

PM-50 Digital Input Graphical Panel Meters

Installation Guide

- Universal Digital (pulsed) Inputs
- 4.3" (1/8 DIN) or 3.5" (1/16 DIN) 18-bit color display with resistive touchscreen and swipe gesture
- DC powered, AC powered with optional module
- Choice of programming options
- Data Access Point; communication choices - Wi-Fi, RS-485/Modbus and optional Ethernet or RS-232
- NEMA 4X/IP65 sealed front bezel



FOR USE IN HAZARDOUS LOCATIONS:
Class I, Division 2, Groups A, B, C, and D
T4A



Visit www.redlion.net for how-to videos, full user manual and additional support.

GENERAL DESCRIPTION

Red Lion's Graphical Panel Meters, PM-50, is a platform of meters designed to increase operator productivity and expose critical plant floor data for use in project scheduling and process improvements. Local operators can easily relate to the more intuitive graphical display. Additional displays could be added to provide even more data. The meters feature on-board Wi-Fi, RS-485/Modbus and optional Ethernet or RS-232.

PM-50 features a 4.3" or 3.5" Color Graphical Touchscreen. With an appearance like many smart devices, the display includes a status bar and menu selections for easy operation. Recognizing a swipe gesture allows multiple screens to be accessed. Touchscreen push buttons can be displayed on the screen or hidden during operation. The meters mount in standard industrial hole sizes, 1/8 DIN and 1/16 DIN respectively.

On power-up, a Programming Wizard will assist you to get started. You may also select a Programming App, Web Server, or the traditional button/menu style for your programming needs. For OEM customers a microSD Card allows for quick programming and installation, saving time and money.

The Digital model accepts various pulse sensors. Onboard outputs include two Solid State Outputs that can take up to 30 V source voltage with software configurable source or sink options. User inputs are also available to provide external interface and control when required.

The PM-50 platform includes modular construction to add additional capabilities. External modules can easily be installed in the field to add a variety of output and communication options. As safety advances through the Automation Industry, DC is the more common choice for power. However, there are still many requirements for AC power and they can be accommodated with our AC to DC Power Module.

PACKAGE CHECKLIST

This product package should contain the items listed below. If any items are missing or damaged, contact Red Lion immediately.

- PM-50 Digital Input Panel Meter
- Accessory Pack
- Installation Guide

SAFETY SUMMARY

All safety related regulations, local codes and instructions that appear in this document or on equipment must be observed to ensure personal safety and to prevent damage to either the device or equipment connected to it.

Do not use these products to replace proper safety interlocking. No software-based device (or any other solid-state device) should ever be designed to be responsible for the maintenance of personnel safety or consequential equipment not equipped with safeguards. Red Lion disclaims any responsibility for damages, either direct or consequential, that result from the use of this equipment in a manner not specified.



CAUTION: Risk of Danger

Read complete instructions prior to installation and operation of the unit.

ATTENTION : Risque de danger

Lire les instructions complètes avant l'installation et l'utilisation de l'appareil.



WARNING - EXPLOSION HAZARD - When in hazardous locations, disconnect power before replacing or wiring modules.

AVERTISSEMENT - RISQUE D'EXPLOSION - Dans les endroits dangereux, débranchez l'alimentation électrique avant de remplacer ou de câbler les modules.



This equipment is suitable for use in Class I, Division 2, Groups A, B, C, D, or non-hazardous locations only.

Cet équipement est adapté à une utilisation dans des endroits de classe I, Division 2, Groupes A, B, C, D, ou dans des endroits non dangereux seulement.

GENERAL METER SPECIFICATIONS

Note: The PM-50 4.3 inch host accepts a maximum of 5 modules while the 3.5 inch host accepts a maximum of 3. Only one module from each function type (i.e. communication, relay, analog output) can be installed.

1. **POWER:** The meter is intended to be powered by NEC/CEC class 2, IEC/EN/UL 60950-1 LPS or UL/CSA 601010-1 Limited Energy power source.

MODEL	4.3-INCH	3.5-INCH
Input Voltage (Volts)	10-30 VDC	10-30 VDC
Max Power PM-50 only	4.6 W	4.6 W
Max Power PM-50, with modules	12 W	12 W

Host Isolation: 500 Vrms for 1 min. to all inputs and outputs.

2. **DISPLAY:** 4.3" or 3.5" Color TFT display with resistive analog touch screen

SIZE	4.3-INCH	3.5-INCH
TYPE	TFT	TFT
COLORS	262,144	262,144
PIXELS	480 X 272	320 X 240
BRIGHTNESS	420 cd/m ²	540 cd/m ²
LED BACKLIGHT LIFE*	30,000 HR TYP.	30,000 HR TYP.

* Lifetime at room temperature (25°C)

3. **SENSOR POWER:**
+24 VDC, $\pm 5\%$ @ 50 mA max.
4. **COUNTER DISPLAYS:** 9 digits available
Display Range: -99,999,999 to 999,999,999
Over Range Display: Overrange
Under Range Display: Underrange
Display Designators: Cnt-A, Cnt-B, Cnt-C
Maximum Count Rates: 50% duty cycle
If Setpoints Disabled: 35 KHz for all modes except Quadrature x4 (32 KHz)
If Setpoint(S) Enabled: 20 KHz for any mode except Quadrature x1 (19 KHz), Quadrature x2 (17 KHz) and Quadrature x4 (10 KHz)
5. **RATE DISPLAYS:** 6-digit
Maximum Frequency: 50 KHz
Minimum Frequency: 0.001 Hz
Display Update Time: 0.1 to 999.9 seconds
Accuracy: $\pm 0.01\%$
6. **SIGNAL INPUTS (INPUT A and INPUT B):**
Software configurable input types including switch contacts, TTL outputs, magnetic pickups and all standard RLC sensors. Inputs are configurable for current sinking or current sourcing outputs with input filtering for low frequency signals or switch contact debounce. Not isolated from the sensor input common.
Logic: Input trigger levels $V_{IL} = 1.2$ V max.; $V_{IH} = 3.75$ V min.
Sink: Adds internal 7.8 K Ω pull-up resistor to +5 VDC, 0.7 mA max
Source: Adds internal 3.9 K Ω pull-down resistor, 7.3 mA max. at 28 VDC, $V_{MAX} = 30$ VDC
Magnetic Pickup:
 $V_{IN_PK} = 200$ mV; $V_{IN_HSYS} = 100$ mV; Must also have SRC selection turned on through software
 $V_{MAX} = \pm 40$ V_{PEAK} or 28 Vrms
Dual Count Modes:
When any dual count mode is used, then User Inputs 1 and/or 2 will accept the second signal of each signal pair. The user inputs do not have the Logic/Mag, HI/LO Freq, and Sink/Source software selections. The user inputs are inherently a logic input with no low frequency filtering implemented in

software. The user input may only be selected for sink/source by the User Input Active parameter.

7. **USER INPUTS:** Two programmable user inputs
Max. Continuous Input: 30 VDC
Isolation to Sensor Input Common: Not isolated.
Logic State: User programmable for sink/source (Lo/Hi)

INPUT STATE	LO/SINK	HI/SOURCE
	20 K Ω pull-up to +3.3 V	20 K Ω pull-down
Active	$V_{IN} < 0.9$ VDC	$V_{IN} > 2.4$ VDC
Inactive	$V_{IN} > 2.4$ VDC	$V_{IN} < 0.9$ VDC

8. **MEMORY:** Nonvolatile memory retains all programmable parameters and display values.
Memory Card: microSD slot accepts up to 32 GB capacity cards in FAT16/FAT32 format.
9. **RS485 SERIAL PORT:** Uses Modbus protocol
Baud Rate: Up to 115,200
Data Format: 7/8 bit; odd, even, or no parity; 1 or 2 stop bits
Isolation: 500 Vrms to sensor, user power and digital inputs.
Not isolated to solid state outputs
10. **Wi-Fi CAPABILITIES:**
Wi-Fi: Power output up to 20.5 dBm
Frequency:

TECHNOLOGY	CHANNELS	FREQUENCIES
Wi-Fi	1-13	2412-2484 MHz

Note: Channel/frequency limitation is enforced based on configured country/region code.

Wi-Fi Compliance: TCP/IP; 802.11 b/g/n

11. **ON-BOARD DUAL SSR OUTPUTS:** Both outputs must be used either in SINKING or in SOURCING mode together.
Sinking Mode:

Type: Switched DC, N-channel open drain MOSFET
Max Sink Current: 100 mA
 V_{DS} ON: 0.3 V @ 100 mA
 V_{DS} MAX: 30 VDC
Offstate Leakage Current: 0.5 mA max

Sourcing Mode:

Type: Switched DC, P-channel open source MOSFET
Max Source Current: 100 mA
 V_{DS} ON: 0.3 V @ 100 mA
 V_{DS} MAX: 30 VDC
Offstate Leakage Current: 0.5 mA max

12. **ENVIRONMENTAL CONDITIONS:**

Operating Temperature Range: -10 to 55 °C
Storage Temperature Range: -20 to 60 °C
Operating and Storage Humidity: 0 to 85% max. RH non-condensing
Vibration to IEC 68-2-6: Operational 5-500 Hz, 2 g
Shock to IEC 68-2-27: Operational 20 g (10 g relay)
Altitude: Up to 2000 meters
Installation Category II, Pollution Degree 2 as defined in IEC/EN 60664-1.

13. **CERTIFICATIONS AND COMPLIANCES:**

CE Approved

EN 61326-1 Immunity to Industrial Locations
Emission CISPR 11 Class A
IEC/EN 61010-1
RoHS Compliant

FCC ID#: 2AC7Z-ESP32WROOM32U

UL Hazardous: File # E317425

Type 4X Indoor/IP65 Enclosure rating (Face only) for all models
IP20 Enclosure rating (Rear of unit)

14. **CONNECTIONS:** High compression spring-clamp terminal block

Wire Strip Length: 0.32-0.35" (8-9 mm)

Wire Gauge Capacity: Four 28 AWG (0.32 mm) solid,
two 20 AWG (0.61 mm) or one 16 AWG (2.55 mm)

15. **CONSTRUCTION:** This unit is rated NEMA 4X/IP65 for indoor use only. IP20 Touch safe. One piece bezel/ case. Flame resistant. Panel gasket, module locks, and mounting panel latch included.

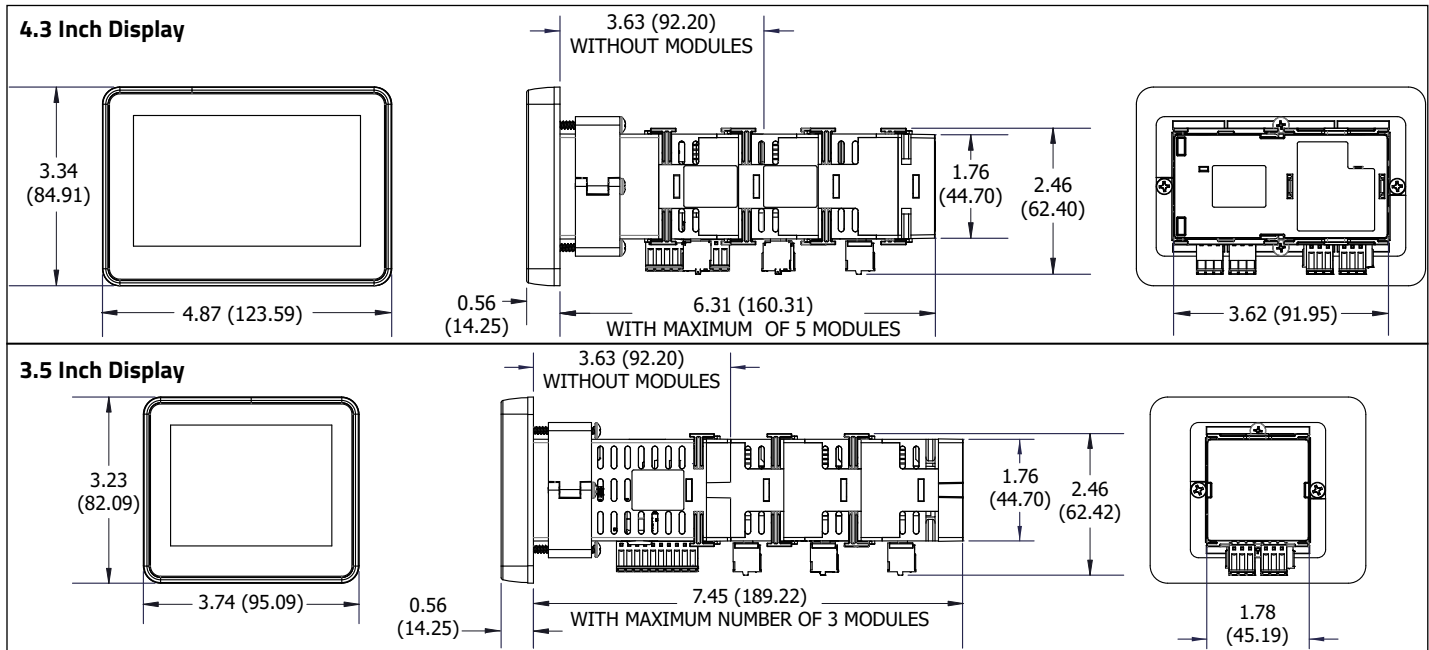
16. **MOUNTING REQUIREMENTS:** Maximum panel thickness is 0.25" (6.35 mm). For NEMA 4X/IP65 sealing, a steel panel with a minimum thickness of 0.04" (1.02 mm) is recommended.
Panel Latch Screw Torque: 5.0 lbf-in (0.56 Nm) **CAUTION: DO NOT OVERTIGHTEN**

17. **WEIGHT:**

4.3: 11.5 oz (326 g)

3.5: 8.1 oz (229.6 g)

DIMENSIONS In inches (mm)



INSTALLATION ENVIRONMENT

The unit should be installed in a location that does not exceed its own operating temperature and provides good air circulation. Placing the unit near devices that generate excessive heat should be avoided.

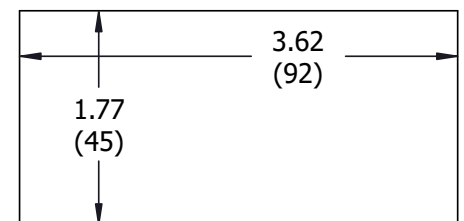
The PM-50 4.3 and 3.5 inch models meet NEMA 4X/IP65 requirements when properly installed. This unit is designed for through-panel mounting. The mounting surface should have a minimum thickness of 0.04" (1.02 mm) and maximum thickness of 0.25" (6.35 mm). Cut the mounting hole per the dimensions shown in the diagram. Care should be taken to remove any loose material from the mounting cut-out to prevent that material from falling into the unit during installation. Prepare the panel cutout to the dimensions shown.

For hazardous location installation the following shall be taken into consideration:

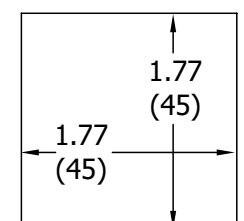
- The device shall be panel mounted in a tool accessible enclosure with a minimum ingress protection rating of at least IP64 as defined in IEC/EN 60529.
- This device is open-type and must be mounted in a suitable dust-tight end-enclosure in accordance with articles 500 and 502 of the NEC and positioned so only the face of the display is exposed.

- Must be wired using Division 2 wiring methods as specified in article 501-4(b), 502-4(b), and 503-3(b) of the National Electric Code, NFPA 70 for installation within the United States, or as specified in section 19-152 of Canadian Electrical Code for installation in Canada.

4.3 Inch Meter

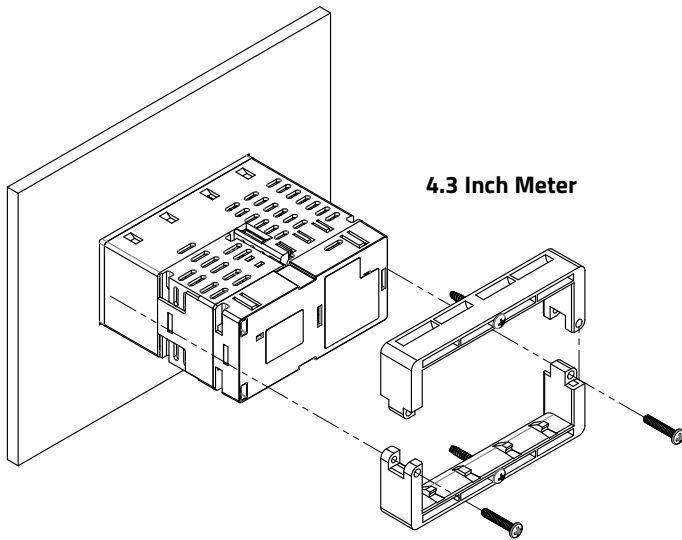


3.5 Inch Meter

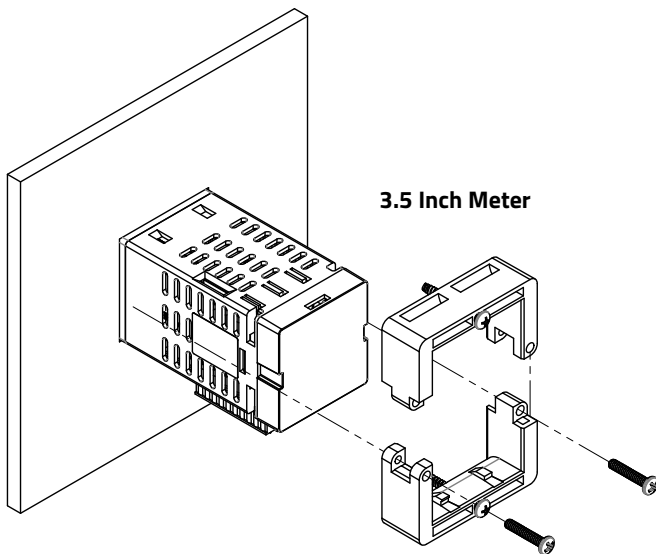


METER INSTALLATION

Slide the panel gasket over the rear of the unit to the back of the bezel. The unit should be installed fully assembled. Insert the unit into the panel cutout.



While holding the unit in place, place either the top or bottom panel latch on the rear of the unit closest to the panel cutout so that the tabs of the panel latch engage in the slots on the case. Repeat this process with the other half of the panel latch. Secure the latch with the panel mounting screws provided. To achieve a proper seal, tighten the latch screws evenly until the unit is snug in the panel (Torque to approximately 5 in-lbs [56 N-cm]). Do not over-tighten the screws.



EMC INSTALLATION GUIDELINES

Although Red Lion Controls products are designed with a high degree of immunity to Electromagnetic Interference (EMI), proper installation and wiring methods must be followed to ensure compatibility in each application. The type of the electrical noise, source or coupling method into a unit may be different for various installations. Cable length, routing, and shield termination are

very important and can mean the difference between a successful or troublesome installation. Listed are some EMI guidelines for a successful installation in an industrial environment.

1. A unit should be mounted in a metal enclosure, which is properly connected to protective earth.
2. Use shielded cables for all Signal and Control inputs. The shield connection should be made as short as possible. The connection point for the shield depends somewhat upon the application. Listed below are the recommended methods of connecting the shield, in order of their effectiveness.
 - a. Connect the shield to earth ground (protective earth) at one end where the unit is mounted.
 - b. Connect the shield to earth ground at both ends of the cable, usually when the noise source frequency is over 1 MHz.
3. Never run Signal or Control cables in the same conduit or raceway with AC power lines, conductors, feeding motors, solenoids, SCR controls, and heaters, etc. The cables should be run through metal conduit that is properly grounded. This is especially useful in applications where cable runs are long and portable two-way radios are used in close proximity or if the installation is near a commercial radio transmitter. Also, Signal or Control cables within an enclosure should be routed as far away as possible from contactors, control relays, transformers, and other noisy components.
4. Long cable runs are more susceptible to EMI pickup than short cable runs.
5. In extremely high EMI environments, the use of external EMI suppression devices such as Ferrite Suppression Cores for signal and control cables is effective. The following EMI suppression devices (or equivalent) are recommended:
 - Fair-Rite part number 0443167251 (Red Lion #FCOR0000)
 - Line Filters for input power cables:
 - Schaffner # FN2010-1/07 (Red Lion #LFIL0000)
6. To protect relay contacts that control inductive loads and to minimize radiated and conducted noise (EMI), some type of contact protection network is normally installed across the load, the contacts or both. The most effective location is across the load.
 - a. Using a snubber, which is a resistor-capacitor (RC) network or metal oxide varistor (MOV) across an AC inductive load is very effective at reducing EMI and increasing relay contact life.
 - b. If a DC inductive load (such as a DC relay coil) is controlled by a transistor switch, care must be taken not to exceed the breakdown voltage of the transistor when the load is switched. One of the most effective ways is to place a diode across the inductive load. Most Red Lion products with solid state outputs have internal zener diode protection. However external diode protection at the load is always a good design practice to limit EMI. Although the use of a snubber or varistor could be used.
 - Red Lion part numbers: Snubber: SNUB0000
 - Varistor: ILS11500 or ILS23000
7. Care should be taken when connecting input and output devices to the instrument. When a separate input and output common is provided, they should not be mixed. Therefore a sensor common should NOT be connected to an output common. This would cause EMI on the sensitive input common, which could affect the instrument's operation.

Visit <http://www.redlion.net/emi> for more information on EMI guidelines, Safety and CE issues as they relate to Red Lion products.

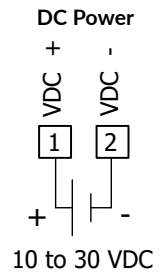
WIRING

All power, input and output (I/O) wiring must be in accordance with Class I, Division 2 wiring methods and in accordance with the authority having jurisdiction. Electrical connections are made via pluggable spring-clamp terminal blocks. It is recommended that the power supplied to the meter be protected by a fuse or circuit breaker.

When wiring the meter, refer to the label on the unit for pin-out numbering against those shown in the wiring drawings for proper wire position. Strip and connect the wire according to the terminal block specifications on Page 3. Use a small screwdriver to press down on tab next to the terminal position to open the spring clamp. Insert the wire into the terminal position and then remove the screwdriver to engage the spring-clamp.

POWER WIRING

Must use a Class 2 circuit according to National Electrical Code (NEC), NFPA-70 or Canadian Electrical Code (CEC), Part I, C22.1 or a Limited Power Supply (LPS) according to IEC/EN 60950-1 or Limited-energy circuit according to IEC/EN 61010-1.



Ensure software configuration is set to correspond with your required application wiring.

Magnetic Pickup Input A Software Configuration - Select Mag Mode	AC Inputs From Tach Generators, Etc. Input A	Two Wire Proximity, Current Source Input A
Current Sinking Output Input A	Current Sourcing Output Input A	Interfacing With TTL Input A
Switch or Isolated Transistor; Current Sink Input A	Switch or Isolated Transistor; Current Source Input A	Emitter Follower; Current Source Input A
Current Sink Output; Quad/Direction Single Counter A If using Single Counter B, then wire signal to 16 and Quad/Direction to 12. Settings configured in Software.	Current Sink Output; Quad/Direction Counter A & Rate B	Current Sink Output; Quad/Direction Counter A & Counter B

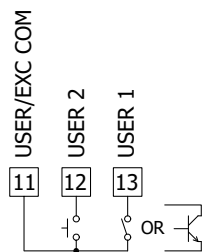
Shaded areas not recommended for counting applications.

USER INPUT WIRING

User Input terminal does not need to be wired in order to remain in the inactive state.

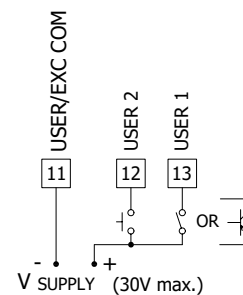
Sinking Logic

When the parameter is programmed to Low, check with device GUI option. The user inputs of the controller are internally pulled up to +3.3 V with 20 K Ω resistance. The input is active when it is pulled low (<0.9 V).



Sourcing Logic

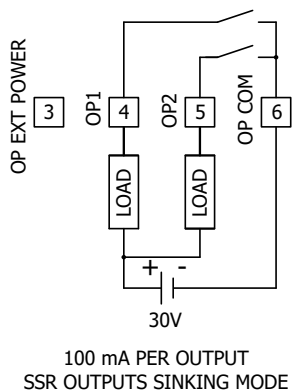
When the parameter is programmed to High, check with device GUI option. The user inputs of the controller are internally pulled down to 0 V with 20 K Ω resistance. The input is active when a voltage greater than 2.4 VDC is applied.



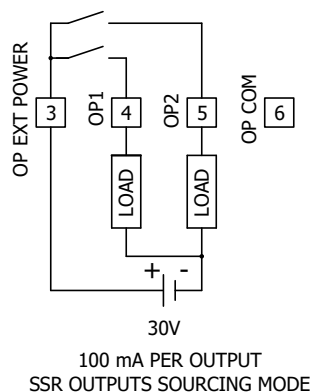
ON-BOARD DUAL SSR WIRING

The SSR outputs require meter configuration to address their functionality. The drawings below illustrate the wiring for each option.

Sinking Mode

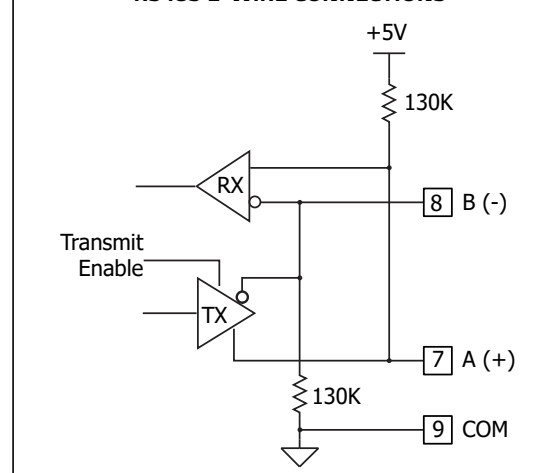


Sourcing Mode



RS485/MODBUS

RS485 2-WIRE CONNECTIONS



See appropriate document for instructions on module installation and wiring support.

CONFIGURING A PM-50

Various options are available to configure your PM-50 so you can choose the one that fits your requirement.

Programming Wizard

On initial power up a Programming Wizard will offer assistance. Proceeding with the Wizard will help with the basic configuration including screen set-up, selecting the input and programming the output. After completion your device will display the items you selected. Additional capabilities can be accessed via the Programming App, Web Server, or manually entering the programming.

Web Interface

To configure the device for web access, login as Admin and follow the below steps to setup Wi-Fi:

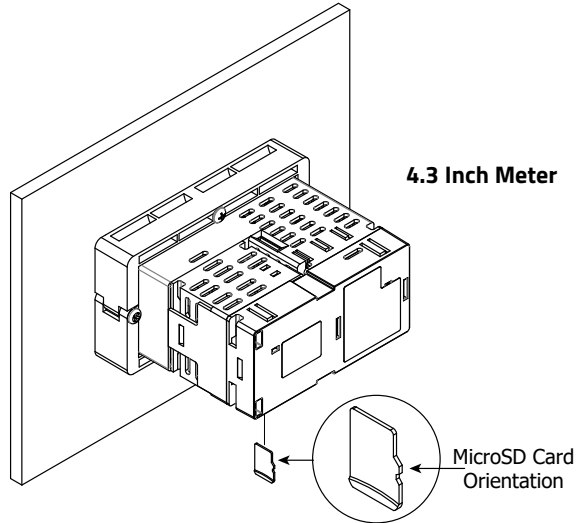
1. Go to System → Network Configuration → Wi-Fi Configuration
2. Enable Wi-Fi as “ON” and select the right arrow
3. From here, make your Wi-Fi configuration selections based on your connection setup.

App Connectivity

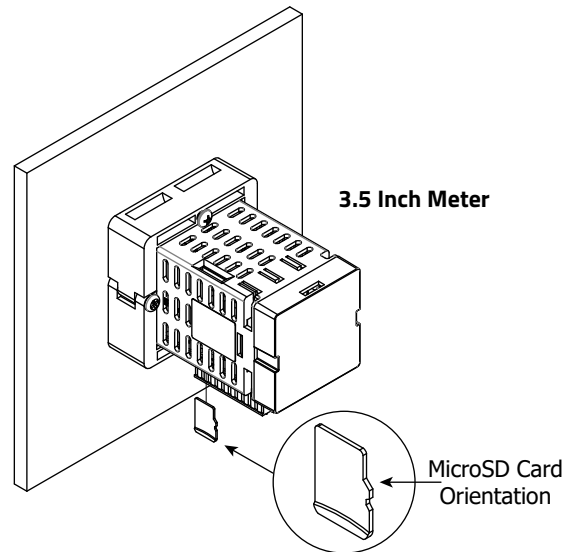
Programming and monitoring of the device can be done via an App. Go to the App Store and search for PM50 by Red Lion. Install the app on your smart device. With Wi-Fi enabled, monitoring and controlling of the device can be done through the app. Now programming the device is as easy as making some selections and downloading to the device.

INSERTION/REMOVAL OF THE microSD CARD

The microSD Card can be used to flash new firmware on PM-50 by placing an image file on the formatted microSD card. It can also be used to import previous configuration through import/export configuration menu. The card is then inserted into the PM-50 slot located next to the terminals on the bottom side of the unit. Refer to the User manual for more information on the proper names and locations of the files.



After inserting the microSD card into the unit, navigate to the Device/Misc. Configuration/Firmware Upload screen on the PM-50 to upload the latest firmware version.



ORDERING INFORMATION

DESCRIPTION	PART NUMBER
Graphical Panel Meter, 4.3" Display, Digital Input	PM500D0400800F00
Graphical Panel Meter, 3.5" Display, Digital Input	PM500D0301600F00

Accessories

TYPE	DESCRIPTION	PART NUMBER
Modules	RS232 Serial Communications Module	PMM000CM23200000
	Ethernet Communications Module	PMM000CMNET000000
	Analog Output Module	PMM000IOAN000000
	Dual Setpoint Relay Output Module	PMM000IORL200000
	Quad Setpoint Relay Output Module	PMM000IORL400000
	AC to DC Power Module	PMM000PWACP00000
Misc.	Replacement Rear Cover/Bus Board with Spacer Module (4.3" model only)	PMA000CP00800000
	Conversion Panel 92 mm x 75 mm to 1/8 DIN	PMA000MK00800000
	Conversion Panel 68 mm x 68 mm to 1/16 DIN	PMA000MK01600000
	Replacement Module Lock Pins	PMA000MKLP00000
	4.3" Protective Screen Overlay	PMA000SP00800000
	3.5" Protective Screen Overlay	PMA000SP01600000
	MicroSD Card	SD032G00

RED LION CONTROLS TECHNICAL SUPPORT

If for any reason you have trouble operating, connecting, or simply have questions concerning your new product, contact Red Lion's technical support.

Support: support.redlion.net

Website: www.redlion.net

Inside US: +1 (877) 432-9908

Outside US: +1 (717) 767-6511

Red Lion Controls, Inc.

20 Willow Springs Circle York, PA 17406

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LIMITED WARRANTY

(a) Red Lion Controls Inc. (the "Company") warrants that all Products shall be free from defects in material and workmanship under normal use for the period of time provided in "Statement of Warranty Periods" (available at www.redlion.net) current at the time of shipment of the Products (the "Warranty Period"). **EXCEPT FOR THE ABOVE-STATED WARRANTY, COMPANY MAKES NO WARRANTY WHATSOEVER WITH RESPECT TO THE PRODUCTS, INCLUDING ANY (A) WARRANTY OF MERCHANTABILITY; (B) WARRANTY OF FITNESS FOR A PARTICULAR PURPOSE; OR (C) WARRANTY AGAINST INFRINGEMENT OF INTELLECTUAL PROPERTY RIGHTS OF A THIRD PARTY; WHETHER EXPRESS OR IMPLIED BY LAW, COURSE OF DEALING, COURSE OF PERFORMANCE, USAGE OF TRADE OR OTHERWISE.** Customer shall be responsible for determining that a Product is suitable for Customer's use and that such use complies with any applicable local, state or federal law.

(b) The Company shall not be liable for a breach of the warranty set forth in paragraph (a) if (i) the defect is a result of Customer's failure to store, install, commission or maintain the Product according to specifications; (ii) Customer alters or repairs such Product without the prior written consent of Company.

(c) Subject to paragraph (b), with respect to any such Product during the Warranty Period, Company shall, in its sole discretion, either (i) repair or replace the Product; or (ii) credit or refund the price of Product provided that, if Company so requests, Customer shall, at Company's expense, return such Product to Company.

(d) **THE REMEDIES SET FORTH IN PARAGRAPH (c) SHALL BE THE CUSTOMER'S SOLE AND EXCLUSIVE REMEDY AND COMPANY'S ENTIRE LIABILITY FOR ANY BREACH OF THE LIMITED WARRANTY SET FORTH IN PARAGRAPH (a).**

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