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Bulletin No. PAX2A-(x)
Drawing No. LP0830
Effective 08/10

MODEL PAX2A – 1/8 DIN ANALOG PANEL METER

- *UNIVERSAL PROCESS, VOLTAGE, CURRENT, RESISTANCE AND TEMPERATURE INPUTS*
- *UNIVERSAL AC/DC POWER SUPPLY*
- *6 / 9 DIGIT DUAL LINE/COLOR DISPLAY W/ 0.71" & 0.35" DIGITS*
- *PROGRAMMABLE UNITS DISPLAY*
- *VARIABLE CONTRAST AND INTENSITY DISPLAY*
- *UP TO 160 SAMPLES PER SECOND CONVERSION RATE*
- *BUILT-IN USB PROGRAMMING PORT ENABLING UNIT CONFIGURATION WITH CRIMSON PROGRAMMING SOFTWARE*

DESCRIPTION

The PAX2A Analog Panel Meter offers many features and performance capabilities to suit a wide range of industrial applications. The PAX2A has a universal input to handle various input signals including DC Voltage/Current, Process, Resistance and Temperature. The optional plug-in output cards allow the opportunity to configure the meter for present applications, while providing easy upgrades for future needs. The PAX2A employs a dual line, tri color display with a large 0.71", tri color 6 digit top display line and a 0.35", 9 digit green bottom display line.

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 or calculate service intervals of motors, pumps, etc. The meters have up to four setpoint outputs, implemented on plug-in option cards. The plug-in cards provide dual FORM-C relays (5A), quad FORM-A (3A), or either quad sinking or quad sourcing open collector logic 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, DeviceNet, and Profibus-DP. The PAX2A can be programmed to utilize ModBus protocol. With ModBus, the user has access to most configuration parameters. 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.

The PAX2A includes a built-in USB programming port that makes it possible to configure the meter using a Windows® based program, without any additional communication option cards. The configuration data can be saved to a file for later recall.

A linear DC output signal is available as an optional plug-in 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 partially locked allowing the setpoint values to remain accessible.

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

SAFETY SUMMARY

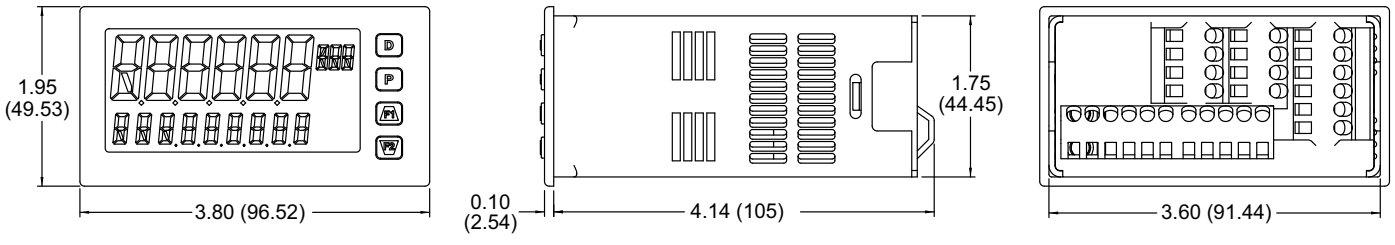
All safety related regulations, local codes and instructions that appear in this literature or on equipment must be observed to ensure personal safety and to prevent damage to either the instrument or equipment connected to it. If equipment is used in a manner not specified by the manufacturer, the protection provided by the equipment may be impaired. Do not use this unit to directly command motors, valves, or other actuators not equipped with safeguards. To do so can be potentially harmful to persons or equipment in the event of a fault to the unit.

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 5.5" (140) W.



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ORDERING INFORMATION

Meter Part Numbers

MODEL NO.	DESCRIPTION	PART NUMBER
PAX2A	Universal DC Analog Input Panel Meter	PAX2A000

Option Card and Accessories Part Numbers

TYPE	MODEL NO.	DESCRIPTION	PART NUMBER
Optional Plug-In 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
	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
		Profibus-DP Communications Card	PAXCDC50
	PAXCDL	Analog Output Card	PAXCDL10
Accessories	SFCRD[2]	Crimson PC Configuration Software for Windows 98, ME, 2000 and XP	SFCRD200

Notes:
1. For Modbus communications use RS485 Communications Output Card and configure communication (tYPE) parameter for Modbus.
2. Crimson software is available for free download from http://www.redlion.net/

GENERAL METER SPECIFICATIONS

1. **DISPLAY**: Positive image LCD
   Top Line - 6 digit, 0.71" (18 mm), with tri-color backlight (red, green or orange), display range: -199999 to 999999;
   Bottom Line - 9 digit, 0.35" (8.9 mm), with green backlight, display range: - 199,999,999 to 999,999,999
2. **POWER**:
   AC Power: 50 to 250 VAC, 50/60 Hz, 14 VA
   DC Power: 21.6 to 250 VDC, 8 W
   Isolation: 2300 Vrms for 1 min. to all inputs and outputs.
3. **ANNUNCIATORS**: Backlight color: Red
   1 - setpoint alarm 1
   2 - setpoint alarm 2
   3 - setpoint alarm 3
   4 - setpoint alarm 4
   Line 1 Units Label – programmable 3 digit units annunciator with tri-color backlight (red, green or orange)
4. **KEYPAD**: 2 programmable function keys, 4 keys total
5. **A/D CONVERTER**: 24 bit resolution
6. **UPDATE RATES**:
   A/D conversion rate: programmable 5 to 160 readings/sec.
   Step response:

Input Rate	5	10	20	40	80	160
Response Time*	600	400	200	100	50	30

   * - msec. 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**:
   "OLOL" - Appears when measurement exceeds + signal range.
   "ULUL" - Appears when measurement exceeds - signal range
   "Short" - Appears when shorted sensor is detected. (RTD only)
   "OPEN" - Appears when open sensor is detected.
   ". . . . ." - Appears when display values exceed + display range.
   "- . . . . ." - Appears when display values exceed - display range.
8. **INPUT CAPABILITIES**:

Current Input:

INPUT RANGE	ACCURACY (18 to 28°C)	ACCURACY (0 to 50°C)	IMPEDANCE/ COMPLIANCE	MAX CONT. OVERLOAD	* RESOLUTION
± 250 µADC	0.03% of rdg + µA	0.12% of rdg + µA	1.11 KΩ	mA	10nA
± 2.5 mADC	0.03% of rdg + µA	0.12% of rdg + µA	111 Ω	mA	0.1µA
± 25 mADC	0.03% of rdg + µA	0.12% of rdg + µA	11.1 Ω	mA	1µA
± 250 mADC	0.05% of rdg + µA	0.12% of rdg + µA	1.1 Ω	mA	10µA
± 2 ADC	0.5% of rdg + mA	0.7% of rdg + mA	0.1 Ω	mA	0.1mA

* Higher resolution can be achieved via input scaling.

Voltage Input:

INPUT RANGE	ACCURACY (18 to 28°C)	ACCURACY (0 to 50°C)	IMPEDANCE/ COMPLIANCE	MAX CONT. OVERLOAD	* RESOLUTION
± 250 mVDC	0.03% of rdg + µV	0.12% of rdg + µV	451 KΩ	V	10µV
± 2.0 VDC	0.03% of rdg + µV	0.12% of rdg + µV	451 KΩ	V	0.1mV
± 10 VDC	0.03% of rdg + µV	0.12% of rdg + µV	451 KΩ	V	1mV
± 25 VDC	0.03% of rdg + µV	0.12% of rdg + µV	451 KΩ	V	1mV
± 100 VDC	0.3% of rdg + mV	0.12% of rdg + mV	451 KΩ	V	10mV
± 200 VDC	0.3% of rdg + mV	0.12% of rdg + mV	451 KΩ	V	10mV

* Higher resolution can be achieved via input scaling.

Temperature Inputs:
READOUT:
Scale: F or C
Offset Range: -199,999 to 999,999

THERMOCOUPLE INPUTS:
Input Impedance: 20MΩ
Lead Resisitance Effect: 0.03 %V/Ω
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 28ºC and 15 to 75% RH environment; and Accuracy over a 0 to 50ºC and 0 to 85% RH (non condensing) environment. Accuracy specified over the 0 to 50ºC 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 -200ºC is a function of temperature, ranging from 1ºC at -200ºC and degrading to 7ºC at -270ºC. 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 = .00392	-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

9. **EXCITATION POWER**: Jumper selectable
   Transmitter Power: +18 VDC @ 50 mA
   Reference Voltage: + 2 VDC, +/- 2%
   Compliance: 1KΩ load min (2 mA max)
   Temperature Coefficient: 40 ppm/ºC max.
   Reference Current: 1.05 mADC, +/- 2%
   Compliance: 10 KΩ load max.
   Temperature Coefficient: 40 ppm/ºC max.
10. **USER INPUTS**: Two programmable user inputs
    Max. Continuous Input: 30 VDC
    Isolation To Sensor Input Common: Not isolated.
    Response Time: 12 msec. max.

Logic State: User programmable (USrACt) for sink/source (LO/HI) logic

INPUT STATE	SINKING INPUTS	SOURCING INPUTS
	20KΩ pull-up to +3.3V	20KΩ pull-down
Active	V_{IN} < 1.1 VDC	V_{IN} > 2.3 VDC
Inactive	V_{IN} > 2.3 VDC	V_{IN} < 1.1 VDC

11. **TOTALIZER**:
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
12. **CUSTOM LINEARIZATION**:
Data Point Pairs: Selectable from 2 to 16
Display Range: -19,999 to 99,999
Decimal Point: 0 to 0.0000
Ice Point Compensation: user value (0.00 to 650.00 µV/C)
13. **MEMORY**: Nonvolatile E^2PROM memory retains all programmable parameters and display values.
14. **ENVIRONMENTAL CONDITIONS**:
Operating Temperature Range: 0 to 50 °C (0 to 45 °C with all three plug-in cards installed)
Storage Temperature Range: -40 to 60 °C
Operating and Storage Humidity: 0 to 85% max. RH non-condensing
Altitude: Up to 2000 meters
15. **CERTIFICATIONS AND COMPLIANCES**:
Consult factory for details.
Refer to EMC Installation Guidelines section of the bulletin for additional information.
16. **CONNECTIONS**: High compression cage-clamp terminal block
Wire Strip Length: 0.3" (7.5 mm)
Wire Gauge Capacity: One 14 AWG (2.55 mm) solid, two 18 AWG (1.02 mm) or four 20 AWG (0.61 mm)
17. **CONSTRUCTION**: This unit is rated for NEMA 4X/IP65 indoor 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.
18. **WEIGHT**: 8 oz. (226.8 g)

OPTIONAL PLUG-IN OUTPUT CARDS

WARNING: Disconnect all power to the unit before installing plug-in cards.

Adding Option Cards

The PAX2A meters can be fitted with up to three optional plug-in cards. The details for each plug-in card can be reviewed in the specification section below. Only one card from each function type can be installed at a time. The function types include Setpoint Alarms (PAXCDS), Communications (PAXCDC), and Analog Output (PAXCDL). The plug-in cards can be installed initially or at a later date.

COMMUNICATION CARDS (PAXCDC)

A variety of communication protocols are available for the PAX2A meter. Only one PAXCDC card can be installed at a time. *Note: For Modbus communications use RS485 Communications Output Card and configure communication (LYPE) parameter for Modbus.*

PAXCDC10 - RS485 Serial (Terminal)
PAXCDC1C - RS485 Serial (Connector)
PAXCDC20 - RS232 Serial (Terminal)
PAXCDC2C - RS232 Serial (Connector)
PAXCDC30 - DeviceNet
PAXCDC50 - Profibus-DP

SERIAL COMMUNICATIONS CARD

Type: RS485 or RS232
Isolation To Sensor & User Input Commons: 500 Vrms for 1 min.
Working Voltage: 50 V. 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

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 (50 V working) between DeviceNet™ and meter input common.

PROFIBUS-DP CARD

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 126, set by the master over the network. Address stored in non-volatile memory.
Connection: 9-pin Female D-Sub connector
Network Isolation: 500 Vrms for 1 minute (50 V working) between Profibus network and sensor and user input commons. Not isolated from all other commons.

PROGRAMMING SOFTWARE

The 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 plug-in card is required to program the meter using the software.

SETPOINT CARDS (PAXCDS)

The PAX2A meter has 4 available setpoint alarm output plug-in cards. Only one PAXCDS card can be installed at a time. (Logic state of the outputs can be reversed in the programming.) These plug-in cards include:

PAXCDS10 - Dual Relay, FORM-C, Normally open & closed
PAXCDS20 - Quad Relay, FORM-A, Normally open only
PAXCDS30 - Isolated quad sinking NPN open collector
PAXCDS40 - Isolated quad sourcing PNP open collector

DUAL RELAY CARD

Type: Two FORM-C relays
Isolation To Sensor & User Input Commons: 2000 Vrms for 1 min.
Working Voltage: 240 Vrms
Contact Rating:
One Relay Energized: 5 amps @ 120/240 VAC or 28 VDC (resistive load), 1/8 HP @120 VAC, inductive 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

Type: Four FORM-A relays
Isolation To Sensor & User Input Commons: 2300 Vrms for 1 min.
Working Voltage: 250 Vrms
Contact Rating:
One Relay Energized: 3 amps @ 240 VAC or 30 VDC (resistive load), 1/10 HP @120 VAC, inductive 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

Type: Four isolated sinking NPN transistors.
Isolation To Sensor & User Input Commons: 500 Vrms for 1 min.
Working Voltage: 50 V. 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

Type: Four isolated sourcing PNP transistors.
Isolation To Sensor & User Input Commons: 500 Vrms for 1 min.
Working Voltage: 50 V. Not Isolated from all other commons.
Rating: Internal supply: 18 VDC unregulated, 30 mA max. total
External supply: 30 VDC max., 100 mA max. each output

ALL FOUR SETPOINT CARDS

Response Time: 200 msec. max. to within 99% of final readout value (digital filter and internal zero correction disabled)
700 msec. max. (digital filter disabled, internal zero correction enabled)

LINEAR DC OUTPUT (PAXCDL)

Either a 0(4)-20 mA or 0-10 V retransmitted linear DC output is available from the analog output plug-in 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.

PAXCDL10 - Retransmitted Analog Output Card

ANALOG OUTPUT CARD

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.
Working Voltage: 50 V. 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 KΩ load min., 20 mA: 500 Ω load max.
Powered: Self-powered
Update time: 200 msec. max. to within 99% of final output value (digital filter and internal zero correction disabled)
700 msec. max. (digital filter disabled, internal zero correction enabled)