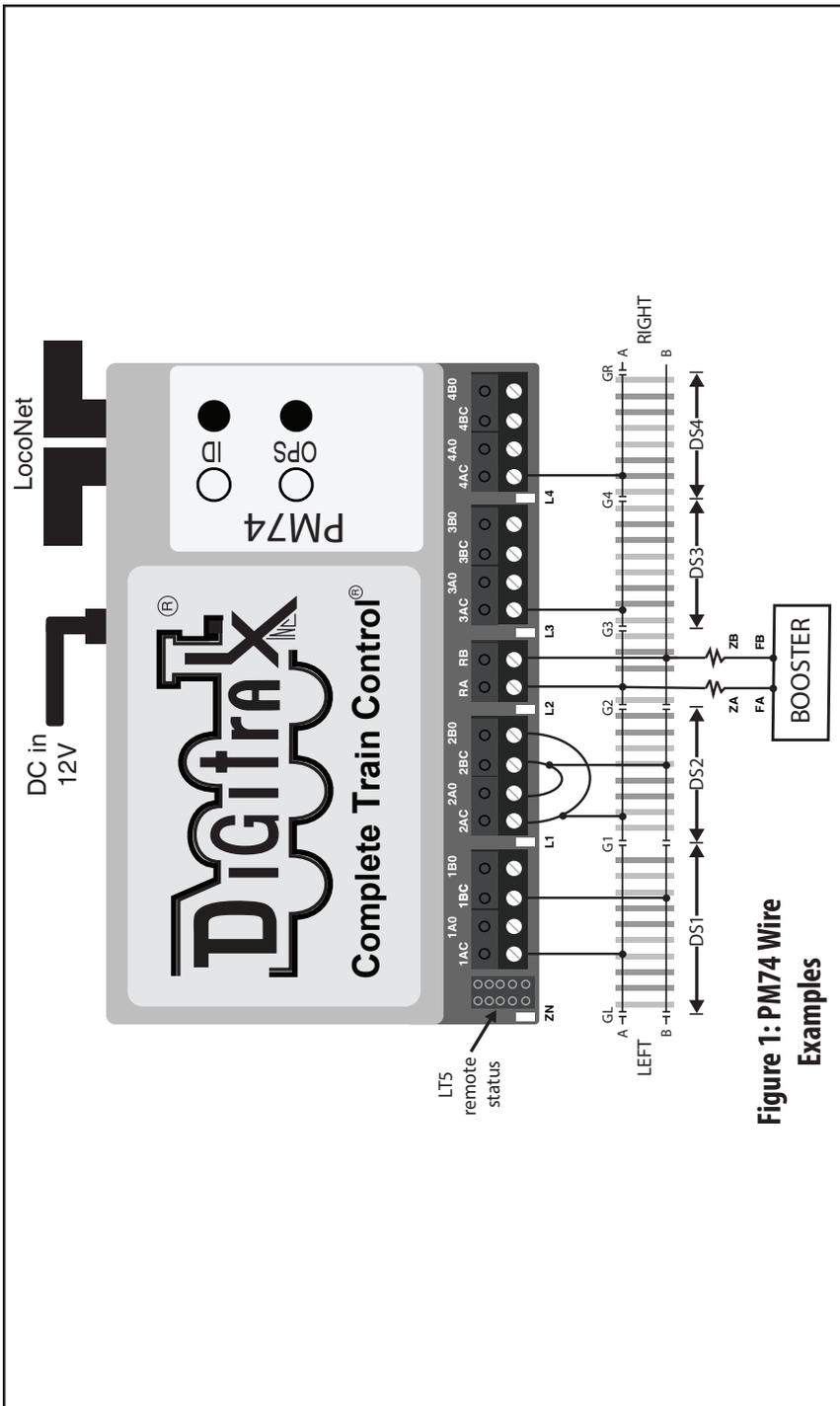
### Parts List

1 PM74 Power Manager	4 4-pin DS plugs
1 Instruction Sheet	1 2-pin Track power plug

### 1.0 PM74 Initial Setup.

To install the PM74 and begin using on your LocoNet layout.

1. Figure 1 shows the recommended connections to operate the PM74 on a LocoNet layout, with several track connection types shown.
2. For initial testing, connect power from a compatible DCC booster track-bus feed via the RA/RB terminals of the PM74's 2-pin track power plug.
3. When powered, the green ID LED should light and will briefly wink OFF at about 2 secs as a 'heartbeat' showing the unit is powered and operational. Additionally the ZN or Zone LED on the left front of the unit will light green, showing DCC packets are being detected on the 2-pin RB terminal.
4. For best operation reliability an optional PS14 or similar DC 12V/300mA



**Figure 1: PM74 Wire Examples**

- power supply should also be plugged into the PM74 DC 2mm power jack. .
5. Plug in an active LocoNet to either PM74 RJ12 connector. The red OPS LED will light up when connected. Any good LocoNet message seen will cause the red PM74 OPS LED to blink OFF briefly. With no LocoNet the PM74 will still provide Power Management, with Occupancy and Transponding detection indicated on just the status LEDs.
  6. Press and hold down the ID button for about 3 seconds until the ID and OPS LEDs blink alternately, then release the ID button.
  7. From your system now send a SW command. This SW# will become the Base address. This sets the value of DS1 Occupancy and Zone reports to this DS number. The following DS2-DS4 use the next three consecutive numbers. The ID and OPS LEDs will stop blinking, showing the PM74 has set the unit's Base address of DS1 to the number of the SW command you just sent.

**This provides initial verification that your PM74 working on LocoNet. You are now ready to customize your track wiring as detailed in the next sections.**

## **2.0 Best Practice DS Short Circuit protection:**

To wire a PM74 DS for Short Circuit Power management, follow the Figure 1 wiring example of the DS1 track section. Note: the DCC power source provided by the Booster must be configured for overall short circuit protection of any track, wires and devices connected to its output by feeders FA and FB.

1. Figure 1 shows the recommended connection example to operate DS1 of the example PM74 for intelligent short-circuit Power Management. This is the factory default setting for all 4 DS connections, providing track short-circuit protection to both DS RA/RB rails.
2. This DS1 track wiring is configured with two track feeds from PM74 terminals 1AC and 1BC which power both DS1 RA and RB rails, as defined between double gap *pairs* GL and G1. The PM74 monitors any fault current that may occur on **either rails and feeders connected to DS1**. This provides best sensitivity and fault detection reliability.
3. Always test the fault response of **all the rails and feeder wiring to a short-circuit** during installation. The e.g. DS1 relay will click repeatedly while a fault of sufficient current is detected in that PM74 DS1 section.
4. Test occupancy detection with 10K ohms or less placed across the rails of DS1, e.g. a box car with a resistor wheel set. The status led L1 will light GREEN to indicate that DS1 rails are logically "occupied" and this occupancy information is reported to LocoNet.
5. If a transponding decoder is placed in DS1 the L1 led will blink to indicate that DS1 is occupied *and* a transponder has been detected. The decoder address and DS location is reported onto LocoNet.
6. Boosters have internal fault detection; current levels, state and timing logic that may interact with any downstream fault protection devices. The PM74 has a fault current trip point at about 4amps in each DS, and are configured to operate faster than compatible boosters. This means if the PM74 reacts before the Booster shuts down the fault track voltage disturbance will be limited to the faulted DS protected by the PM74. While a fault current flows

briefly and is being detected, the booster track voltage becomes chaotic and the DCC packets are mutilated.

7. For reliable detection performance best practice is to not use Analog Mode/Address 00 zero-stretching.
8. If OPSW41 is CLOSED (C) the status and optional LT5 leds will now report relay state, *not* the Occupancy and Transponding state displayed when OPSW41= THROWN (T). For short circuit configured DS's the corresponding leds will light as the DS relay actuates to cut off a faulted DS. For a Auto-reverse DS the, e.g. example L2, led will flip lit to unlit as DS2 polarity changes. LocoNet messages are unaffected by this OPSW.

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### 3.0 Auto-reverse DS connection:

To set up an Auto-reverse DS section like example DS2 rails of Figure 1:

1. Set OPSW2 = C to configure DS2 for auto-reverse. See section 5.0 for option switch setup.
2. The DS2 4-pin screw terminal block must be wired with; (a) 2AC connected to 2BO and then to e.g. the DS2 RA rail, and (b) 2AO connected to 2BC and then to e.g. DS2 RB rail. On a fault the DS2 relay operates to reverse the loop polarity and the actual DS2 RA/RB connections reverse DCC polarity
3. The Figure 1 PM74 DS2 section wiring, **and** option switch are now configured for Auto-reverse action. In this example the rails between double gap portals G1 and G2 are configured as a Wye or reverse loop section. This has to have an entry portal G1 or G2 DCC polarity-matched for a train to cross that gap.
4. The Auto-reverse action on DS2 fault detection will flip the polarity of DS2 rails, which fixes the gap that has the problem. For a reverse loop, fixing a first gap portal means the other portal gap will become polarity mismatched.

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### 4.0 Alternate Short Circuit protection:

For a slightly simplified DS short-circuit wiring option, DS3 and DS4 examples in Figure 1 are shown each wired with only a single 3AC or 4AC connection.

1. Follow the Figure 1 wiring example for DS3 and DS4.
2. Since we are using the 3AC and 4AC 4-pin terminals only, the connected DS3 and DS4 sections must have their RB rail current return connected back to the FB feeder. This is because the G3 and G4 gaps *are not double* and only isolate and protect the DS3/4 RA rails from over current faults.
3. Since DS3 and DS4 RB currents are not being monitored any faults on these RB rails of are not protected by the PM74, and so rely solely on the Booster fault protection capability. Now RB faults in DS3 and DS4 disrupt the DCC power to all tracks on the booster.
4. Excluding the RB current in a DS also lowers the; fault current, and both Transponding and Occupancy sensitivity, so this wiring method is not the best choice.

## 5.0 PM74 Options: OPSW changes

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The PM74 configuration and behavior can be configured using OPSW's. The Factory default OPSW settings will configure correctly for most common requirements.

1. Press the OPS button for about 3 seconds until the green ID and OPS LEDs blink together. Release the OPS button. The PM74 is now setup to configure OPSW's by sending the required SW# as Closed (C) or Thrown(T) to setup an option.
2. Set the SW# from OPSW Table 1 choices below as C or T, matching the wanted settings.
3. When finished press and hold OPS button for 3 seconds to exit OPSW setup mode. The PM74 will now restart with the new OPSW settings and adjustments in effect.
4. Factory default OPSW settings are shown in **T**.
5. You may also access all OPSW's by CV programming shown in section 7.0, but using this SW command method may be less complicated.
6. OPSW's not in this table are reserved and should be kept at Factory default T settings.

**Table 1: PM74 Opsw setting table:**

OPSW#	Default	Action
1, 2, 3, 4	<b>T</b> <b>T</b> <b>T</b> <b>T</b>	C = Change DS1 to auto-reverse mode C = Change DS2 to auto-reverse mode C = Change DS3 to auto-reverse mode C = Change DS4 to auto-reverse mode
7	<b>T</b>	C = Lower fault trip current
8	<b>T</b>	C = Raise fault trip current, overrides Opsw7
11	<b>T</b>	C= Disable Occupancy Detection
12	<b>T</b>	C= Disable Transponding Detection
31	<b>T</b>	C= Increase Occupancy sensitivity
40	<b>T</b>	C= Factory Reset
41	<b>T</b>	C= Leds show Relay state, not detection

## 6.0 Advanced DT602 based PM74 configuration

To perform these advanced features, a DT602 with SubVersion 0.5 or higher will be needed - see [www.digitrax.com](http://www.digitrax.com) for the latest software IPL.

**6.1 Detecting all PM74's and setting Base addresses:** On an updated DT602 plugged into LocoNet, press the; Menu>3>4 keys to enter the Route Editor menu. If *any* PM74 is plugged into LocoNet, the DT602 will beep after about one second and show "DS7x" routes at the D soft key position.

1. Press the D soft key to get the "Selecting DS7X device:" screen as shown below. This example DT602 screen shows two PM74 devices detected on LocoNet, their Base DS (SW) address, active DS address count# and unique device serial numbers (SN or SerNo).
2. Note that the PM74 does not control Switches, but for convenience in mixed Series7 edits, for the PM74 the SW is actually a reference to a base DS or occupancy detection number used.
3. The lowest PM74 Base address *detected and sorted* is SW0001 with SN 1222. This is displayed in RED to indicate that it conflicts with the 2nd PM74 SN 3122 also at default Base address SW0001. This is true because the next free address is SW1+4 or SW0005, that 2nd PM74 SN 3122 is not set *at or above*.
4. You can use the DT602 Left Hand (LH) encoder knob to scroll up and down through the detected PM74 devices, with an underline showing the current selected PM74 or Series7 device.
5. Rotate the DT602 LH encoder knob to underline the 2nd PM74 line entry as shown. We will now move the base address of this selected 2nd unit to resolve the overlap problem with the 1st problem PM74 shown in red.
6. Press the number 5 then press the A soft key "Chng Adr". The 2nd PM74 will now change to Base SW5, and now the 1st PM74 will show GREEN because there are now no DS/SW overlaps to the next PM74.
7. In this way you may select any Series7 device to edit its base as needed.
8. To identify the actual underlined 2nd physical PM74 on the layout; press the F soft key "Ident" and just this PM74 will blink its ID/OPS/leds for 3 seconds.
9. Press "X" to exit any DT602 advanced mode.
10. This advanced DT602 capability allows you configure all Series7 devices in position on a LocoNet layout, quickly and conveniently, even if all devices are initially overlapping at factory-default Base SW1/DS1.
11. If you are using other types of non-Series7 LocoNet control devices, you will have to note their active SW addresses and manually ensure the PM74's and other Series7 units are configured to avoid these.

Cs Rt	Ident
Selecting DS7X device:	
Device:	Base+Out# SerNo
PM74	Sw0001+4 # 1222
<u>PM74</u>	Sw0001+4 # 3122
DS7x device select: LH knob	
Chng adr	

## 7.0 Programming PM74 CVs:

As for section 6.0, a suitable DT602 is required. Press the; Menu>2>1 keys to enter Operations Mode programming.

1. Press the F soft key "SWITCH" to enter the "**Ops Switch**" mode CV programming screen, as shown adjacent.
2. This example screen shows CV# 11 selected by the numeric keys for a PM74 with BASE address of SW0001.
3. Use the LH and RH encoder knobs to select the base DS/SW# of the Series7 device that you wish to modify a CV on.
4. The PM74's CV11 to CV16 access 48 OPSW bit settings. CV11 bit0 is OPSW1.
5. For example; with CV11 selected, press the B or "CVDATA" soft key to change to CV data entry.
6. Press the number 3, then press "WRITE" soft key. This now configures CV11 or OPSW1-8 bits to 3, making OPSW1 and 2 =C,. This changes DS1 and DS2 to Auto-reverse. A value of 00 in CV11 will return OPSW1-8 to factory default.
7. Be careful changing the values in CV11,12,13,14,15 and CV16 since the 8 bit data value 0-255 in these CV's actually each control 8 individual OPSW bits.
8. On a successful READ attempt the CV data number will turn GREEN.
9. The DT602 does not indicate to the PM74 when programming is complete, so after you have *finished* CV changes, best practice is to POWER cycle the PM74. Alternately, you can WRITE CV7 to 00 to restart that PM74.

		LOCO
CV Program Menu A:		
Ops Switch ADR: 0001		
CV Number: 0011		
CV data: 0003		
CVNUM	CVDATA	DONE

## 8.0 Set up Notes:

1. Wiring resistances Za and Zb are shown in the FA and FB feeders to signify the effect of combined wire losses. These become critical if the bus and/or feeder wires are too small, which limits the available fault current. This may cause fault detection to be unreliable or ineffective. Best practice is to use e.g. 12AWG to 16AWG feeder bus wires from the Booster terminals to e.g. the RA/RB power input terminals of the DS74. Most common issues are due to; excessive wiring resistance, an incompatible booster with insufficient DCC output, or low DC power input to allow an adequate fault current.
2. A PM74 will operate on DCC 2-pin track power without DC power input to the 2mm jack, but control may fail due to track power interruptions from complex fault sequences. Also, the total PM74 run and startup current will subtract from the Booster current available for mobile/locomotive decoders in that Booster Power District.
3. A PM74 can operate with just DCC track power on 2-pin terminals and no LocoNet cable, but it will not have LocoNet reporting features available.
4. DCC track current is widely varying due to combined time changes of; motor, lights, sound and inrush currents, so a fault trip threshold has to allow normal operations but be low enough to activate correctly on a fault.

## 9.0 FCC Information:

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Radio or TV Interference (this information is MANDATED by the FCC) This equipment has been tested by Digitrax and is Declared in Conformity with the limits for a Class B digital device, pursuant to part 15 of the FCC rules. These limits are designed to provide reasonable protection against harmful interference in a residential environment. This equipment generates, uses and can radiate radio frequency energy and, if not installed and used in accordance with the instruction manual, may cause harmful interference to radio communications. However, there is no guarantee that interference will not occur in a particular installation. If this equipment does cause harmful interference to radio or television reception, which can be determined by turning the equipment off and on, the user is encouraged to try to correct the interference by one or more of the following measures:

- Reorient or relocate the receiving antenna.
- Increase the separation between the equipment and the receiver.
- Connect the equipment into an outlet on a circuit different from that to which the receiver is connected.
- Consult the dealer or an experienced radio/TV technician for help.

Note that any modifications to the equipment not expressly approved by Digitrax voids the user's authority to operate under and be in compliance with CFR 47 rules, as administered by the Federal Communication Commission. Digitrax believes any conscientiously installed equipment following guidelines in this manual would be unlikely to experience RFI problems.

For Canadian Users:

“This digital apparatus does not exceed the Class B limits for Radio noise emission from digital apparatus set out in the Radio Interference Regulation of the Canadian Department of Communications.”

Le present appareil numerique n emet pas de bruits radio-electriques dépassant les limites applicables aux appareils numeriques de la classe B prescrites dans le Reglement sur le brouillage radioelectrique edicte par le ministre des Communications du Canada. fonctionnement.”

## 10.0 Warranty & Repair

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Digitrax gives a PM74 Warranty against material defects for one year from manufacture. Visit [www.digitrax.com](http://www.digitrax.com) for instructions for returning items for repair.

**Please return warranty items directly to Digitrax - DO NOT return items to place of purchase.**

Digitrax, Inc. reserves the right to make changes in design and specifications, and/or to modify or improve its products without imposing any obligations upon itself to install these changes, additions or improvements on products previously manufactured. IPL capable products like the PM74 & DT602 may be user field updated with the latest IPL files that are available for free on the product specific information pages of the [www.digitrax.com](http://www.digitrax.com) web site.

The newest features are documented on the product pages of the website.

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