PD9000 ConsoliDator+
Multivariable Controller

ConsoliDator+

Field Mount

Panel Mount

MULTI-CHANNEL CONTROLLER

- **NEMA 4X Panel or Field Mount Multi-Channel Controller**
- **Convenient Display, Control, & Alarm of Multiple 4-20 mA & Pulse Inputs**
- **Numeric & Bargraph Color Display (320 x 240 pixels) 5.7" (145 mm)**
- **Sunlight Readable Display, White Backlight**
- **Isolated 24 VDC Transmitter Supplies 200 mA / Analog Input; 1,600 mA Max**
- **99 Channels, 32 Totalizers, 32 Timers, & 199 Modbus Slave Inputs**
- **64 High & Low Alarms assigned to up to 25 Relays with AND/OR Logic**
- **Modular Design for Input & Output Flexibility**
- **Up to (28) 4-20 mA Isolated Inputs or Pulse Inputs**
- **Up to (25) 10 Amp Form C Relays (With Eight Analog or Pulse Inputs)**
- **Up to (25) Isolated 4-20 mA Outputs (With Eight Analog or Pulse Inputs)**
- **Operating Temperature Range: -40 to 60°C (-40 to 140°F)**
- **Pulse, Analog, & Modbus Input Flow Rate / Total / Grand Total Capability**
- **50-Point Linearization, Square Root, and Exponent for Open Channel Flow**
- **Round Horizontal Tank Volume Calculation; Just Enter Diameter & Length**
- **Multi-Pump Alternation Control or Simple On / Off Control**
- **Programmable Displays, Function Keys & Digital Inputs**
- **Math Functions: Sum, Diff, Average, Multiply, Divide, % Efficiency, & More**
- **Display Direct Modbus PV Inputs – Slave Mode**
- **RS-485 Modbus RTU Standard & Ethernet Modbus TCP/IP Optional**
- **Free ConsoliDator+ Configuration Software**
- **3 Year Warranty**

PRECISION DIGITAL CORPORATION

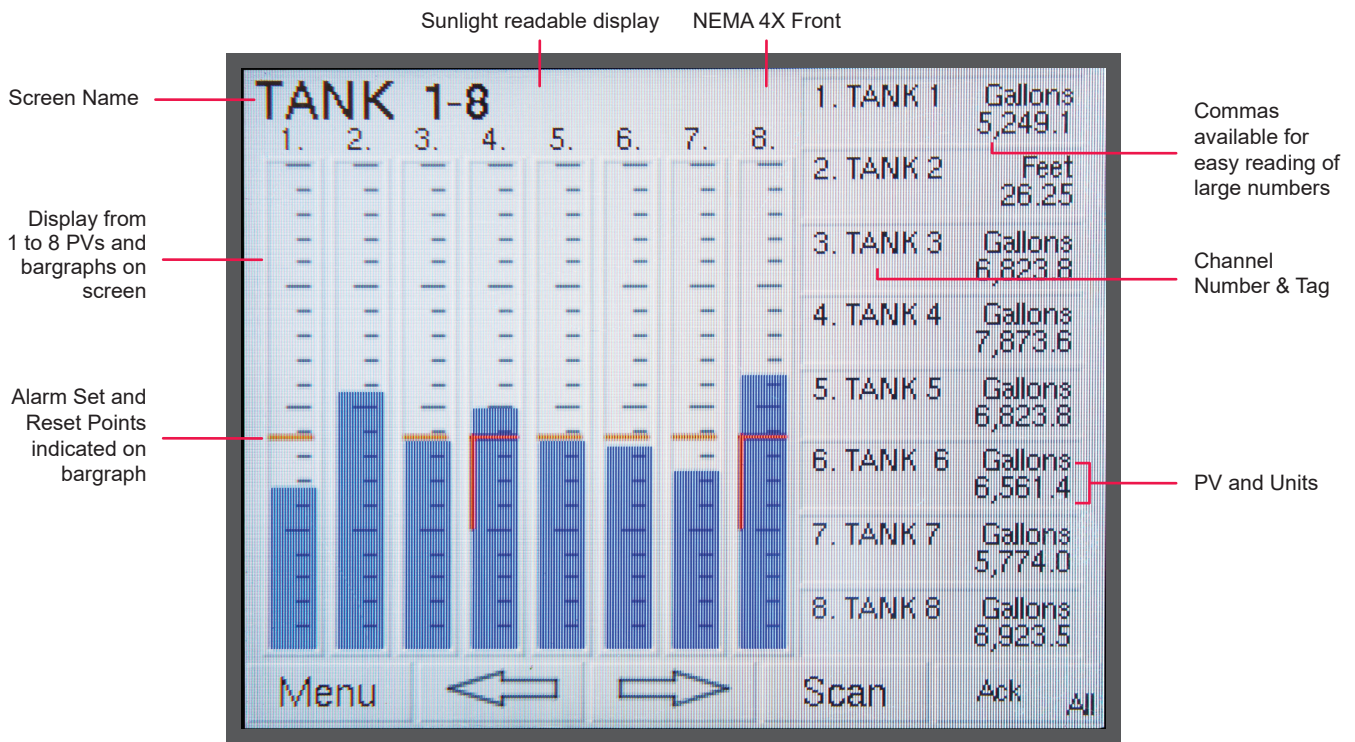PRECISION DIGITAL

www.predig.com

OVERVIEW

The ConsoliDator+ is a multi-channel controller that is both easy to use and satisfies a wide variety of process display, alarm and control applications. It accepts 4-20 mA inputs, flow meter pulse inputs, digital inputs, and Modbus RTU inputs and displays them both in numeric and bargraph format on a large, 5.7" color display. It can be equipped with multiple relays with user-definable actions, 4-20 mA outputs, digital outputs, Modbus RTU, and Ethernet Modbus TCP/IP protocol communication capabilities. Additionally, the controller is equipped with up to 32 timers that can be used to control many processes or events.

All this functionality is easily programmed using free software or via the front panel pushbuttons. Choose the model that best suits your application, from monitoring only to fully loaded controllers with an extensive combination of inputs, outputs and communication protocols. The standard product offering is listed in the ordering guide and other models are available for special order.
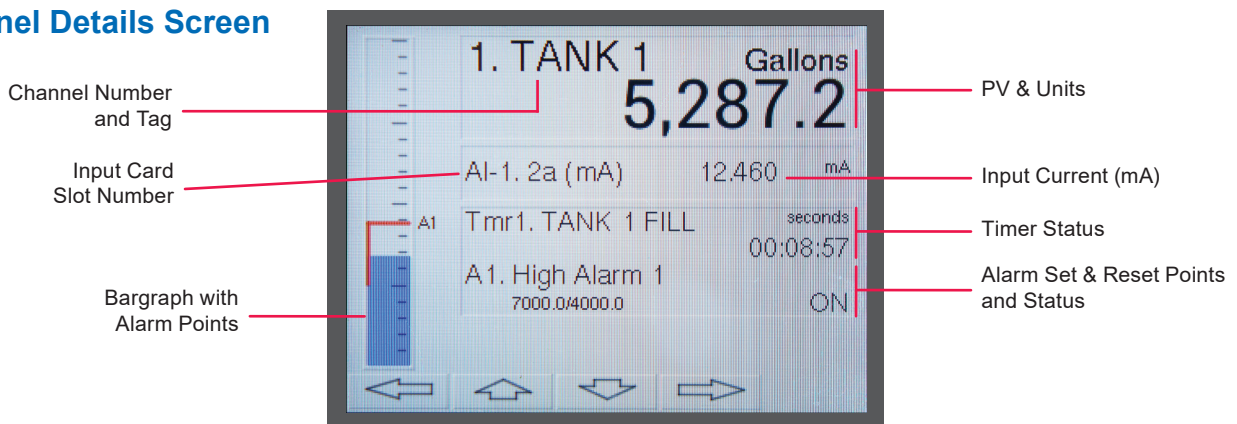
SCREENS

The ConsoliDator+ can be programmed to display the data on up to 20 different screens in a variety of formats, with and without bargraphs. The following screens show a typical main screen and channel details screen:

Main Screen

Screen Name

Display from 1 to 8 PVs and bargraphs on screen

Alarm Set and Reset Points indicated on bargraph

Sunlight readable display   NEMA 4X Front

Commas available for easy reading of large numbers

Channel Number & Tag

PV and Units

Channel Details Screen

Channel Number and Tag

Input Card Slot Number

Bargraph with Alarm Points

PV & Units

Input Current (mA)

Timer Status

Alarm Set & Reset Points and Status

INPUTS & OUTPUTS

If all Input / Output slots are used exclusively for one function, the ConsoliDator+ can accept up to (28) isolated 4-20 mA and pulse inputs, (25) isolated 4-20 mA outputs, and (25) relays. See the Ordering Guide for standard configurations. In addition, the ConsoliDator+ has digital inputs and outputs and RS485 capabilities as standard and Ethernet as an option. The following shows the connections for a ConsoliDator+ with four pulse inputs, eight isolated 4-20 mA inputs, 10 isolated 4-20 mA outputs and 10 Form C relays.
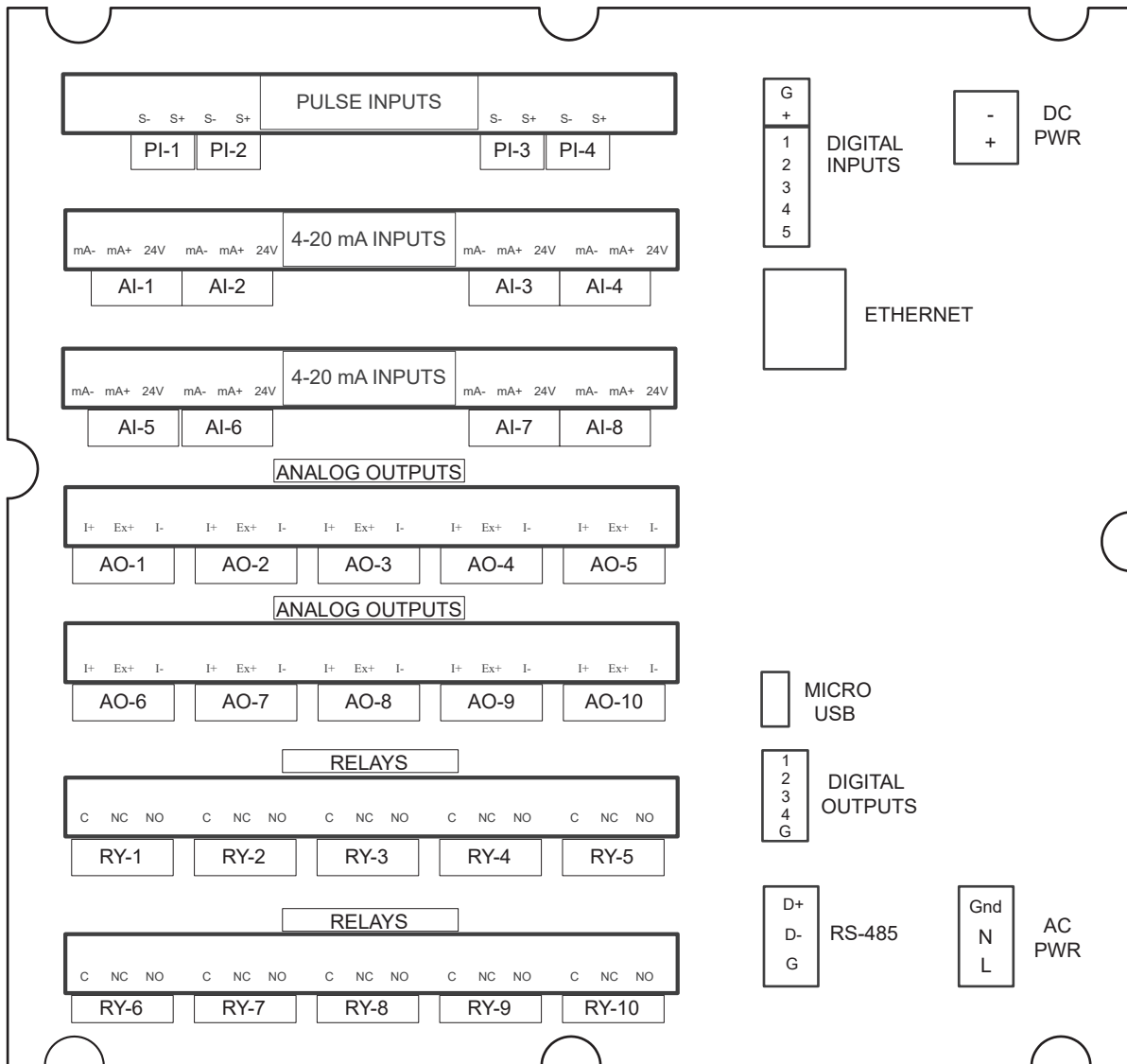
Notes:

1. Each 4-20 mA input has its own isolated 24 VDC power supply to power the transmitter.
2. Each 4-20 mA output has its own isolated 24 VDC power supply to power the output loop.
3. Each relay is Form C and rated at 10 A.
4. Input / output connections are made to removable screw connectors.
5. Every ConsoliDator+ has five digital inputs (additional digital inputs can be obtained by using the Pulse Inputs).
6. Every ConsoliDator+ has four digital outputs.
7. Every ConsoliDator+ has RS-485 with Modbus.
8. All ConsoliDator+ models can be powered from either AC or DC Power.
9. Ethernet with Modbus TCP is an option.
10. Micro USB is used for programming the ConsoliDator+.

SETTING CHANNEL PARAMETERS

What makes the ConsoliDator+ easy to program is its intuitive setup screens. As shown in the first image below, the setup screen allows you to see all the relevant information you need when creating or editing a channel - all on one screen! When creating a new channel, the channel number is auto-generated for you. All you have to do is populate the appropriate fields such as the channel tag name, function, input, and units. Scaling the inputs and outputs, selecting number of decimals, and turning the bargraph on/off and inputing its values are also programmed from this screen. During programming, the soft keys will change based on the screen in place. For instance, pressing the edit key will bring up the letters/numbers key pad and appropriate navigation keys will appear (Shown in the bottom image). See the PD9000 manual for details on setup and programming.

Auto-Generated Channel #: User-editable to re-order channels

Channel Tag: User editable

Function: Applied to input source

Input: Source for channel

Units: Engineering / time or none

Decimals: Number of decimals for PV

Scale: Enter input and output values

Cutoff: PV goes to zero below the cutoff value

Display Bargraph: Display on screen

Bargraph Scale: Set the 0 and 100% values

Soft Keys: Change based on the screen in place

1.	Rate #1
Function:	Scale Linear 2-Pt
Input:	AI-1. 2a (mA)
Units:	Gallons/min
Decimals:	1

■ Bargraph

0% : 0.0
100% : 10000.0

Scale:

	Input (mA)	Output (Gallons/min)
1.	4.000	0.00
2.	20.000	10000.0

■ Cutoff   0.00   Gallons

⬅   ⬆   ⬇   Edit   Delete

Numbers Key Pad Button: pressing this will bring up the numbers key pad

Text Field Editing Buttons

Text / Numbers Input Field

Letter and Numbers Key Pad: Used to input text and numbers in text fields

Soft Keys: Change based on the screen in place

1.	Rate #1
Source:	2b (mA)
Function:	Scale
Units:	GAL/
Decimals:	2

■ Bargraph

: 0.0
: 10000.0

Rate #1

... | A B C D E
F G H I J K L
M N O P Q R S
T U V W X Y Z
___ Enter x

Scale: Inpu

1. 0.00
2. 10000.0

■ Cutoff

⬇   ⇐| |⇒   X⇒   Enter

INDIVIDUAL CHANNEL VIEW

To view the details of any channel, press Menu and then press View – Channel. Select the channel of interest. Navigate through the different items using the navigation keys. A green bar indicates the selected item, press the R-key to step into and see more details about the inputs and outputs related to the channel in view.

In the following examples, the screens show all the parameters associated with Channel 1 including analog input, slot number and its current value, setpoints and status of alarms, and analog output and its mA value. The bargraphs in each of these screens examples represent the current value in gallon units.
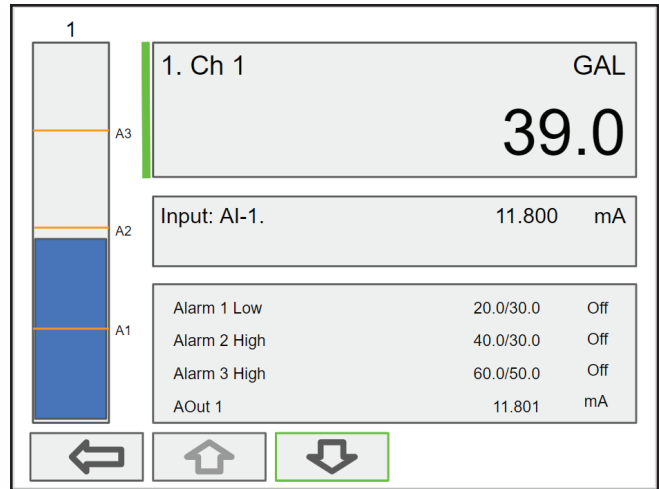

Alarm set points are indicated by amber horizontal lines

Low & High Alarm Indication

If applicable, alarms may be acknowledged, and totals may be reset from the channel view screens. The alarm set points are indicated by an amber line at the corresponding value on the bargraph.
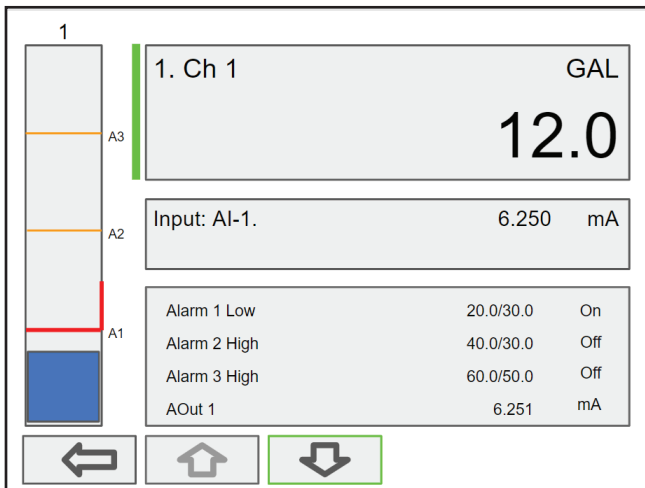
Active Low Alarm: Indicated by red horizontal and vertical lines. The top of the vertical line is the reset point of the low alarm. The low alarm is indicated on the right side of the bargraph.
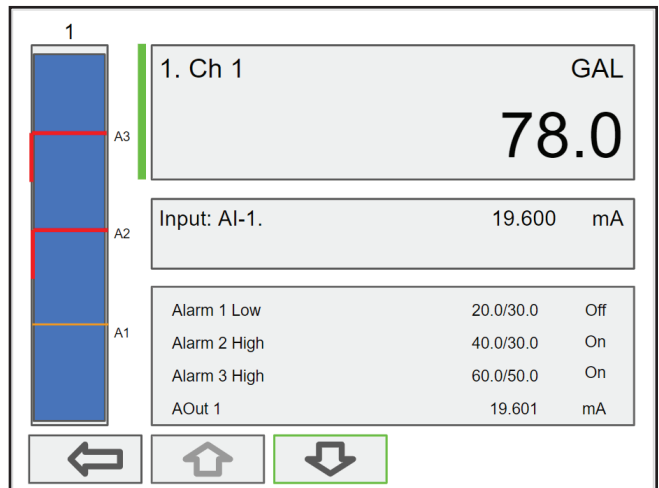
Active High Alarm: Indicated by red horizontal and vertical lines. The bottom of the vertical line is the reset point of the high alarm. The high alarm is indicated on the left side of the bargraph.

CONNECTIONS

Power connections are made to one of the power terminal connectors. All units are capable of being powered either by AC or by DC for the ranges specified.

90-264 VAC Power

- Use three-terminal power connector as shown in Figure 1.
- Unit is protected internally with 1.25 A auto-resettable fuse. 2 A max, slow blow, 250 V min UL Recognized external fuse recommended.

24 VDC Power ± 10%

- Use two-terminal power connector as shown in Figure 1.
- Unit is protected internally with 3.7 A auto-resettable fuse. 4 A max, slow blow, 50 V min UL Recognized external fuse recommended.
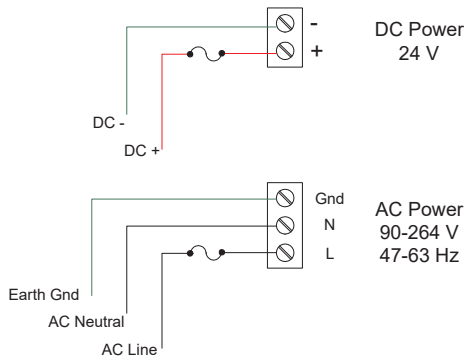
Figure 1. Power Connections

Note:
The controller may be powered by AC voltage with the 24 VDC power connection used as backup power.

Isolated Input Signal Connections

Isolated input signal connections are made to removable screw terminal connectors, which are labeled individually on the back panel of the controller. The back panel shows the type of input card installed in each slot (The top slot is #1 and the bottom is #7). Individual inputs are referenced as PI-1 to PI-4 for pulse inputs and AI-1 to AI-4, AI-5 to AI-8, etc for analog inputs.

4-20 mA Analog Input Connections

Analog 4-20 Input connections are made to screw terminal connectors (two inputs per connector). The following figures show examples for typical applications. Each of the 4-20 mA inputs may be connected in any of the modes shown below.
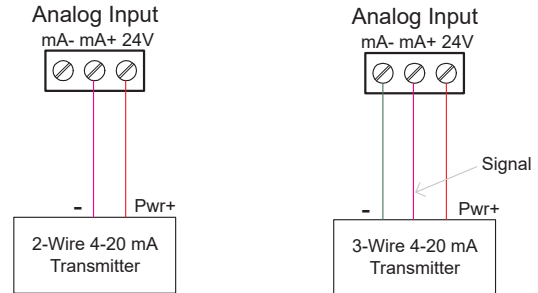
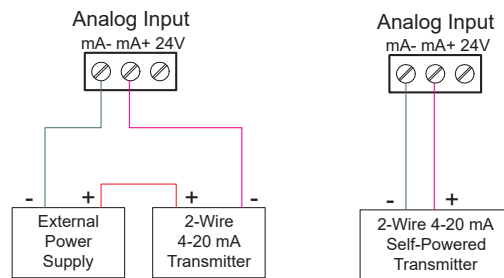**Figure 2. Transmitters Powered by ConsoliDator+'s Isolated 24 VDC Power Supply**

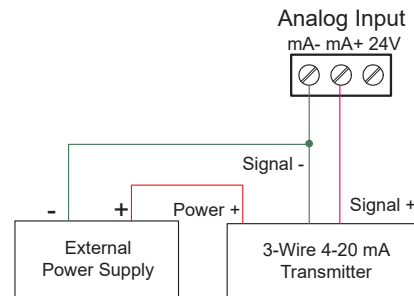**Figure 3. Transmitter Powered by External Supply or Self-Powered**

Figure 4. Three-Wire Transmitters Powered Externally

Flow Meter Pulse Input Connections

Flow Meter Pulse Inputs are wired to four-terminal connectors (two inputs per connector). A square waveform is used in the illustration, but the input is capable of reading many other types of signals within the voltage and frequency ranges specified.
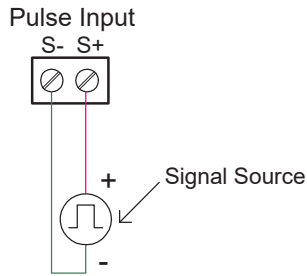

Figure 5. Flow Meter Pulse Input Connections

Digital Input Connections

Inputs are wired between terminals 1-5 of the digital input connector and the G terminal of the 2-position connector above the digital inputs. Normally open switch contacts may be used as shown in Figure 6. The diagram also shows a Digital Input using an NPN open collector transistor output from a live signal. Logic LO or switch closure appearing across the terminals is interpreted as ON. When using an open collector transistor, a logic HI at the base (marked "B" in Figure 6) will be interpreted as ON. The 2-position connector has a +5 V terminal that may be used to provide excitation to some sensors requiring more than the pull-up provided on each digital input terminal.
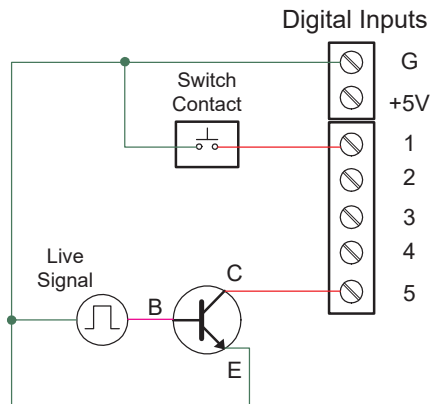
Figure 6. Digital Input from Switch Closure and Live Signal

Analog Output Connections

The following figures show examples for isolated 4-20 mA transmitter output connections. Terminal connectors are labeled individually. The analog outputs are isolated from each other and from the inputs. They are powered internally to provide an active 4-20 mA output loop. The outputs may be powered externally by connecting the positive voltage to the Ex+ terminal.
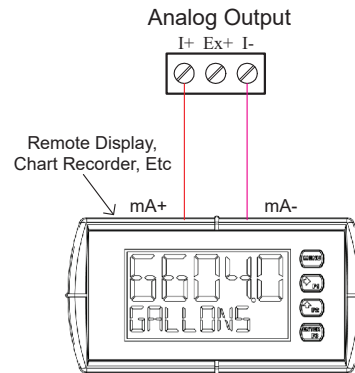
Figure 7. Active 4-20 mA Output Powered by ConsoliDator+

Figure 8. Passive 4-20 mA Output Powered by External Supply

Note: Analog inputs and outputs are isolated from each other.

Digital Output Connections

The digital outputs may be used to drive digital inputs, alarm annunciators, or other devices such as solid state relays that can be driven with low voltage signals.

Figure 9. Digital Outputs Driving 5V Solid State Relay and Alarm Annunciator

Relay Connections

Relay connections are made to three-terminal connectors labeled individually. There are five relays per card.

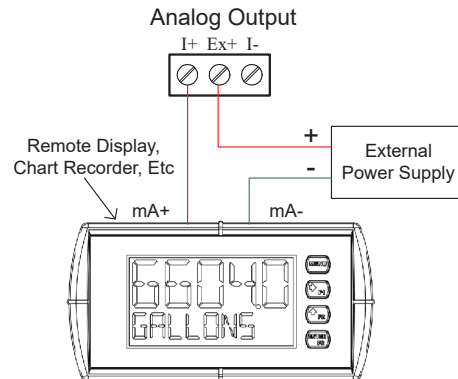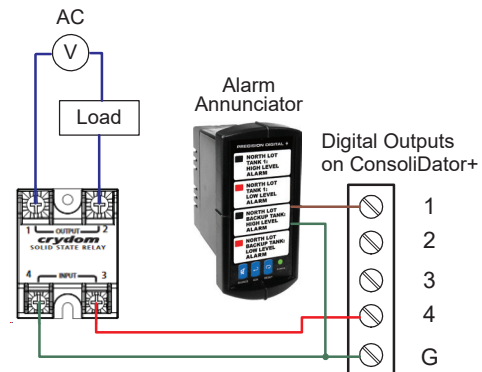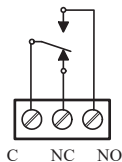**Figure 10. Relay Connections**

Switching Inductive Loads

The ConsoliDator+ has internal circuitry to protect the relays from inductive loads, however, the use of suppressors (snubbers) is strongly recommended when switching inductive loads to prevent disrupting the microprocessor's operation. The suppressors also prolong the life of the relay contacts. Suppression can be obtained with resistor-capacitor (RC) networks assembled by the user or purchased as complete assemblies. Refer to the following circuits for RC network assembly and installation.
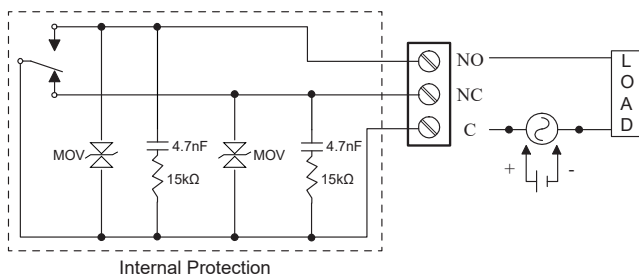

Figure 11. AC and DC Internal Inductive Load Protection

For additional external protection choose R and C as follows:

R: 0.5 to 1 Ω for each volt across the contacts
C: 0.5 to 1 µF for each amp through closed contacts

Notes:

1. Use capacitors rated for 250 VAC.

2. RC networks may affect load release time of solenoid loads. Check to confirm proper operation.

3. Install the RC network at the instrument's relay screw terminals. An RC network may also be installed across the load. Experiment for best results.

Use diode with a reverse breakdown voltage two to three times the circuit voltage and forward current at least as large as the load current.
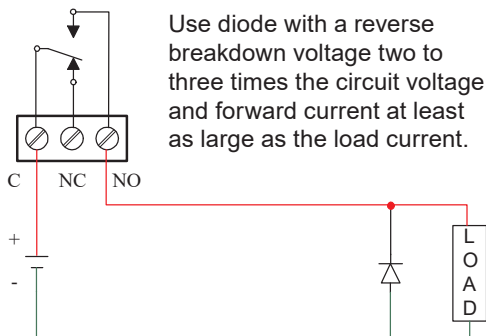
Figure 12. Low Voltage DC Loads Protection

RC Networks Available from Precision Digital

RC networks are available from Precision Digital and should be applied to each relay contact switching an inductive load. Part number: PDX6901.

Serial Communication Connections

The RS-485 port for serial communication (using Modbus protocol) has three terminals labeled D+, D-, and G. It is strongly recommended to use three-wire shielded cable and to always connect the ground terminal to the other equipment's ground to avoid differential voltage between the systems. Distances up to 4000 feet can be reached with RS-485. Up to 32 Modbus devices may be connected to a single RS-485 bus.
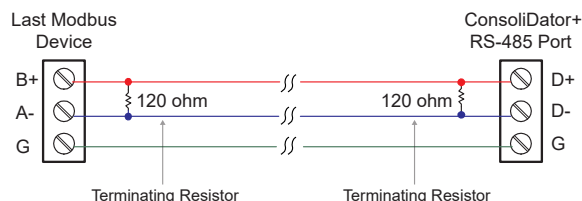
Figure 13. Serial Connections

Ethernet Option

The Ethernet port is available on the RJ45 connector. This allows the ConsoliDator+ to connect to a local area network. The Ethernet port option is configured using the Lantronix DeviceInstaller software, available for download from the Lantronix's Website at **www.lantronix.com/products/xport**. See the PD9000 ConsoliDator+ manual for ethernet port setup details.

External Keypad Connections

Normally open pushbuttons may be wired to the digital inputs connector for use when the front panel of the controller is not accessible. The external keys may be assigned to replicate the Menu and F1-F4 function keys.
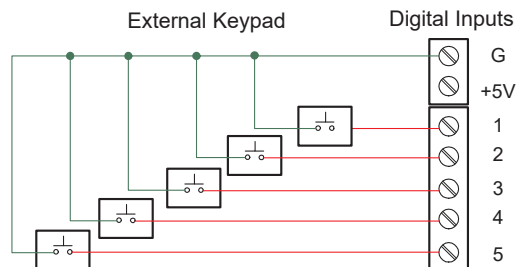
Figure 14. External Keypad Connections

SPECIFICATIONS

Except where noted all specifications apply to operation at 25°C (77°F)

General

Display: Color; QVGA (320x240 px), 5.7" (145 mm) diagonally, white backlight Bargraph: Twenty divisions Numerical: Up to 15 digits (±999,999,999,999,999) Feet & Inches Format: 99,999' 11.9"

Screen Bargraph: Enable/disable: Channels, totals, timers Bargraph scale: 0 – 100%, independent of channel scale. Twenty divisions: 5% each. Screen: Select to show bargraph or not.

Decimal Point: 0 to 15 decimal places, user selectable

Engineering Units: User selectable units or custom units Time, Distance, Volume, Pressure, Weight, Temperature, Current, Voltage, Percent, Amps, Volts, Counts, Logic, and Custom, Any unit/unit of time or other units

Display Update Rate: User selectable: 0.1 to 10 sec (10 updates/ sec to 1 update/10 sec)

Programming Method: Front panel buttons, external buttons, or ConsoliDator+ Software

Number of Alarms: Up to 64 high or low Automatic (non-latching) or latching On & Off time delays. May be assigned to one or more relays. Note: Alarms are independent from relays.

Alarm Types: Single Source: One input
Multi-Source: Two or more inputs
Interval: Enter time interval and On Time
Alarm OR: Any active input alarm triggers the OR alarm
Alarm AND: All input alarms must be active to trigger the AND alarm

Alarm Ack & Reset: Automatic only (Non-latching)
Automatic and manual
Manual only (Latching)
Manual with Ack only after alarm is cleared (Latching with Clear)

Internal Buzzer: 60 dBA @ 24 inches (61 cm) Enable/disable in System – General menu. Associated with alarm Horn setting

External Horn (Sold separately): Assign any relay to the Horn function to activate an external horn when alarm condition is detected.

Calibration: All inputs and outputs are calibrated at the factory. Field calibration not possible.

Input & Output Cards: Max Number of I/O Cards: 7
Analog Inputs: 4/card, Pulse Inputs: 4/card, Analog Outputs: 5/card, Relays: 5/card

Number of Screens: Up to 20 screens with 1 to 8 PVs or items per screen. Enable or disable screen title, channel #, and bargraph Automatic or manual scanning Scan time: 1 to >1000 sec, independent for each screen. F1-F4 keys are assigned per screen

Function Keys: User programmable (See defaults below) F1 = Previous ← F2 = Next → F3 = Scan/Stop F4 = Ack

Number of Channels: Up to 99 channels
Input source: 4-20 mA, Pulse, Digital, Modbus, Alarm, Math, Channel, Total, Timer, mA Output, Relay Output, Digital Output, or Modbus Output

Password: Programmable password restricts modification of programmed settings

Non-Volatile Memory: Settings stored for a minimum of 10 years.

Power (User Selectable Based on Wiring): Three-terminal connector (L, N, GND), AC: 80-264 VAC, 47 to 63 Hz, 60 W max DC: 113-370 VDC, 60 W max (L, N), Two-terminal connector (G, 24V) DC: 24 VDC ±10%, 60 W max

Backup Power Supply: If AC and DC power are connected, the 24 VDC can be used as backup power in case of AC power failure.

Fuse: Unit is protected internally with auto-resettable fuse.
AC: 1.25 A max, DC: 3.7 A max

External Fuse: Recommended external fuse slow-blow
120 VAC: 2.0 A, 240 VAC: 1.0 A, 24 VDC: 4 A

Isolation & Grounding: 1500 V Analog inputs/outputs-to-power line, 500 V Analog input-to-input, input-to-output, analog output-to-output
All analog inputs and analog outputs are isolated from each other.
Note: DC Power is not isolated. DC- is connected to Earth Ground. Digital I/O, USB, and Ethernet are grounded.

Environmental: Operating temperature range: -40 to 60°C (-40 to 140°F)
Storage temperature range: -40 to 60°C (-40 to 140°F)
Relative humidity: 0 to 90% non-condensing
All functions operate down to -40°C (-40°F.) If the LCD response is slower, increase the display refresh setting.

Connections: Removable screw terminal blocks, Inputs/Outputs: 12 to 24 AWG wire, Digital I/O: 16 to 30 AWG, RS-485: 12 to 24 AWG wire RJ45 Ethernet connection. USB ports: Micro-USB (Device) and Type A (Host)

Tightening Torque: Screw terminal connectors: 5 lb-in (0.56 Nm) Digital I/O terminals: 2.5 lb-in (0.28 Nm)

Enclosure: Enclosure Body: Thermoplastic Polyester, Color: Gray,
Display Window: Clear Polycarbonate, GE LEXAN HP12W
Front Panel Keys: Silicone rubber

Tamper Proof Enclosure: The field mount enclosure's cover is secured by a clasp that can be locked to prevent unauthorized access to the enclosure's interior.

Mounting: Wall-Mount: Four screws/bolts required (not provided) Pipe-Mount: (2) U-Bolts for 2" Pipe (See Ordering Information) Panel-Mount: Panel-mounting frame and twelve screws (provided) Cutout: 10.0" x 10.0" ±0.05" (254 mm x 254 mm ±1.3 mm) (H x W) Panel thickness: 0.07" – 0.35" (1.8 mm – 8.9 mm) Clearance behind panel: 6" (152 mm)

Conduit Connections: There are four center punched marks on each side of the field enclosure. Holes must be drilled by the installer according to the desired conduit entry.
Size: ½" or ¾" (16 mm or 21 mm)
Clearance: 1.5" (38 mm) diameter

Overall Dimensions: Panel-Mount: 10.85" x 10.85" x 4.87" (276 mm x 276 mm x 124 mm) (H x W x D)
Field-Mount: 11.5" x 12.0" x 8.03"
(292 mm x 305 mm x 204 mm) (H x W x D)

Weight: Ex: PD9000-XY-4PI-8AI-10AO-10RY
Panel-Mount: 7.4 lb (3.4 kg) approx.
Field-Mount: 10.8 lb (4.9 kg) approx.

Warranty: 3 years parts and labor

4-20 mA Analog Inputs

Number of Inputs: (4) Analog inputs/card
(28) Analog inputs max, no other I/O
Typical Input: 4-20 mA
Input Range: 0-24 mA
Accuracy: ±0.03% of full scale ±1 count
4-20 mA Display Value: Up to six full digits (Recommended) ±999,999. More digits may be used, but the stability will be affected. Increase the filter value and display update rate to get a more stable reading.
Transmitter Power Supply: Isolated 24 VDC @ 200 mA/input
Max current: 1,600 mA (All inputs), (8) Analog Input @ 200 mA max
(28) Analog Input @ 20 mA max
Available on AC or DC powered units
Temperature Drift: Better than: 20 ppm/°C from -40 to 60°C ambient
Filter: Window: 0.5, 1, 2, 4, 8 sec, IIR: 16, 32 sec
Glitch Filter: Discards a single sample caused by high frequency noise
Filter Bypass: 0 to 100 % of full scale Filter is ignored, if the signal change is greater than bypass value
Channel Input Scale Function: Linear 2-Point, Multi-Point (up to 50 points) Square Root, Programmable Exponent, Scale Factor, Round Horizontal Tank (Volume), None (mA Input Reading)
Input Protection: Each 4-20 mA input is protected by an auto-resettable fuse, 30 VDC max. The fuse resets automatically after the fault condition is removed.
Input Impedance: 125 Ω Typical Including auto-resettable fuse
Isolation: 1500 V: Input-to-power line
500 V: Input-to-input, input-to-output
All analog inputs and analog outputs are isolated from each other.
Normal Mode Rejection: 100 dB at 50/60 Hz
Common Mode Rejection: 90 dB at 50/60 Hz

Pulse Inputs

Number of Inputs: (4) Pulse inputs/card, (28) Pulse inputs max, no other I/O
Input Type: Active Square Wave, NPN, PNP, Reed Switch, Coil (Magnetic Pickup)
Normal threshold: 1.2 V (0.8 to 3.0 V)
High threshold: 2.5 V (2.0 V to 6.0 V)
Coil threshold: 20 mV (Low) or 100 mV (High)
Signal Level: Active Square Wave: 0 to 30 V max
Typical: 0 to 5 V
Coil: 20 mVp-p to 30 Vp-p (Magnetic Pickup)
Input Impedance: Active, NPN, Reed: 10 kΩ pull-up to 5 V
PNP: 10 kΩ pull-down to (S-)
Coil: >2 kΩ (20 mV sensitivity), >10 kΩ (100 mV sensitivity)
Isolation: Pulse inputs are not isolated, (S-) terminal is connected to system GND
Input Protection: ±36 V, non-isolated
Frequency Response & Signal Level:
Active Square Wave 5 V: 0 to 100 kHz
Coil (Magnetic Pickup): 0 to 50 kHz
Frequency – Signal level (Coil: 20 mV)
20 mVp-p – 100 Hz
100 mVp-p – 10 kHz
Frequency – Signal level (Coil: 100 mV) 100 mVp-p – 90 Hz
500 mVp-p – 5 kHz
20 Vp-p – 50 kHz
Minimum Frequency: 250 µHz High Gate: 4,000 sec
Gate: Low Gate: 1 to 99 sec
High Gate: 2 to 4,000 sec (Must be higher than low gate)
Accuracy: ±1 count for K-Factor > 1 or 30 ppm
K-Factor: Programmable pulses/unit with up to 15 decimal resolution
Scale Pulse Input: Linear 2-Point
Multi-Point Scaling: 2 to 50 points

Modbus Inputs

Number of Inputs: 199 Modbus RTU
Scale MB Input: Modbus input may be used as the input for creating channels and totals, the same way 4-20 mA inputs are used.
Data Type: Bit-Logic
Signed/Unsigned: 16 (Short), 32 (Long), 64 (Long-Long)
Float 32
Float 64 (Double)
Decimal Point: User selectable
Comm Break & Timeout: Specify what value to hold on comm. break and how long to wait for new data before reporting a break condition.
Input Action: Specify what should happen when new data is written to the input register (e.g. add value to total).

Totalizer

Number of Totalizers: Up to 32 totalizers, 15 digits with comma separator

Totalizer Inputs: Calculates total based on selected rate channel, pulse input, digital input, or trigger event for non-rate channels. Reading stored in non-volatile memory, if power is lost.

Maximum Total: 15 digits, 999,999,999,999,999

Rate Channel Input: 4-20 mA input, Pulse input, Modbus input, Digital Input

Rate & Total Decimal Point: Independent and user selectable from 0 to 15 places

Totalizer Reset: Via front panel keys or digital inputs

Non-Resettable Total: Total may be setup to be non-resettable to prevent unintentional reset. This can be changed in the Setup Totals menu.

Total Conversion Factor: Input: Rate channel
Total units may be different than rate units.
Use the Total CF to convert to non-listed units (e.g. Gallons to MGal = 0.000001)

Pulse Input K-Factor: K-Factor = pulses/units of measure
Calculates total directly from pulse input or from rate channel
Decimals: 0 to 15

Count Down: Total may be setup to count down

Preset Value: Enter the preset value to count up or down.
Reset total sets total to the preset value.

Roll-Over: Enter the value for total to roll-over to 0
Example: Roll-Over = 1,000,000. It goes to 0 after 1 million

Negative Total: Allow total value to count below 0 for bi-directional flow based on rate channel

Total Bargraph: Bargraph may be scaled to represent the expected maximum total.

Function Keys: Screen Setup: Assign F1-F4 to Reset Total, Enter Total, Add To, or Remove From total

Channel & Math Functions

Scale Functions	K-Factor	Converts number of pulses to volume or other units
	Scale Factor	Apply multiplier to a channel
	Scale Linear 2-Pt	Scale a channel
	Scale Multi-Point	Multi-point scaling of a channel
	Scale Square Root	Apply square root to a channel – Differential Pressure from two channels
	Scale Exponent	Apply exponent for weirs and flumes open channel flow calculation
	Round Horizontal Tank	Calculate volume in round horizontal tank with flat ends
	Units Conversion	Convert standard units to custom units

Math Functions	Constant	Assign fixed value
	Summation	Add two or more channels
	Difference	Subtract any two channels
	Abs Difference	Difference always positive
	Absolute Value	Convert channel value to positive
	Average	Find the average of channels
	Weighted Average	Assign % weight to two or more channels
	Multiply	Multiply two channels
	Divide	Divide two channels
	% Efficiency	Calculate input to output efficiency ((A-B)/A)*100%

Additional Functions	Compare	
	Greatest	Greatest value in a group of channels
	Least	Smallest value in a group of channels
	Measure	
	Tare	Calculate net value when Tare function is applied via function key
	Maximum	Maximum value reached by the process
	Minimum	Minimum value reached by the process
	Percent (Bargraph)	% bargraph of any: 4-20 mA input, channel, total, timer, or mA output
	Duration	Keep track of time a condition has been present (e.g. high alarm active)
	Control	
	Sampler	Trigger relay sample and select sampling time (e.g. Turn relay on for 30 sec every time total increases by 1,000 Gallons)
	On-Off Control	Set on & off control based on process value
	Relays	
	Cycle Count	Number of relay cycles since last reset
	Runtime	Relay runtime (ON) hh:mm:ss
	Modbus	
	Time Since Read	This is the time since a Modbus master device read a register

Digital Inputs & Outputs

Digital Inputs: 5 Inputs, non-isolated, 30 VDC max
Standard feature on all ConsoliDator+ models
Low: 0 to 1.2 V
High: 2.8 to 30.0 V
Internal pull-up: 5 kΩ to 5 V
Max pulse frequency: 1 kHz @ 5 Vp-p
+5 V terminal: Internal pull-up 100 Ω
Note: Pulse inputs may be used as digital inputs
Types of Digital Inputs: Normally open switch: External excitation not required (Current: 1 mA)
Open collector transistor: 4.1 V open circuit voltage
Logic level: 0 to 30 V
Digital Outputs: 4 Outputs
Standard feature on all ConsoliDator+ models
Low: 0 V (no load), 1.5 V max @ 10 mA sink (External pull-up)
High: 5.0 V (no load), 3.5 V @ 10 mA load
Maximum current: 30 mA Output impedance: 100 Ω
Output protection: 150 mA auto-resettable fuse
Max frequency: 5 Hz
Input/Output Protection: ±36 V, non-isolated

Relays

Number of Relays: (5) Relays/card, (30) Relays max with (4) analog or (4) pulse inputs, no other I/O
Rating: SPDT (form C) Rated 10 A @ 120/240 VAC or 8 A @ 30 VDC resistive load NO contacts: 1/3 HP, 120 VAC, 30,000 cycles NC contacts: 1/8 HP, 120 VAC, 50,000 cycles
Minimum load: 100 mA @ 5 VDC
Isolation: 1500 VAC, 50/60 Hz for 1 min between coil and contacts
Deadband: 0-100% of full scale, user selectable
Electrical Noise Suppression: TVS diodes & snubbers on all contacts. Recommended, additional external suppressor: 0.01 µF/470 Ω, 250 VAC (Order: PDX6901)
Assignment & Operation: Any relay may be assigned to any alarm, channel, total, timer, digital input, Modbus input, pump alternation, horn, always on, or always off. Multiple relays may be assigned to the same alarm or channel. All relays are programmed independently.
High & Low Alarm: Defined by set and reset points in the Alarm menu
High or Low Alarm: Assign relay to any alarm or channel for on/off relay control Note: Automatic reset only for channel
Multi-Source High or Low Alarm: Assign relay to two or more alarms. Indicate common high or low condition.
Pulse Action: Set any relay for pulsing on/off timed relay control. Programmable pulse width (on/off time) and on/off delay.
Sampling: Relay must be assigned to channel setup for Sampler function with user-defined total increment or set point and sampling time.
Pump Alternation: Any relay may be setup to alternate with any relay in the group. Multiple alternation groups may be setup.
Acknowledge: Front panel Ack key or digital input acknowledges alarms; relays associated with acknowledged alarm are turned off. Acknowledge all or any alarm.
Alarm Relay: Assign any relay to be driven by any alarm; acknowledging the alarm turns off the relay.
Time Delay: Programmable on/off delays, 0.0 to 999.9 sec Independent for each relay.
Auto Initialization: When power is applied to the controller, relays will reflect the state of the input to the controller.

4-20 mA Transmitter Outputs

Number of Analog Outputs: (5) Analog outputs/card, (35) Analog outputs max with no other I/O cards (Seven I/O slots)
Output Range: 4.00 to 20.00 mA, nominal
Calibration: Factory calibrated for 4-20 mA
Scaling Range: Any process range
Reverse scaling allowed
Assignment & Operation: Assign to any analog or pulse input, digital input, Modbus input, channel, total, timer, alarm, or fixed value (none).
Note: Multiple 4-20 mA outputs can be assigned to the same input.
Accuracy: ±0.03% F.S. ±0.005 mA
Temperature Drift: 20 ppm/°C from -40 to 60°C ambient. (Output & Input drifts are separate)
Output Loop Power: Powered by controller or externally by 12 to 32 VDC
Output Loop Resistance: Powered by controller: 10 to 600 Ω
External 12 VDC: 10 to 200 Ω External 24 VDC: 10 to 600 Ω
External 32 VDC: 10 to 1000 Ω
Isolation: 1500 V: Output-to-power line
500 V: Output-to-output, output-to-input
All analog inputs and analog outputs are isolated from each other.

Modbus® Serial Communications

Compatibility: RS-485 (EIA-485)
Protocol: Modbus RTU
Device Address: 1 to 247
Transmit Delay: 0 to 99 ms
Baud Rate: 1,200 to 115,200 bps
Data: 8 bit (1 start bit, 1 stop bit)
Parity: Even, Odd, None with 1 stop bit, or None with 2 stop bits

Ethernet Communications

Device: Lantronix Xport-05
Protocol: Modbus TCP/IP (Default), Modbus UDP/IP, Modbus RTU Over TCP/IP, Modbus RTU Over UDP/IP
Port Settings (Do Not Change):
Protocol: RS232
Baud Rate: 9600
Data Bits: 8
Flow Control: None
Parity: None, Stop Bits: 1
Note: Do NOT change these settings
Network Stack: IPv4
Ethernet MAC/PHY: 10/100 Mbps
Additional Specifications: Refer to the Lantronix Webpage https://www.lantronix.com/products/xport
Ethernet Port Configuration: Download the Lantronix DeviceIntaller software to configure the Ethernet port https://www.lantronix.com/products/xport

ConsoliDator+ Software

System Requirements: Windows® 7, 10
Compatability: One software version for all models
Connection: Micro-USB, RS-485, or Ethernet
Configuration: Configure inputs and outputs.
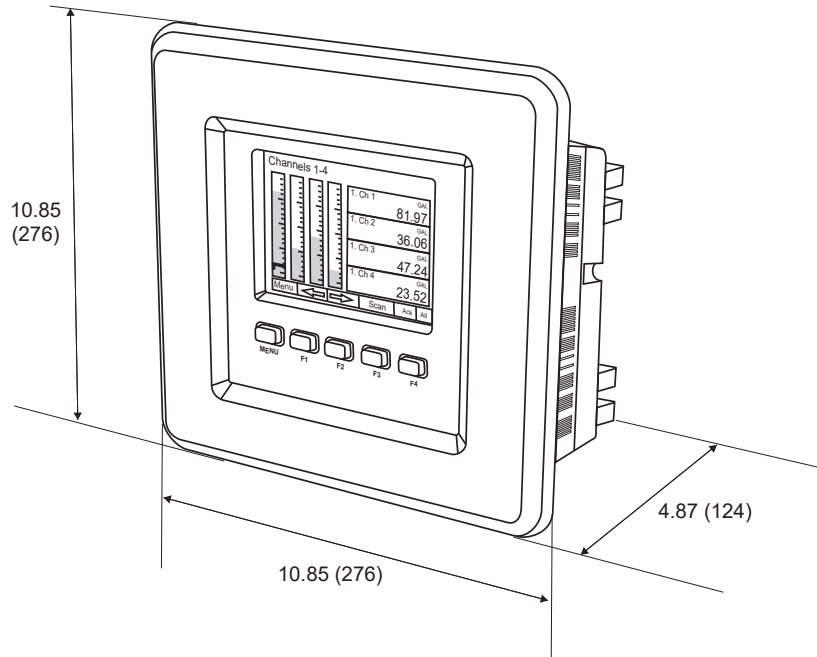Save controller settings file on PC for programming other controllers or to restore settings.
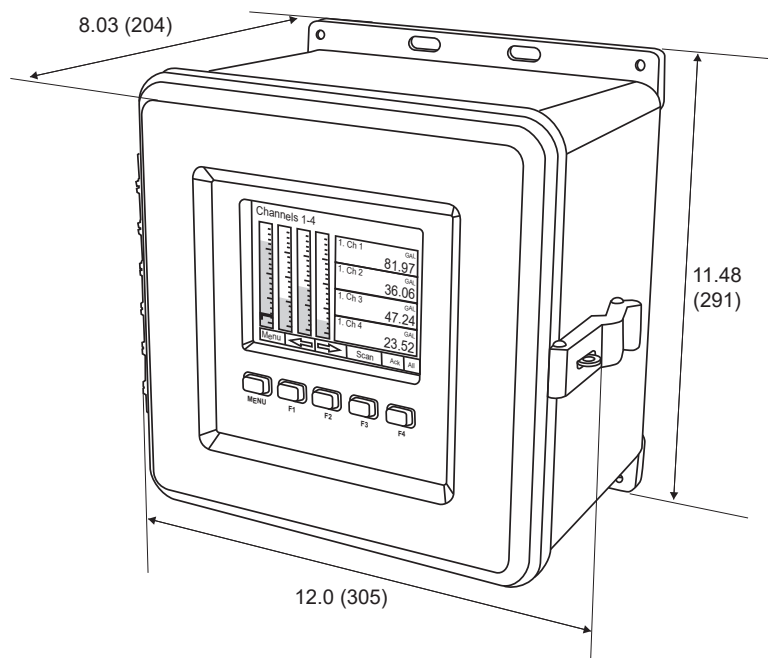
DIMENSIONS

Overall Dimensions

Units: Inches (mm)

10.85
(276)

4.87 (124)

10.85 (276)

Panel Mount Controller

8.03 (204)

11.48
(291)

12.0 (305)

Field / Wall Mount Controller

PD9000 Multi-Channel Controller

ORDERING INFORMATION

General Purpose Panel Mount Models				
Model	**Pulse Inputs**	**4-20 mA Inputs**	**4-20 mA Outputs**	**Relays**
PD9000-GP-4AI	0	4	0	0
PD9000-GP-4AI-10RY	0	4	0	10
PD9000-GP-4AI-5AO-10RY	0	4	5	10
PD9000-GP-4AI-20RY	0	4	0	20
PD9000-GP-4AI-5AO-20RY	0	4	5	20
PD9000-GP-8AI	0	8	0	0
PD9000-GP-8AI-10RY	0	8	0	10
PD9000-GP-8AI-10AO-10RY	0	8	10	10
PD9000-GP-8AI-20RY	0	8	0	20
PD9000-GP-8AI-25RY	0	8	0	25
PD9000-GP-12AI	0	12	0	0
PD9000-GP-12AI-20RY	0	12	0	20
PD9000-GP-12AI-10AO-10RY	0	12	10	10
PD9000-GP-16AI	0	16	0	0
PD9000-GP-16AI-15RY	0	16	0	15
PD9000-GP-16AI-15AO	0	16	15	0
PD9000-GP-20AI	0	20	0	0
PD9000-GP-20AI-10RY	0	20	0	10
PD9000-GP-20AI-10AO	0	20	10	0
PD9000-GP-24AI	0	24	0	0
PD9000-GP-24AI-5RY	0	24	0	5
PD9000-GP-24AI-5AO	0	24	5	0
PD9000-GP-28AI	0	28	0	0
PD9000-GP-4PI	4	0	0	0
PD9000-GP-4PI-5AO	4	0	5	0
PD9000-GP-4PI-5AO-10RY	4	0	5	10
PD9000-GP-4PI-4AI-5AO	4	4	5	0
PD9000-GP-4PI-4AI-5AO-10RY	4	4	5	10
PD9000-GP-4PI-8AI-10AO-10RY	4	8	10	10
PD9000-GP-8PI	8	0	0	0
PD9000-GP-8PI-10AO	8	0	10	0
PD9000-GP-8PI-10AO-10RY	8	0	10	10
PD9000-GP-8PI-8AI-10AO-5RY	8	8	10	5

G = General Purpose
F = Field-Mount
P = Panel-Mount
AI = Analog Input

PI = Pulse Input
AO = Analog Output
RY = Relay
E = Ethernet (Add "–E" at the end of the model number)
Example: PD9000-GP-4PI-8AI-10AO-10RY-E

General Purpose Field/Wall Mount Models				
Model	Pulse Inputs	4-20 mA Inputs	4-20 mA Outputs	Relays
PD9000-GF-4AI	0	4	0	0
PD9000-GF-4AI-10RY	0	4	0	10
PD9000-GF-4AI-5AO-10RY	0	4	5	10
PD9000-GF-4AI-20RY	0	4	0	20
PD9000-GF-4AI-5AO-20RY	0	4	5	20
PD9000-GF-8AI	0	8	0	0
PD9000-GF-8AI-10RY	0	8	0	10
PD9000-GF-8AI-10AO-10RY	0	8	10	10
PD9000-GF-8AI-20RY	0	8	0	20
PD9000-GF-8AI-25RY	0	8	0	25
PD9000-GF-12AI	0	12	0	0
PD9000-GF-12AI-20RY	0	12	0	20
PD9000-GF-12AI-10AO-10RY	0	12	10	10
PD9000-GF-16AI	0	16	0	0
PD9000-GF-16AI-15RY	0	16	0	15
PD9000-GF-16AI-15AO	0	16	15	0
PD9000-GF-20AI	0	20	0	0
PD9000-GF-20AI-10RY	0	20	0	10
PD9000-GF-20AI-10AO	0	20	10	0
PD9000-GF-24AI	0	24	0	0
PD9000-GF-24AI-5RY	0	24	0	5
PD9000-GF-24AI-5AO	0	24	5	0
PD9000-GF-28AI	0	28	0	0
PD9000-GF-4PI	4	0	0	0
PD9000-GF-4PI-5AO	4	0	5	0
PD9000-GF-4PI-5AO-10RY	4	0	5	10
PD9000-GF-4PI-4AI-5AO	4	4	5	0
PD9000-GF-4PI-4AI-5AO-10RY	4	4	5	10
PD9000-GF-4PI-8AI-10AO-10RY	4	8	10	10
PD9000-GF-8PI	8	0	0	0
PD9000-GF-8PI-10AO	8	0	10	0
PD9000-GF-8PI-10AO-10RY	8	0	10	10
PD9000-GF-8PI-8AI-10AO-5RY	8	8	10	5

G = General Purpose   PI = Pulse Input
F = Field-Mount   AO = Analog Output
P = Panel-Mount   RY = Relay
AI = Analog Input   E = Ethernet (Add "–E" at the end of the model number)
                              Example: PD9000-GP-4PI-8AI-10AO-10RY-E

Input / Output Cards & Accessories

Model	Description
PDA9000-C4AI	(4) Isolated 4-20 mA Inputs Card for ConsoliDator+
PDA9000-C4PI	(4) Pulse Inputs Card for ConsoliDator+
PDA9000-C5AO	(5) Isolated 4-20 mA Outputs Card for ConsoliDator+
PDA9000-C5RY	(5) Relays Card for ConsoliDator+
PDA9000U	(2) U-Bolts Zinc-Plated Kit for 2" Pipe for ConsoliDator+
PDA9000U-SS	(2) U-Bolts Stainless Steel Kit for 2" Pipe for ConsoliDator+
PDP9000EB	Additional Devices Internal Mounting Plate for Field-Mount ConsoliDator+ Enclosure
PDA9000SH	Sun Hood for Field Mount or Panel Mount ConsoliDator+
PDX9000EC	Enclosure for Field-Mount ConsoliDator+ (Only for conversion from panel-mount)
PDX9000FC	Front Cover for Panel-Mount ConsoliDator+ (Only for conversion from field-mount)
PDA-LHR	Red Light / Horn for ConsoliDator+ Models with Relays
PDA-LHG	Green Light / Horn for ConsoliDator+ Models with Relays
PDA-LHY	Yellow Light / Horn for ConsoliDator+ Models with Relays
PDA-LHB	Blue Light / Horn for ConsoliDator+ Models with Relays
PDA-LHW	White Light / Horn for ConsoliDator+ Models with Relays
PDA-LH5C	Light / Horn with User Choice of Red, Green, Yellow, Blue, or White Light
PDA-LH3LC-RYG	Light / Horn with Red, Yellow, Green Light Layers

Setup & Calibration Services

Part Number	Description
PDN-CALCON+12	ConsoliDator+ Calibration and Certificate for up to 12 inputs and outputs
PDN-CALCON+24	ConsoliDator+ Calibration and Certificate for up to 24 inputs and outputs
PDN-CALCON+36	ConsoliDator+ Calibration and Certificate for up to 36 inputs and outputs
PDN-CALCON+12-DATA	ConsoliDator+ Calibration and Certificate with data for up to 12 inputs and outputs
PDN-CALCON+24-DATA	ConsoliDator+ Calibration and Certificate with data for up to 24 inputs and outputs
PDN-CALCON+36-DATA	ConsoliDator+ Calibration and Certificate with data for up to 36 inputs and outputs
PDN-CSETCON+	Custom Setup for ConsoliDator+

Your Local Distributor is:

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