

MODEL PAX® – 1/8 DIN ANALOG INPUT PANEL METERS



- PROCESS, VOLTAGE, CURRENT, TEMPERATURE, AND STRAIN GAGE INPUTS
- 5-DIGIT 0.56" RED SUNLIGHT READABLE DISPLAY
- VARIABLE INTENSITY DISPLAY
- 16 POINT SCALING FOR NON-LINEAR PROCESSES
- PROGRAMMABLE FUNCTION KEYS/USER INPUTS
- 9 DIGIT TOTALIZER (INTEGRATOR) WITH BATCHING
- OPTIONAL CUSTOM UNITS OVERLAY W/BACKLIGHT
- FOUR SETPOINT ALARM OUTPUTS (W/OPTION CARD)
- COMMUNICATION AND BUS CAPABILITIES (W/OPTION CARD)
- RETRANSMITTED ANALOG OUTPUT (W/OPTION CARD)
- CRIMSON® PROGRAMMING SOFTWARE
- NEMA 4X/IP65 SEALED FRONT BEZEL

GENERAL DESCRIPTION

The PAX® Analog Panel Meters offer many features and performance capabilities to suit a wide range of industrial applications. Available in five different models to handle various analog inputs, including DC Voltage/Current, AC Voltage/Current, Process, Temperature, and Strain Gage Inputs. Refer to pages 4 through 6 for the details on the specific models. The option cards allow the opportunity to configure the meter for present applications, while providing easy upgrades for future needs.

The meters employ a bright 0.56" LED display. The unit is available with a red sunlight readable or a standard green LED. The intensity of display can be adjusted from dark room applications up to sunlight readable, making it ideal for viewing in bright light applications.

The meters provide a MAX and MIN reading memory with programmable capture time. The capture time is used to prevent detection of false max or min readings which may occur during start-up or unusual process events.

The signal totalizer (integrator) can be used to compute a time-input product. This can be used to provide a readout of totalized flow, calculate service intervals of motors or pumps, etc. The totalizer can also accumulate batch weighing operations.

Optional digital output cards provide the meter with up to four setpoint outputs. The cards are available as dual relay, quad relay, quad sinking transistor, quad sourcing transistor/SSR drive, or dual triac/dual SSR drive outputs. The setpoint alarms can be configured to suit a variety of control and alarm requirements.

Communication and Bus Capabilities are also available as option cards. These include RS232, RS485, Modbus, DeviceNet, and Profibus-DP. Readout values and setpoint alarm values can be controlled through the bus. Additionally, the meters have a feature that allows a remote computer to directly control the outputs of the meter. With an RS232 or RS485 card installed, it is possible to configure the meter using a Windows® based program. The configuration data can be saved to a file for later recall.

A linear DC output signal is available as an optional card. The card provides either 20 mA or 10 V signals. The output can be scaled independent of the input range and can track either the input, totalizer, max or min readings.

Once the meters have been initially configured, the parameter list may be locked out from further modification in its entirety or only the setpoint values can be made accessible.

The meters have been specifically designed for harsh industrial environments. With NEMA 4X/IP65 sealed bezel and extensive testing of noise effects to CE requirements, the meter provides a tough yet reliable application solution.

SAFETY SUMMARY

All safety related regulations, local codes as well as 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 consistent with these specifications.



CAUTION: Risk of Danger
Read complete instructions prior to installation and operation of the unit.



CAUTION: Risk of electric shock.

DIMENSIONS In inches (mm)

Note: Recommended minimum clearance (behind the panel) for mounting clip installation is 2.1" (53.4) H x 5.0" (127) W.

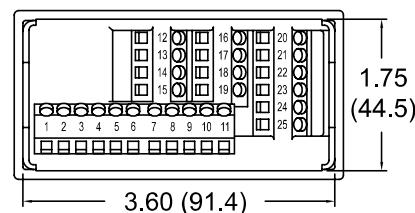
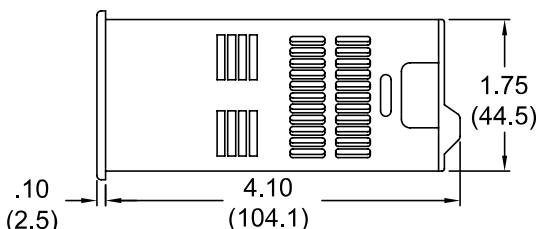
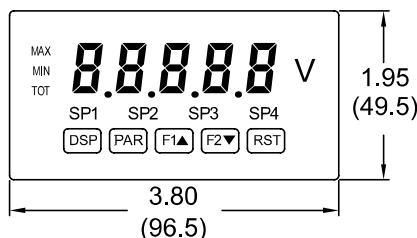
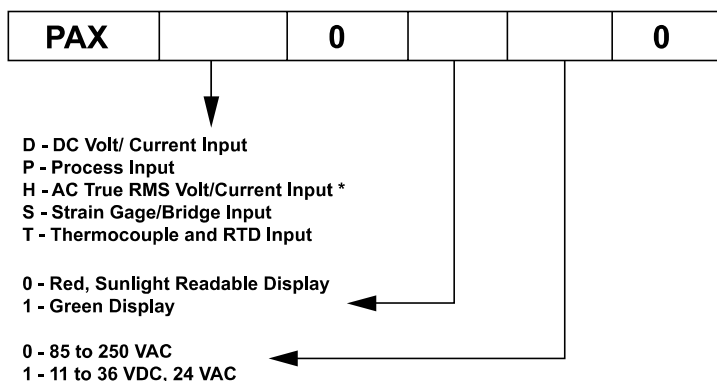


TABLE OF CONTENTS

Ordering Information	2	Setting the Jumpers	8
General Meter Specifications	3	Installing Option Cards	10
Universal DC Input Panel Meter	4	Wiring the Meter	11
Process Input Panel Meter	4	Reviewing the Front Buttons and Display...	14
AC True RMS Voltage and Current Meter...	5	Programming the Meter.....	15
Strain Gage Input Panel Meter	5	Factory Service Operations	30
Thermocouple and RTD Input Meter	6	Parameter Value Chart	32
Option Cards	7	Programming Overview	34
Installing the Meter	8		

ORDERING INFORMATION

Meter Part Numbers



* PAXH is only available with 85-250 VAC power supply.

Option Card and Accessories Part Numbers

TYPE	MODEL NO.	DESCRIPTION	PART NUMBER
Option Cards	PAXCDS	Dual Setpoint Relay Output Card	PAXCDS10
		Quad Setpoint Relay Output Card	PAXCDS20
		Quad Setpoint Sinking Open Collector Output Card	PAXCDS30
		Quad Setpoint Sourcing Open Collector Output Card	PAXCDS40
		Dual Triac/Dual SSR Drive Output Card	PAXCDS50
		Quad Form C Relay Output Card	PAXCDS60 *
	PAXCDC	RS485 Serial Communications Card with Terminal Block	PAXCDC10
		Extended RS485 Serial Communications Card with Dual RJ11 Connector	PAXCDC1C
		RS232 Serial Communications Card with Terminal Block	PAXCDC20
		Extended RS232 Serial Communications Card with 9 Pin D Connector	PAXCDC2C
		DeviceNet Communications Card	PAXCDC30
		Modbus Communications Card	PAXCDC40
		Extended Modbus Communications Card with Dual RJ11 Connector	PAXCDC4C
		Profibus-DP Communications Card	PAXCDC50
	PAXCDL	Analog Output Card	PAXCDL10
	PAXUSB	PAX USB Programming Card	PAXUSB00
Accessories	CBLUSB	USB Programming Cable Type A-Mini B	CBLUSB01
	PAXLBK	Units Label Kit Accessory (Not required for PAXT)	PAXLBK10

* This card is not suitable for use in older PAX models. For proper installation, a case knock-out feature must be present on the top surface of the PAX case. This feature began to be introduced to the standard PAX units in July of 2014 (2614).

Crimson® configuration software is available as a free download from <http://www.redlion.net>

GENERAL METER SPECIFICATIONS

1. **DISPLAY:** 5 digit, 0.56" (14.2 mm) red sunlight readable or standard green LEDs, (-19999 to 99999)
2. **POWER:**
 - AC Versions:
 - AC Power: 85 to 250 VAC, 50/60 Hz, 15 VA
 - Isolation: 2300 Vrms for 1 min. to all inputs and outputs.
 - DC Versions (Not available on PAXH):
 - DC Power: 11 to 36 VDC, 11 W
 - (derate operating temperature to 40° C if operating <15 VDC and three option cards are installed)
 - AC Power: 24 VAC, $\pm 10\%$, 50/60 Hz, 15 VA
 - Isolation: 500 Vrms for 1 min. to all inputs and outputs (50 V working).
3. **ANNUNCIATORS:**
 - MAX - maximum readout selected
 - MIN - minimum readout selected
 - TOT - totalizer readout selected, flashes when total overflows
 - SP1 - setpoint alarm 1 is active
 - SP2 - setpoint alarm 2 is active
 - SP3 - setpoint alarm 3 is active
 - SP4 - setpoint alarm 4 is active
 - Units Label - optional units label backlight
4. **KEYPAD:** 3 programmable function keys, 5 keys total
5. **A/D CONVERTER:** 16 bit resolution
6. **UPDATE RATES:**
 - A/D conversion rate: 20 readings/sec.
 - Step response: internal zero correction cannot be disabled
 - 700 msec. max. (digital filter disabled, internal zero correction cannot be disabled)
 - PAXH Only: 1 sec max. to within 99% of final readout value (digital filter disabled)
 - Display update rate: 1 to 20 updates/sec.
 - Setpoint output on/off delay time: 0 to 3275 sec.
 - Analog output update rate: 0 to 10 sec
 - Max./Min. capture delay time: 0 to 3275 sec.
7. **DISPLAY MESSAGES:**
 - "LOL" - Appears when measurement exceeds + signal range.
 - "ULUL" - Appears when measurement exceeds - signal range
 - PAXT: "SHrt" - Appears when shorted sensor is detected. (RTD only)
 - PAXT: "OPEN" - Appears when open sensor is detected.
 - "..." - Appears when display values exceed + display range.
 - "-..." - Appears when display values exceed - display range.
 - "E..." - Appears when Totalizer exceeds 9 digits.
 - "h..." - Denotes the high order display of the Totalizer.
8. **INPUT CAPABILITIES:** See specific product specifications, pages 4-6
9. **EXCITATION POWER:** See specific product specifications, pages 4-6
10. **LOW FREQUENCY NOISE REJECTION:** (Does not apply to PAXH)
 - Normal Mode: > 60 dB @ 50 or 60 Hz $\pm 1\%$, digital filter off
 - Common Mode: >100 dB, DC to 120 Hz
11. **USER INPUTS:** Three programmable user inputs
 - Max. Continuous Input: 30 VDC
 - Isolation To Sensor Input Common: Not isolated. (Not PAXH)
 - PAXH: Isolation to Sensor Input Common: 1400 Vrms for 1 min.
 - Working Voltage: 125 V
 - Response Time: 50 msec. max.
 - Logic State: Jumper selectable for sink/source logic

INPUT STATE	SINKING INPUTS 22 K Ω pull-up to +5 V	SOURCING INPUTS 22 K Ω pull-down
Active	$V_{IN} < 0.9$ VDC	$V_{IN} > 3.6$ VDC
Inactive	$V_{IN} > 3.6$ VDC	$V_{IN} < 0.9$ VDC
12. **TOTALIZER:**
 - Function:
 - Time Base: second, minute, hour, or day
 - Batch: Can accumulate (gate) input display from a user input
 - Time Accuracy: 0.01% typical
 - Decimal Point: 0 to 0.0000
 - Scale Factor: 0.001 to 65.000
 - Low Signal Cut-out: -19,999 to 99,999
 - Total: 9 digits, display alternates between high order and low order readouts
13. **CUSTOM LINEARIZATION:**
 - Data Point Pairs: Selectable from 2 to 16
 - Display Range: -19,999 to 99,999
 - Decimal Point: 0 to 0.0000
 - PAXT: Ice Point Compensation: user value (0.00 to 650.00 $\mu V/^{\circ}C$)
14. **MEMORY:** Nonvolatile E²PROM retains all programmable parameters and display values.
15. **ENVIRONMENTAL CONDITIONS:**
 - Operating Temperature Range: 0 to 50°C (0 to 45°C with all three option cards installed)
 - Vibration to IEC 68-2-6: Operational 5 to 150 Hz, 2 g.
 - Shock to IEC 68-2-27: Operational 25 g (10 g relay).
 - Storage Temperature Range: -40 to 60°C
 - Operating and Storage Humidity: 0 to 85% max. RH non-condensing
 - Altitude: Up to 2000 meters
16. **CERTIFICATIONS AND COMPLIANCES:**
 - CE Approved**
 - EN 61326-1 Immunity to Industrial Locations
 - Emission CISPR 11 Class A
 - Safety requirements for electrical equipment for measurement control, and laboratory use:
 - EN 61010-1: General Requirements
 - EN 61010-2-030: Particular Requirements for Testing and Measuring Circuits
 - RoHS Compliant
 - UL Listed Component: File #E179259
 - Type 4X Enclosure rating (Face only)
 - IP65 Enclosure rating (Face only)
 - IP20 Enclosure rating (Rear of unit)
 - Refer to EMC Installation Guidelines section of the bulletin for additional information.
17. **CONNECTIONS:** High compression cage-clamp terminal block
 - Wire Strip Length: 0.3" (7.5 mm)
 - Wire Gauge: 30-14 AWG copper wire
 - Torque: 4.5 inch-lbs (0.51 N-m) max.
18. **CONSTRUCTION:** This unit is rated for NEMA 4X/IP65 outdoor use. IP20 Touch safe. Installation Category II, Pollution Degree 2. One piece bezel/case. Flame resistant. Synthetic rubber keypad. Panel gasket and mounting clip included.
19. **WEIGHT:** 10.4 oz. (295 g)

MODEL PAXD - UNIVERSAL DC INPUT

- *FOUR VOLTAGE RANGES (300 VDC Max)*
- *FIVE CURRENT RANGES (2A DC Max)*
- *THREE RESISTANCE RANGES (10K Ohm Max)*
- *SELECTABLE 24 V, 2 V, 1.75 mA EXCITATION*

PAXD SPECIFICATIONS

INPUT RANGES:

INPUT RANGE	ACCURACY* (18 to 28°C)	ACCURACY* (0 to 50°C)	IMPEDANCE/ COMPLIANCE	MAX CONTINUOUS OVERLOAD	RESOLUTION
±200 µADC	0.03% of reading +0.03 µA	0.12% of reading +0.04 µA	1.11 Kohm	15 mA	10 nA
±2 mADC	0.03% of reading +0.3 µA	0.12% of reading +0.4 µA	111 ohm	50 mA	0.1 µA
±20 mADC	0.03% of reading +3 µA	0.12% of reading +4 µA	11.1 ohm	150 mA	1 µA
±200 mADC	0.05% of reading +30 µA	0.15% of reading +40 µA	1.1 ohm	500 mA	10 µA
±2 ADC	0.5% of reading +0.3 mA	0.7% of reading +0.4 mA	0.1 ohm	3 A	0.1 mA
±200 mVDC	0.03% of reading +30 µV	0.12% of reading +40 µV	1.066 Mohm	100 V	10 µV
±2 VDC	0.03% of reading +0.3 mV	0.12% of reading +0.4 mV	1.066 Mohm	300 V	0.1 mV
±20 VDC	0.03% of reading +3 mV	0.12% of reading +4 mV	1.066 Mohm	300 V	1 mV
±300 VDC	0.05% of reading +30 mV	0.15% of reading +40 mV	1.066 Mohm	300 V	10 mV
100 ohm	0.05% of reading +0.03 ohm	0.2% of reading +0.04 ohm	0.175 V	30 V	0.01 ohm
1000 ohm	0.05% of reading +0.3 ohm	0.2% of reading +0.4 ohm	1.75 V	30 V	0.1 ohm
10 Kohm	0.05% of reading +1 ohm	0.2% of reading +1.5 ohm	17.5 V	30 V	1 ohm

* After 20 minute warm-up. Accuracy is specified in two ways: Accuracy over an 18 to 28°C and 10 to 75% RH environment; and accuracy over a 0 to 50°C and 0 to 85% RH (non-condensing environment). Accuracy over the 0 to 50°C range includes the temperature coefficient effect of the meter.

EXCITATION POWER:

Transmitter Power: 24 VDC, ±5%, regulated, 50 mA max.

Reference Voltage: 2 VDC, ± 2%

Compliance: 1 kohm load min. (2 mA max.)

Temperature coefficient: 40 ppm/°C max.

Reference Current: 1.75 mADC, ± 2%

Compliance: 10 kohm load max.

Temperature coefficient: 40 ppm/°C max.

MODEL PAXP - PROCESS INPUT

- *DUAL RANGE INPUT (20 mA or 10 VDC)*
- *24 VDC TRANSMITTER POWER*

PAXP SPECIFICATIONS

SENSOR INPUTS:

INPUT (RANGE)	ACCURACY* (18 to 28°C)	ACCURACY* (0 to 50°C)	IMPEDANCE/ COMPLIANCE	MAX CONTINUOUS OVERLOAD	DISPLAY RESOLUTION
20 mA (-2 to 26 mA)	0.03% of reading +2 µA	0.12% of reading +3 µA	20 ohm	150 mA	1 µA
10 VDC (-1 to 13 VDC)	0.03% of reading +2 mV	0.12% of reading +3 mV	500 Kohm	300 V	1 mV

* After 20 minute warm-up. Accuracy is specified in two ways: Accuracy over an 18 to 28°C and 10 to 75% RH environment; and accuracy over a 0 to 50°C and 0 to 85%RH (non-condensing environment). Accuracy over the 0 to 50°C range includes the temperature coefficient effect of the meter.

EXCITATION POWER:


Transmitter Power: 24 VDC, ±5%, regulated, 50 mA max.

MODEL PAXH - AC TRUE RMS VOLT AND CURRENT

- FOUR VOLTAGE RANGES (300 VAC Max)
- FIVE CURRENT RANGES (5 A Max)
- ACCEPTS AC OR DC COUPLED INPUTS
- THREE WAY ISOLATION: POWER, INPUT AND OUTPUTS

PAXH SPECIFICATIONS

INPUT RANGES:

 Isolation To Option Card Commons and User Input Commons: 125 Vrms
Isolation To AC Power Terminals: 250 Vrms

INPUT RANGE	ACCURACY*	IMPEDANCE (60 Hz)	MAX CONTINUOUS OVERLOAD	MAX DC BLOCKING	RESOLUTION
200 mV	0.1% of reading +0.4 mV	686 Kohm	30 V	±10 V	0.01 mV
2 V	0.1% of reading +2 mV	686 Kohm	30 V	±50 V	0.1 mV
20 V	0.1% of reading +20 mV	686 Kohm	300 V	±300 V	1 mV
300 V	0.2% of reading +0.3 V	686 Kohm	300 V	±300 V***	0.1 V
200 µA	0.1% of reading +0.4 µA	1.11 Kohm	15 mA	±15 mA	0.01 µA
2 mA	0.1% of reading +2 µA	111 ohm	50 mA	±50 mA	0.1 µA
20 mA	0.1% of reading +20 µA	11.1 ohm	150 mA	±150 mA	1 µA
200 mA	0.1% of reading +0.2 mA	1.1 ohm	500 mA	±500 mA	10 µA
5 A	0.5% of reading +5 mA	0.02 ohm	7 A**	±7 A***	1 mA

*Conditions for accuracy specification:

- 20 minutes warmup
- 18-28°C temperature range, 10-75% RH non-condensing
- 50 Hz - 400 Hz sine wave input with 1.414 crest factor
- 1% to 100% of range

For conditions outside the above listed:

Temperature from 0-18 and 28-50°C: Add 0.1% reading + 20 counts error
Crest factors:

1-3: Add 0.2% reading + 10 counts error

3-5: Add 1% reading

DC component: Add 0.5% reading + 10 counts

20-50 Hz and 400-10 KHz: Add 1% reading + 20 counts error

** Non-repetitive surge rating: 15 A for 5 seconds

*** Inputs are direct coupled to the input divider and shunts. Input signals with high DC component levels may reduce the usable range.

MAX CREST FACTOR (Vp/VRMS): 5 @ Full Scale Input

INPUT COUPLING: AC or AC and DC

INPUT CAPACITANCE: 10 pF

COMMON MODE VOLTAGE: 125 VAC working

COMMON MODE REJECTION: (DC to 60 Hz) 100 dB

MODEL PAXS - STRAIN GAGE INPUT

- LOAD CELL, PRESSURE AND TORQUE BRIDGE INPUTS
- DUAL RANGE INPUT: ±24 mV OR ±240 mV
- SELECTABLE 5 VDC OR 10 VDC BRIDGE EXCITATION
- PROGRAMMABLE AUTO-ZERO TRACKING

PAXS SPECIFICATIONS

SENSOR INPUTS:

INPUT RANGE	ACCURACY* (18 to 28 °C)	ACCURACY* (0 to 50 °C)	IMPEDANCE	MAX CONTINUOUS OVERLOAD	RESOLUTION
±24 mVDC	0.02% of reading +3 µV	0.07% of reading +4 µV	100 Mohm	30 V	1 µV
±240 mVDC	0.02% of reading +30 µV	0.07% of reading +40 µV	100 Mohm	30 V	10 µV

* After 20 minute warm-up. Accuracy is specified in two ways: Accuracy over an 18 to 28 °C and 10 to 75% RH environment; and accuracy over a 0 to 50 °C and 0 to 85% RH (non-condensing environment). Accuracy over the 0 to 50 °C range includes the temperature coefficient effect of the meter.

CONNECTION TYPE: 4-wire bridge (differential)
2-wire (single-ended)

COMMON MODE RANGE (w.r.t. input common): 0 to +5 VDC
Rejection: 80 dB (DC to 120 Hz)

BRIDGE EXCITATION :

Jumper Selectable: 5 VDC @ 65 mA max., ±2%

10 VDC @ 125 mA max., ±2%

Temperature coefficient (ratio metric): 20 ppm/°C max.

MODEL PAXT - THERMOCOUPLE AND RTD INPUT

- THERMOCOUPLE AND RTD INPUTS
- CONFORMS TO ITS-90 STANDARDS
- CUSTOM SCALING FOR NON-STANDARD PROBES
- TIME-TEMPERATURE INTEGRATOR

PAXT SPECIFICATIONS

READOUT:

Resolution: Variable: 0.1, 0.2, 0.5, or 1, 2, or 5 degrees

Scale: F or C

Offset Range: -19,999 to 99,999 display units

THERMOCOUPLE INPUTS:

Input Impedance: 20 MΩ

Lead Resistance Effect: 0.03μV/ohm

Max. Continuous Overvoltage: 30 V

INPUT TYPE	RANGE	ACCURACY* (18 to 28 °C)	ACCURACY* (0 to 50 °C)	STANDARD	WIRE COLOR	
					ANSI	BS 1843
T	-200 to 400°C -270 to -200°C	1.2°C **	2.1°C	ITS-90	(+) blue (-) red	(+) white (-) blue
E	-200 to 871°C -270 to -200°C	1.0°C **	2.4°C	ITS-90	(+) purple (-) red	(+) brown (-) blue
J	-200 to 760°C	1.1°C	2.3°C	ITS-90	(+) white (-) red	(+) yellow (-) blue
K	-200 to 1372°C -270 to -200°C	1.3°C **	3.4°C	ITS-90	(+) yellow (-) red	(+) brown (-) blue
R	-50 to 1768°C	1.9°C	4.0°C	ITS-90	no standard	(+) white (-) blue
S	-50 to 1768°C	1.9°C	4.0°C	ITS-90	no standard	(+) white (-) blue
B	100 to 300°C 300 to 1820°C	3.9°C 2.8°C	5.7°C 4.4°C	ITS-90	no standard	no standard
N	-200 to 1300°C -270 to -200°C	1.3°C **	3.1°C	ITS-90	(+) orange (-) red	(+) orange (-) blue
C (W5/W26)	0 to 2315°C	1.9°C	6.1°C	ASTM E988-90***	no standard	no standard

*After 20 min. warm-up. Accuracy is specified in two ways: Accuracy over an 18 to 28 °C and 15 to 75% RH environment; and Accuracy over a 0 to 50 °C and 0 to 85% RH (non condensing) environment. Accuracy specified over the 0 to 50 °C operating range includes meter tempco and ice point tracking effects. The specification includes the A/D conversion errors, linearization conformity, and thermocouple ice point compensation. Total system accuracy is the sum of meter and probe errors. Accuracy may be improved by field calibrating the meter readout at the temperature of interest.

** The accuracy over the interval -270 to -200 °C is a function of temperature, ranging from 1 °C at -200 °C and degrading to 7 °C at -270 °C. Accuracy may be improved by field calibrating the meter readout at the temperature of interest.

*** These curves have been corrected to ITS-90.

RTD INPUTS:

Type: 3 or 4 wire, 2 wire can be compensated for lead wire resistance

Excitation current: 100 ohm range: 165 μA

10 ohm range: 2.6 mA

Lead resistance: 100 ohm range: 10 ohm/lead max.

10 ohm range: 3 ohms/lead max.

Max. continuous overload: 30 V

INPUT TYPE	RANGE	ACCURACY* (18 to 28 °C)	ACCURACY* (0 to 50 °C)	STANDARD ***
100 ohm Pt alpha = .00385	-200 to 850°C	0.4°C	1.6°C	IEC 751
100 ohm Pt alpha = .003919	-200 to 850°C	0.4°C	1.6°C	no official standard
120 ohm Nickel alpha = .00672	-80 to 260°C	0.2°C	0.5°C	no official standard
10 ohm Copper alpha = .00427	-100 to 260°C	0.4°C	0.9°C	no official standard

CUSTOM RANGE: Up to 16 data point pairs

Input range: -10 to 65 mV

0 to 400 ohms, high range

0 to 25 ohms, low range

Display range: -19999 to 99999

INPUT TYPE	RANGE	ACCURACY* (18 to 28 °C)	ACCURACY* (0 to 50 °C)
Custom mV range	-10 to 65mV (1 μV res.)	0.02% of reading + 4μV	0.12% of reading + 5μV
Custom 100 ohm range	0 to 400 Ω (10 MΩ res.)	0.02% of reading + 0.04 Ω	0.12% of reading + 0.05 Ω
Custom 10 ohm range	0 to 25 Ω (1 MΩ res.)	0.04% of reading + 0.005 Ω	0.20% of reading + 0.007 Ω

ACCESSORIES

UNITS LABEL KIT (PAXLBK) - Not required for PAXT

Each meter has a units indicator with backlighting that can be customized using the Units Label Kit. The backlight is controlled in the programming.

Each PAXT meter is shipped with °F and °C overlay labels which can be installed into the meter's bezel display assembly.

EXTERNAL CURRENT SHUNTS (APSCM)

To measure DC current signals greater than 2 ADC, a shunt must be used. The APSCM010 current shunt converts a maximum 10 ADC signal into 100.0 mV. The APSCM100 current shunt converts a maximum 100 ADC signal into 100.0 mV. The continuous current through the shunt is limited to 115% of the rating.

PROGRAMMING SOFTWARE

Crimson software is a Windows based program that allows configuration of the PAX meter from a PC. Crimson offers standard drop-down menu commands, that make it easy to program the meter. The meter's program can then be saved in a PC file for future use. A PAX serial option card or PAX USB programming card is required to program the meter using the software. Crimson can be downloaded at www.redlion.net.

OPTION CARDS



WARNING: Disconnect all power to the unit before installing option cards.

Adding Option Cards

The PAX and MPAX series meters can be fitted with up to three option cards. The details for each option card can be reviewed in the specification section below. Only one card from each function type can be installed at one time. The function types include Setpoint Alarms (PAXCDS), Communications (PAXCDC), and Analog Output (PAXCDL). The option cards can be installed initially or at a later date.

PAXH Isolation Specifications For All Option Cards

Isolation To Sensor Commons: 1400 Vrms for 1 min.

Isolation to User Input Commons: 500 Vrms for 1 min.

COMMUNICATION CARDS (PAXCDC)

A variety of communication protocols are available for the PAX and MPAX series. Only one of these cards can be installed at a time. When programming the unit via Crimson, a Windows® based program, the RS232, RS485, or USB Cards must be used.

SERIAL COMMUNICATIONS CARD: PAXCDC1_ and PAXCDC2_

Type: RS485 or RS232

Isolation To Sensor & User Input Commons: 500 Vrms for 1 min.

Not Isolated from all other commons.

Data: 7/8 bits

Baud: 300 to 19,200

Parity: No, Odd or Even

Bus Address: Selectable 0 to 99, Max. 32 meters per line (RS485)

Transmit Delay: Selectable for 2 to 50 msec or 50 to 100 msec (RS485)

DEVICENET™ CARD: PAXCDC30

Compatibility: Group 2 Server Only, not UCMM capable

Baud Rates: 125 Kbaud, 250 Kbaud, and 500 Kbaud

Bus Interface: Phillips 82C250 or equivalent with MIS wiring protection per DeviceNet™ Volume I Section 10.2.2.

Node Isolation: Bus powered, isolated node

Host Isolation: 500 Vrms for 1 minute between DeviceNet™ and meter input common.

MODBUS CARD: PAXCDC4_

Type: RS485; RTU and ASCII MODBUS modes

Isolation To Sensor & User Input Commons: 500 Vrms for 1 minute.

Not isolated from all other commons.

Baud Rates: 300 to 38400.

Data: 7/8 bits

Parity: No, Odd, or Even

Addresses: 1 to 247.

Transmit Delay: Programmable; See Transmit Delay explanation.

PROFIBUS-DP CARD: PAXCDC50

Fieldbus Type: Profibus-DP as per EN 50170, implemented with Siemens SPC3 ASIC

Conformance: PNO Certified Profibus-DP Slave Device

Baud Rates: Automatic baud rate detection in the range 9.6 Kbaud to 12 Mbaud

Station Address: 0 to 125, set by rotary switches.

Connection: 9-pin Female D-Sub connector

Network Isolation: 500 Vrms for 1 minute between Profibus network and sensor and user input commons. Not isolated from all other commons.

PAXUSB PROGRAMMING CARD: PAXUSB00

Type: USB Virtual Comms Port

Connection: Type mini B

Isolation To Sensor & User Input Commons: 500 Vrms for 1 min.

Not Isolated from all other commons.

Baud Rate: 300 to 19.2k

Unit Address: 0 to 99; only 1 meter can be configured at a time

SETPOINT CARDS (PAXCDS)

The PAX and MPAX series has 6 available setpoint alarm output option cards. Only one of these cards can be installed at a time. (Logic state of the outputs can be reversed in the programming.)

DUAL RELAY CARD: PAXCDS10

Type: Two FORM-C relays

Isolation To Sensor & User Input Commons: 2000 Vrms for 1 min.

Contact Rating:

One Relay Energized: 5 amps @ 120/240 VAC or 28 VDC (resistive load).

Total current with both relays energized not to exceed 5 amps

Life Expectancy: 100 K cycles min. at full load rating. External RC snubber extends relay life for operation with inductive loads

QUAD RELAY CARD: PAXCDS20

Type: Four FORM-A relays

Isolation To Sensor & User Input Commons: 2300 Vrms for 1 min.

Contact Rating:

One Relay Energized: 3 amps @ 240 VAC or 30 VDC (resistive load).

Total current with all four relays energized not to exceed 4 amps

Life Expectancy: 100K cycles min. at full load rating. External RC snubber extends relay life for operation with inductive loads

QUAD SINKING OPEN COLLECTOR CARD: PAXCDS30

Type: Four isolated sinking NPN transistors.

Isolation To Sensor & User Input Commons: 500 Vrms for 1 min.

Not Isolated from all other commons.

Rating: 100 mA max @ $V_{SAT} = 0.7$ V max. $V_{MAX} = 30$ V

QUAD SOURCING OPEN COLLECTOR CARD: PAXCDS40

Type: Four isolated sourcing PNP transistors.

Isolation To Sensor & User Input Commons: 500 Vrms for 1 min.

Not Isolated from all other commons.

Rating: Internal supply: 24 VDC $\pm 10\%$, 30 mA max. total

External supply: 30 VDC max., 100 mA max. each output

DUAL TRIAC/DUAL SSR DRIVE CARD: PAXCDS50

Triac:

Type: Isolated, zero crossing detection

Voltage: 260 VAC max., 20 VAC min.

Max Load Current: 1 Amp @ 25°C

0.75 Amp @ 50°C

Total load current with both triacs ON not to exceed 1.5 Amps

Min Load Current: 5 mA

Off State Leakage Current: 1 mA max @ 60 Hz

Operating Frequency: 20-400 Hz

SSR Drive:

Type: Two isolated sourcing PNP Transistors.

Isolation To Sensor & User Input Commons: 500 Vrms for 1 min.

Not Isolated from all other commons.

Rating:

Output Voltage: 18/24 VDC (unit dependent) $\pm 10\%$, 30 mA max. total both outputs

QUAD FORM C RELAY CARD: PAXCDS60

Type: Four FORM-C relays

Isolation To Sensor & User Input Commons: 500 Vrms for 1 min.

Contact Rating:

Rated Load: 3 Amp @ 30 VDC/125 VAC

Total Current With All Four Relays Energized not to exceed 4 amps

Life Expectancy: 100 K cycles min. at full load rating. External RC snubber extends relay life for operation with inductive loads

ALL SETPOINT CARDS

Response Time: internal zero correction cannot be disabled

700 msec. max. (digital filter disabled, internal zero correction cannot be disabled)

LINEAR DC OUTPUT (PAXCDL)

Either a 0(4)-20 mA or 0-10 V retransmitted linear DC output is available from the analog output option card. The programmable output low and high scaling can be based on various display values. Reverse slope output is possible by reversing the scaling point positions.

ANALOG OUTPUT CARD: PAXCDL10 - Self-Powered Output (Active)

Types: 0 to 20 mA, 4 to 20 mA or 0 to 10 VDC

Isolation To Sensor & User Input Commons: 500 Vrms for 1 min.

Not Isolated from all other commons.

Accuracy: 0.17% of FS (18 to 28 °C); 0.4% of FS (0 to 50 °C)

Resolution: 1/3500

Compliance: 10 VDC: 10 K Ω load min., 20 mA: 500 Ω load max.

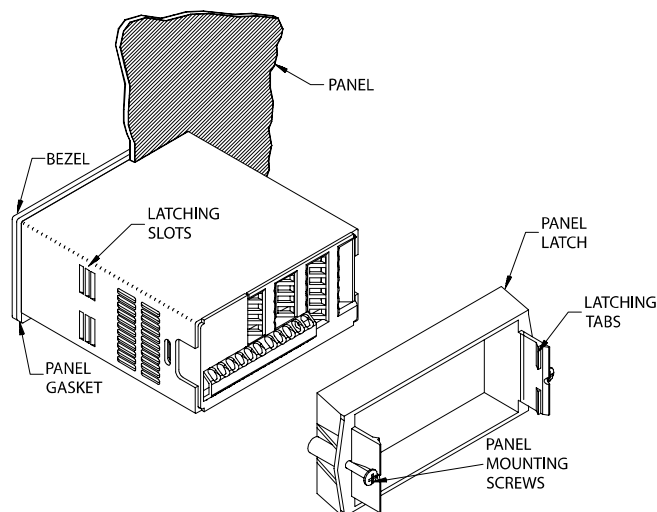
Update time: internal zero correction cannot be disabled

700 msec. max. (digital filter disabled, internal zero correction cannot be disabled)

1.0 INSTALLING THE METER

Installation

The PAX meets NEMA 4X/IP65 requirements when properly installed. The unit is intended to be mounted into an enclosed panel. Prepare the panel cutout to the dimensions shown. Remove the panel latch from the unit. 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.



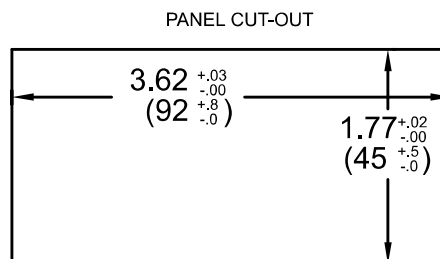
While holding the unit in place, push the panel latch over the rear of the unit so that the tabs of the panel latch engage in the slots on the case. The panel latch should be engaged in the farthest forward slot possible. To achieve a proper seal, tighten the latch screws evenly until the unit is snug in the panel (Torque to approximately 7 in-lbs [79N-cm]). Do not over-tighten the screws.

Installation Environment

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

The bezel should be cleaned only with a soft cloth and neutral soap product. Do NOT use solvents. Continuous exposure to direct sunlight may accelerate the aging process of the bezel.

Do not use tools of any kind (screwdrivers, pens, pencils, etc.) to operate the keypad of the unit.



2.0 SETTING THE JUMPERS

The meter can have up to four jumpers that must be checked and / or changed prior to applying power. The following Jumper Selection Figures show an enlargement of the jumper area.

To access the jumpers, remove the meter base from the case by firmly squeezing and pulling back on the side rear finger tabs. This should lower the latch below the case slot (which is located just in front of the finger tabs). It is recommended to release the latch on one side, then start the other side latch.

Input Range Jumper

This jumper is used to select the proper input range. The input range selected in programming must match the jumper setting. Select a range that is high enough to accommodate the maximum input to avoid overloads. The selection is different for each meter. See the Jumper Selection Figure for appropriate meter.

Excitation Output Jumper

If your meter has excitation, this jumper is used to select the excitation range for the application. If excitation is not being used, it is not necessary to check or move this jumper.

User Input Logic Jumper

This jumper selects the logic state of all the user inputs. If the user inputs are not used, it is not necessary to check or move this jumper.

PAXH:

Signal Jumper

This jumper is used to select the signal type. For current signals, the jumper is installed. For voltage signals, remove the jumper from the board. (For 2 V inputs, this removed jumper can be used in the "2 V only" location.)

Couple Jumper

This jumper is used for AC / DC couple. If AC couple, then the jumper is removed from the board. If DC couple is used, then the jumper is installed.

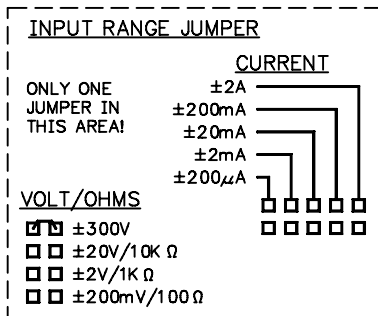
PAXD Jumper Selection

Input Range Jumper

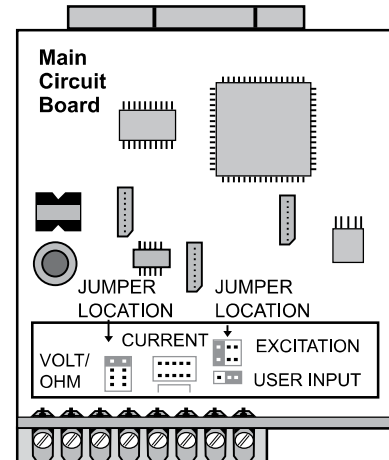
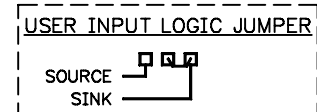
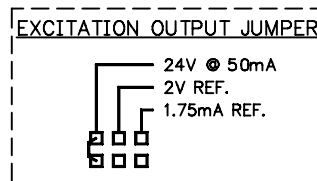
One jumper is used for voltage/ohms or current input ranges. Select the proper input range high enough to avoid input signal overload. **Only one jumper is allowed in this area.** Do not have a jumper in both the voltage and current ranges at the same time. Avoid placing the jumper across two ranges.

JUMPER SELECTIONS

The \frown indicates factory setting.



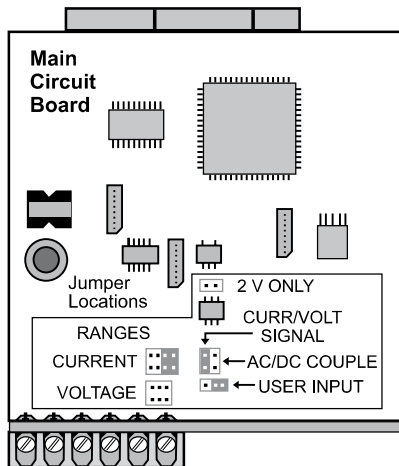
↓ REAR TERMINALS ↓



PAXH Jumper Selection



CAUTION: To maintain the electrical safety of the meter, remove unneeded jumpers completely from the meter. Do not move the jumpers to positions other than those specified.



Signal Jumper

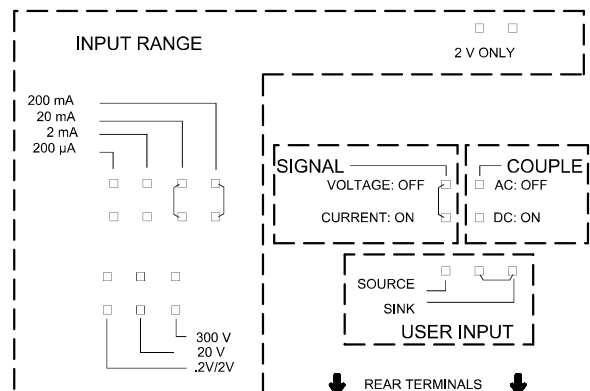
One jumper is used for the input signal type. For current signals, the jumper is installed. For voltage signals, remove the jumper from the board. (For 2 V inputs, this removed jumper can be used in the "2 V only" location.)

Couple Jumper

One jumper is used for AC / DC couple. If AC couple is used, then the jumper is removed from the board. If DC couple is used, then the jumper is installed.

JUMPER SELECTIONS

The \frown indicates factory setting.



Input Range Jumper

For most inputs, one jumper is used to select the input range. However, for the following ranges, set the jumpers as stated:

5 A: Remove all jumpers from the input range.

2 V: Install one jumper in ".2/2V" position and one jumper in "2 V only".

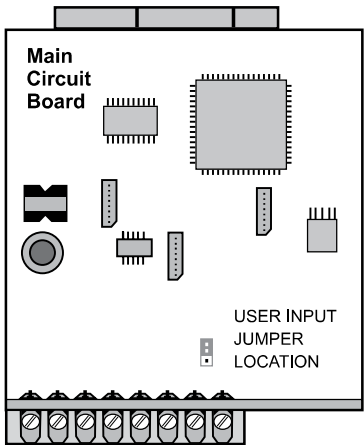
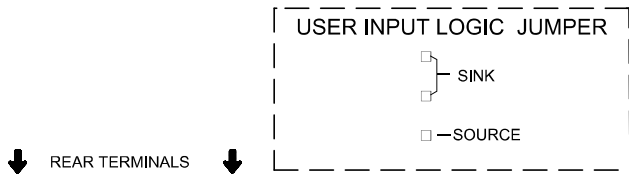
All Other Ranges: One jumper in the selected range only.

Do not have a jumper in both the voltage and current ranges at the same time. Avoid placing a jumper across two ranges.

PAXP Jumper Selection

JUMPER SELECTIONS

The ☒ indicates factory setting.



PAXS Jumper Selection

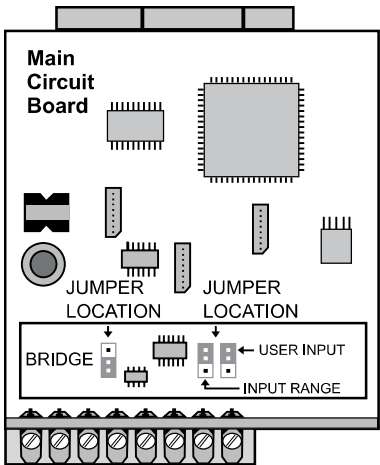
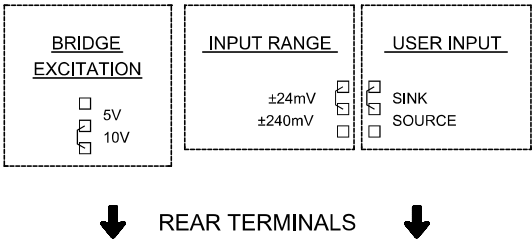
Bridge Excitation

One jumper is used to select bridge excitation to allow use of the higher sensitivity 24 mV input range. Use the 5 V excitation with high output (3 mV/V) bridges. The 5 V excitation also reduces bridge power compared to 10 V excitation.

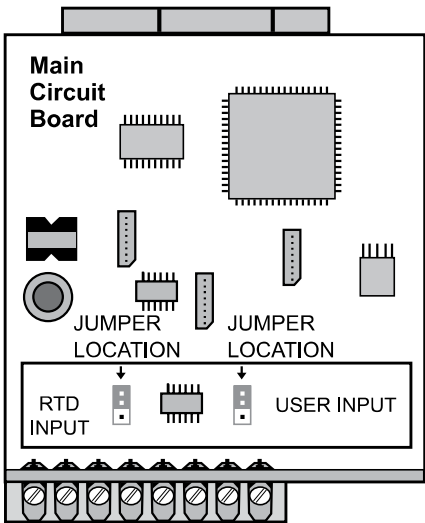
A maximum of four 350 ohm load cells can be driven by the internal bridge excitation voltage.

JUMPER SELECTIONS

The ☒ indicates factory setting.



PAXT Jumper Selection

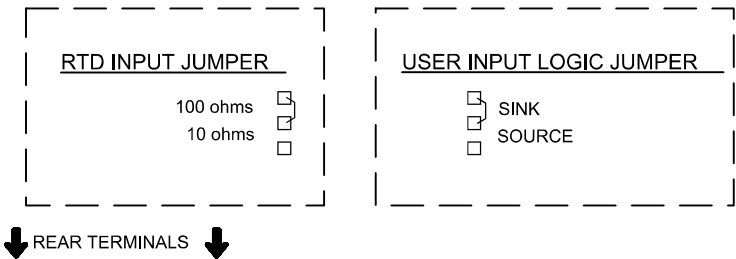


RTD Input Jumper

One jumper is used for RTD input ranges. Select the proper range to match the RTD probe being used. It is not necessary to remove this jumper when not using RTD probes.

JUMPER SELECTIONS

The ☒ indicates factory setting.



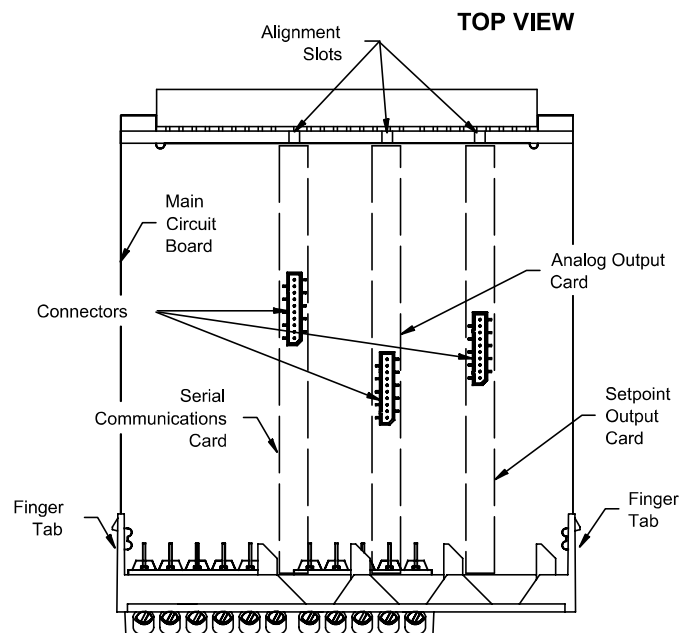
3.0 INSTALLING OPTION CARDS

Note: For option card specific installation instructions, refer to the literature shipped with the option card.

The option cards are separately purchased cards that perform specific functions. These cards plug into the main circuit board of the meter. The option cards have many unique functions when used with the PAX.



CAUTION: The option card and main circuit board contain static sensitive components. Before handling the cards, discharge static charges from your body by touching a grounded bare metal object. Ideally, handle the cards at a static controlled clean workstation. Also, only handle the cards by the edges. Dirt, oil or other contaminants that may contact the cards can adversely affect circuit operation.



To Install:

1. With the meter removed from the case, locate the option card connector for the card type to be installed. The types are keyed by position with different main circuit board connector locations. When installing the card, hold the meter by the rear terminals and not by the front display board.
2. Install the option card by aligning the card terminals with the slot bay in the rear cover. Be sure the connector is fully engaged and the tab on the option card rests in the alignment slot on the display board.
3. Slide the meter base back into the case. Be sure the rear cover latches fully into the case.
4. Apply the option card label to the bottom side of the meter in the designated area. Do Not Cover the vents on the top surface of the meter. The surface of the case must be clean for the label to adhere properly.

4.0 WIRING THE METER

WIRING OVERVIEW

Electrical connections are made via screw-clamp terminals located on the back of the meter. All conductors should conform to the meter's voltage and current ratings. All cabling should conform to appropriate standards of good installation, local codes and regulations. It is recommended that power supplied to the meter (DC or AC) be protected by a fuse or circuit breaker.

When wiring the meter, compare the numbers embossed on the back of the meter case against those shown in wiring drawings for proper wire position. Strip the wire, leaving approximately 0.3" (7.5 mm) bare lead exposed (stranded wires should be tinned with solder). Insert the lead under the correct screw-clamp terminal and tighten until the wire is secure. (Pull wire to verify tightness.) Each terminal can accept up to one #14 AWG (2.55 mm) wire, two #18 AWG (1.02 mm), or four #20 AWG (0.61 mm).

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 Controls #FCOR0000)

Line Filters for input power cables:

Schaffner # FN2010-1/07 (Red Lion Controls #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

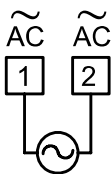
7. Care should be taken when connecting input and output devices to the instrument. When a separate input and output common is provided, they should not be mixed. Therefore a sensor common should NOT be connected to an output common. This would cause EMI on the sensitive input common, which could affect 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.

4.1 POWER WIRING

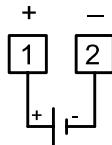
AC Power

Terminal 1: VAC
Terminal 2: VAC



DC Power

Terminal 1: +VDC
Terminal 2: -VDC



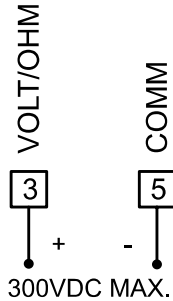
4.2 INPUT SIGNAL WIRING

PAXD INPUT SIGNAL WIRING

Before connecting signal wires, the Input Range Jumper and Excitation Jumper should be verified for proper position.

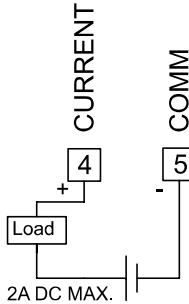
Voltage Signal (self powered)

Terminal 3: +VDC
Terminal 5: -VDC



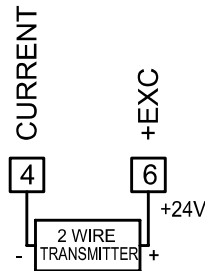
Current Signal (self powered)

Terminal 4: +ADC
Terminal 5: -ADC



Current Signal (2 wire requiring excitation)

Terminal 4: -ADC
Terminal 6: +ADC
Excitation Jumper: 24 V

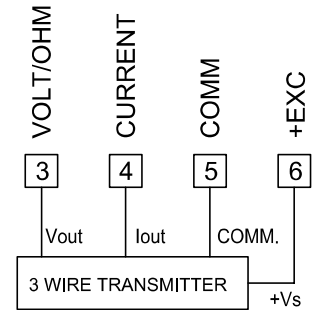


Current Signal (3 wire requiring excitation)

Terminal 4: +ADC (signal)
Terminal 5: -ADC (common)
Terminal 6: +Volt supply
Excitation Jumper: 24 V

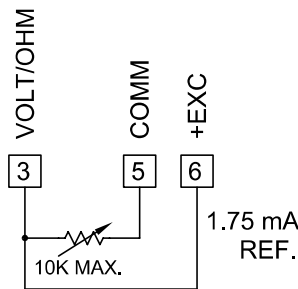
Voltage Signal (3 wire requiring excitation)

Terminal 3: +VDC (signal)
Terminal 5: -VDC (common)
Terminal 6: +Volt supply
Excitation Jumper: 24 V



Resistance Signal (3 wire requiring excitation)

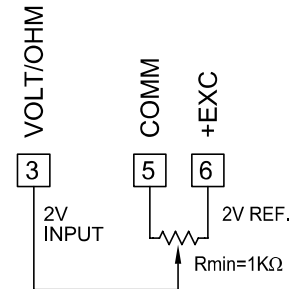
Terminal 3: Resistance
Terminal 5: Resistance
Terminal 6: Jumper to terminal 3
Excitation Jumper: 1.75 mA REF.



Potentiometer Signal (3 wire requiring excitation)

Terminal 3: Wiper
Terminal 5: Low end of pot.
Terminal 6: High end of pot.
Excitation Jumper: 2 V REF.
Input Range Jumper: 2 Volt
Module 1 Input Range: 2 Volt

Note: The Apply signal scaling style should be used because the signal will be in volts.

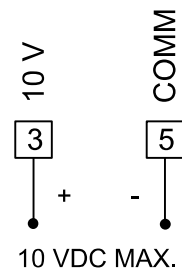


CAUTION: Sensor input common is NOT isolated from user input common. In order to preserve the safety of the meter application, the sensor input common must be suitably isolated from hazardous live earth referenced voltages; or input common must be at protective earth ground potential. If not, hazardous live voltage may be present at the User Inputs and User Input Common terminals. Appropriate considerations must then be given to the potential of the user input common with respect to earth common; and the common of the isolated option cards with respect to input common.

PAXP INPUT SIGNAL WIRING

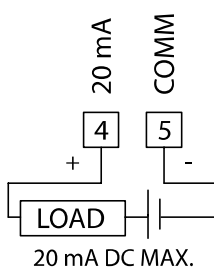
Voltage Signal (self powered)

Terminal 3: +VDC
Terminal 5: -VDC



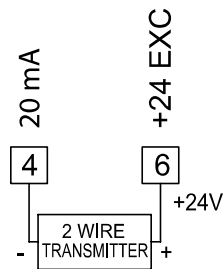
Current Signal (self powered)

Terminal 4: +ADC
Terminal 5: -ADC



Current Signal (2 wire requiring excitation)

Terminal 4: -ADC
Terminal 6: +ADC

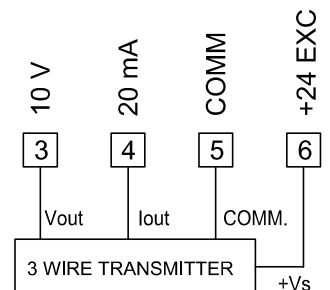


Current Signal (3 wire requiring excitation)

Terminal 4: +ADC (signal)
Terminal 5: -ADC (common)
Terminal 6: +Volt supply

Voltage Signal (3 wire requiring excitation)

Terminal 3: +VDC (signal)
Terminal 5: -VDC (common)
Terminal 6: +Volt supply

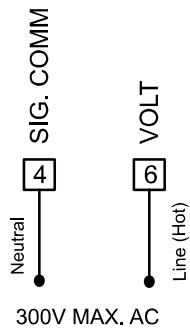


CAUTION: Sensor input common is NOT isolated from user input common. In order to preserve the safety of the meter application, the sensor input common must be suitably isolated from hazardous live earth referenced voltages; or input common must be at protective earth ground potential. If not, hazardous live voltage may be present at the User Inputs and User Input Common terminals. Appropriate considerations must then be given to the potential of the user input common with respect to earth common; and the common of the isolated option cards with respect to input common.

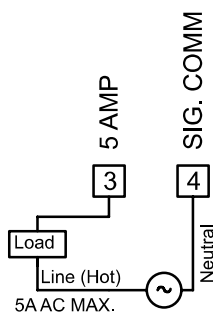
PAXH INPUT SIGNAL WIRING

Before connecting signal wires, the Signal, Input Range and Couple Jumpers should be verified for proper position.

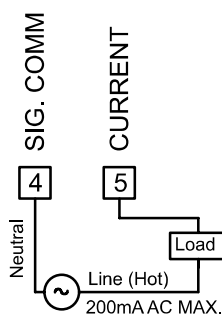
Voltage Signal



Current Signal (Amps)



Current Signal (Milliamps)



CAUTION: Connect only one input signal range to the meter. Hazardous signal levels may be present on unused inputs.

CAUTION: The isolation rating of the input common of the meter with respect to the option card commons and the user input common Terminal 8 (If used) is 125 Vrms; and 250 Vrms with respect to AC Power (meter Terminals 1 & 2). To be certain that the ratings are not exceeded, these voltages should be verified by a high-voltage meter before wiring the meter.



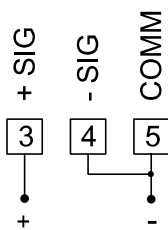
CAUTION:

1. Where possible, connect the neutral side of the signal (including current shunts) to the input common of the meter. If the input signal is sourced from an active circuit, connect the lower impedance (usually circuit common) to the input signal common of the meter.
2. For phase-to-phase line monitoring where a neutral does not exist, or for any other signal input in which the isolation voltage rating is exceeded, an isolating potential transformer must be used to isolate the input voltage from earth. With the transformer, the input common of the meter can then be earth referenced for safety.
3. When measuring line currents, the use of a current transformer is recommended. If using external current shunts, insert the shunt in the neutral return line. If the isolation voltage rating is exceeded, the use of an isolating current transformer is necessary.
4. If the secondary output leads become open, dangerously high voltage can become present if the primary remains energized. It is recommended that the current transformer be internally protected or that a voltage clamping circuit be employed to prevent high voltage across the CT secondary windings. When using a CT, in order to prevent risk of electric shock, ensure that the CT is installed according to local NEC regulation.

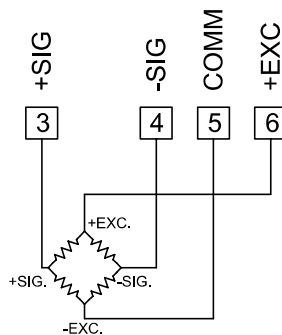
PAXS INPUT SIGNAL WIRING

Before connecting signal wires, the Input Range Jumper should be verified for proper position.

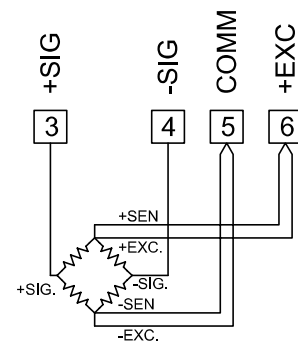
2-Wire Single Ended Input



4-Wire Bridge Input



6-Wire Bridge Input



DEADLOAD COMPENSATION

In some cases, the combined deadload and liveload output may exceed the range of the 24 mV input. To use this range, the output of the bridge can be offset a small amount by applying a fixed resistor across one arm of the bridge. This shifts the electrical output of the bridge downward to within the operating range of the meter. A 100 K ohm fixed resistor shifts the bridge output approximately -10 mV (350 ohm bridge, 10 V excitation).

Connect the resistor between +SIG and -SIG. Use a metal film resistor with a low temperature coefficient of resistance.

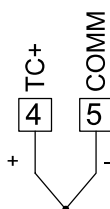
BRIDGE COMPLETION RESISTORS

For single strain gage applications, bridge completion resistors must be employed externally to the meter. Only use metal film resistors with a low temperature coefficient of resistance.

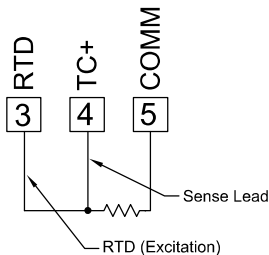
Load cells and pressure transducers are normally implemented as full resistance bridges and do not require bridge completion resistors.

PAXT INPUT SIGNAL WIRING

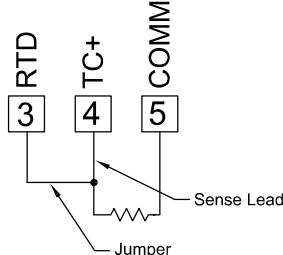
Thermocouple



3-Wire RTD



2-Wire RTD



CAUTION: Sensor input common is NOT isolated from user input common. In order to preserve the safety of the meter application, the sensor input common must be suitably isolated from hazardous live earth referenced voltages; or input common must be at protective earth ground potential. If not, hazardous live voltage may be present at the User Inputs and User Input Common terminals. Appropriate considerations must then be given to the potential of the user input common with respect to earth common; and the common of the isolated option cards with respect to input common.

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