

# PDB 180 BATCH CONTROLLER

## Description

The PDB180 is a programmable, microprocessor based unit which provides batch control, monitors flow rate and controls the flow of processing liquids. Start/Stop controls can be used in conjunction with prewarn and final relays to provide valve actuation or pump control. An optional configuration offers streamlined preset adjustments, remote Start, Stop & Reset, and weighted averaging.

## Features

- Pulse or Analog Input
- Display Batch, Rate or Grand Total
- Pulse Count Input up to 20 KHz
- 16 Point Linearization
- 8 Digit K-Factors for Rate and Total
- Security Lockout
- 2-Way RS232/422 Communications
- NEMA 4X/IP65 Front Panel
- Scalable 4-20 mA Output
- Scaled Pulse Output
- Optional Configuration Includes:
  - Streamlined Preset Adjustment (Easy Preset)
  - Remote Start, Stop and Reset
  - Weighted Averaging



**Model PDB180**

## Application

The unit is normally used for batch control or inventory tracking. The display may be toggled between batch, rate, and grand total. A programmable K-factor makes keying-in engineering units easy. The unit accepts pulse, contact closures or analog inputs and provides two separate preset controls.

## Principle of Operation

The batcher receives an input from a pulse producing flowmeter through a sensor. The user programs the batcher to condition the incoming pulses signal and compute the batch flow and flow rate. A wide variety of different functions can then be performed based on the programmed configurations such as start/stop functions, totalizing, and/or flow rate monitoring. Several other inputs, outputs and functions are available.

## Introduction

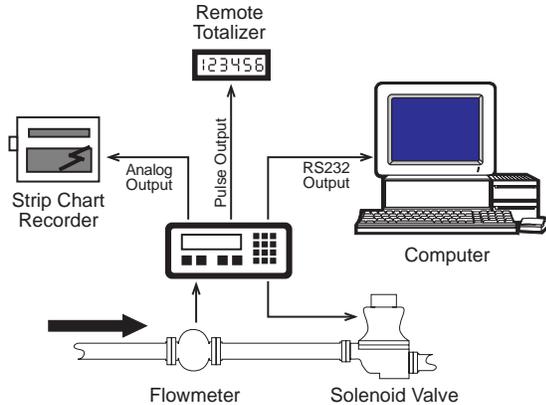
### 1-1 General Description

Sections 1 through 8 of this manual describe the wiring, programming and functionality of the standard Batch controller. Section 9 describes the wiring, programming and functionality of Batch controllers with software version 8.8 (Option 6). Software version 8.8 incorporates Remote Start, Stop & Reset with EZ PRE (easy preset). EZ PRE is a useful tool for applications that require frequent changes to the Preset amount.

The Batch controller uses the following software versions:

- VER 8.8 (Basic unit; Remote Start, Stop & Reset with EZ PRE "Easy Preset")
- VER 12.0 (Option 4; 16 point linearization)

### 1-2 Typical Application



The above application involves liquid flow. The start button is pushed and the Batcher receives pulses from the flowmeter. The pulses are scaled by the K Factor and sent out via the pulsed output to an external counter. The Analog output is directed to a strip chart recorder which gives a hardcopy of the rate. As the Prewarn is reached, the control valve partially closes. When the final Preset is reached the valve shuts down completely. At any time the flow can be suspended by hitting the stop button. Through the serial communications, a computer keeps a record of the daily events.

## 1-3 Principles of Operation

### Presets

When the start button is pushed, two relays engage simultaneously to start flow. When the prewarn number is reached, one relay drops out. When the preset number is reached, the other relay drops out. The user may enter the two numbers when setting up the batch counter. The prewarn is set a certain number of counts less than the preset number. If the prewarn is set larger than the preset, the message "PREWRONG" will appear on the display.

### Ratometer

Accurate to 5 1/2 digits ( $\pm 1$  display digit). The ratemeter can be programmed to accept almost any number of pulses per unit of measurement, sample from 2 to 24 seconds maximum, and auto range up to 6 digits of significant information. The ratemeter with a K Factor of 1 displays the rate of pulses per second. Simply dial in the proper K Factor to display in minutes, hours or other units of measurement. Press the C button, while the unit is displaying the batch, to display the rate; 'R' is displayed on the left side of the display.

### K Factor

The K Factor is used to convert the input pulses or analog input into workable units. The 8 digit K Factor is a divider with a range of 0.00011 to 99999999 (the decimal point may be keyed into any position). Separate K Factors may be entered into the count and rate sections of the Batcher. Thus, you may batch in gallons and display rate in liters per hour. The maximum factored count speed is 20000 Hz. The maximum factored rate is 7 digits.

### 16 Point Linearization (Optional)

This option extends the accurate range by allowing users to dial in different K Factors for different input rates. This option may be used with digital or analog inputs. (See Section 7-3.)

## 1-3 Principles of Operation (continued)

### **Counter**

The maximum count is 99999999. In the setup mode choose "RO" (Reset to Zero) for adding (count up) operation or "SP" (Set to Preset) for subtracting (count down) operation. At any time, the display can be made to flash the Grand Total by pressing the ENT button while in the run mode. Activating the CLR button while the Grand Total is flashing, resets the Grand Total counter.

### **Lockout**

Unauthorized front panel changes can be prevented by entering a user selected, four digit code, in the "Lockout" mode. The status of the unit can be observed but "LOCK ON" appears if changes are attempted. Entering the code again returns the unit to "LOCK OFF" status.

### **Analog Output** (Optional)

The Analog Output option is available on all units except those with **Square Law** inputs. Controlled by an Open Collector transistor, it gives a 4 to 20mA (or 0-20mA) output which corresponds to predefined rate or total readings. In the Setup mode the user is prompted to set the low and high (4 to 20 mA) values and also decide if the analog signal will correspond to the ratemeter or totalizer.

A sinking driver generates a linear current across the user's external device (such as a strip chart recorder, PLC, computer, external meter, etc). The Batcher can supply the 24 VDC to power the current loop. (Connect pin 15 to 13, Pin 16 is now +24 VDC with respect to pin 12.) Connect Pin 16 to the + DC side of the external device and connect Pin 3 to -DC side of the external device.

### **Frequency out**

The Batcher generates a pulse out for each factored count. An NPN transistor output (Pin 2), can drive external devices at rates of 10, 200, 2000 or 20000 counts per second as selected through the keypad menu. If the K Factor scaled inputs generate pulses faster than the output speed selected, an internal buffer will store up to 9,999 counts before "DATA LOST" flashes on the screen. This indicates that the counts being totaled and the scaled outputs may be incorrect. Note that all counts stored in the internal buffer will be pulsed out at the selected frequency even if the counter is reset.

### **Outcard** (Optional)

RS232 or RS422 serial two way communications are available. Up to 15 units can be linked together in parallel and addressed separately to transmit unit status or accept new set points in the standard ASCII format. Baud rates of 300, 600, 1200, 2400, 4800 or 9600 as well as choice of odd, even, space, or mark parity can be selected by keypad control.

## 1-4 STD PRE and EZ PRE Operation Modes

### **STD PRE and EZ PRE Operation Modes**

Version 8.8 of the batcher software allows the user to choose between STD PRE (Standard Preset) and EZ PRE (Easy Preset) operation modes. STD PRE operation is well suited for batch amounts that do not change, since the program mode must be entered to change the preset and the batch count must be cleared before starting a new batch. EZ PRE has been designed for users who frequently change the batch amount. During EZ PRE operation, the preset can be viewed and changed without entering the program mode and another batch can be started without resetting the unit.

**Note:** *Before a batch is started and after a batch is complete, the unit will continue to totalize all inputs.*

**Note:** *EZ PRE is not available on units with 16 Point Linearization.*

#### **Using STD PRE**

##### **Programming**

**Select STD PRE** - Go into the Program Mode and select STD PRE in the PRE TYP sub menu.

**Set the PRESET and PREWARN** - Go into the Program Mode and enter the desired values for the PRESET and the PREWARN.

**Program the Counter** - Go into the Program Mode and set up the counter in the COUNT sub menu.

##### **Operation**

**Start a Batch** - In the Run Mode, reset the total by pressing "CLR", then press "A" to start. When started, both relays energize and the counter begins to count. When the batch is complete, the relays drop out and the unit displays the amount that was batched (0 if in Set to Preset mode).

**Stop a Batch** - Press "B", to temporarily stop process by de-energizing the PRESET and PREWARN relays. Press start, "A", to continue process.

**Repeat a Batch** - In the Run Mode, reset the total and press the start button.

**Change the Batch Size** - Go to the Program Mode and enter new PRESET and PREWARN values.

#### **Using EZ PRE**

##### **Programming**

**Select EZ PRE** - Go into the Program Mode and select EZ PRE in the PRE TYP sub menu.

**Set the PRESET and PREWARN** - Go into the Program Mode and enter the desired values for the PRESET and the PREWARN.

**Program the Counter** - Go into the Program Mode and set up the counter in the COUNT sub menu.

##### **Operation**

**Start a Batch** - In the Run Mode, press "A" to start. When started, both relays energize and the counter begins to total. When complete, the relays drop out and the display flashes the current PRESET value.

**Stop a Batch** - Press "B", to temporarily stop process by de-energizing the PRESET and PREWARN relays. Press start, "A", to continue process.

**Repeat a Batch** - Press the start button.

**Change the Batch Size** - With the current PRESET flashing on the display, type a new number using the keypad. This number becomes the PRESET.

**Display Batch Total or Rate** - With the current PRESET flashing, press "ENT" to place the PRESET value in memory and use the "C" button to toggle between the Batch Total and the Rate.

## 1-5 Specifications

### Housing:

High impact plastic case with NEMA 4X front panel.

### Dimensions:

See Section 1-5, Page 4.

### Display:

8 Digit, 0.55" High, 15 Segment, Red Orange, LED.

### Input Power:

A: 110 VAC  $\pm$  15% or 12 to 27 VDC

B: 220 VAC  $\pm$  15% or 12 to 27 VDC

NOTE: AC Inputs are internally fused with a 160mA slow blow fuse.

### Current:

Maximum 280 mA DC or 5.3 VA at rated AC voltage.

### Output Power:

(On AC powered units only): +12 VDC at 100 mA. Separate Isolated 12 VDC at 100 mA to allow  $\pm$  12 VDC or +24 VDC, regulated  $\pm$  5% worst case.

### Temperature:

Operating: +32°F (0° C) to +130 ° F (+54° C)

Storage: -40°F (-40° C) to +200 ° F (+93° C)

(Extended operating temperature range available, consult factory)

### Memory:

EEPROM stores all program, display mode and count data for a minimum of 10 years if power is lost.

### Reset

Front push button: "CLR" resets displayed number and control output.

Remote Input (Terminal 5): Open or 0 to 1 VDC (low), 3 to 30 VDC (high), 10K ohm input impedance to ground. Minimum pulse on / off time 5 msec.

### Accuracy over full temperature range:

Analog - Zero error:  $\pm$ 0.175% full scale max.

Overall error:  $\pm$ 0.5% full scale max.

Digital - 100% (within specified voltage ranges)

### Pulse Inputs:

3A: Standard. High impedance pulse input. Open or 0 to 1 VDC (low), 3 to 30 VDC (high), 10K ohm input impedance. 20 KHz maximum speed (min. on / off 25 usec).

3B: Same as 3A except 4.7 K ohm pull up resistor to +5 VDC with respect to Terminal 12.

### Analog Inputs:

The current or voltage input is converted to a highly linear 0 to 10 KHz frequency. This frequency can then be scaled by 8 digit K-factors to display rate or count in the appropriate engineering units.

**5A:** 4-20 mA; 250  $\Omega$  input impedance.

**5B:** 0-20 mA; 250  $\Omega$  input impedance.

**5C:** 1-5 VDC; 15 K $\Omega$  input impedance.

**5D:** 0-5 VDC; 15 K $\Omega$  input impedance.

**5E:** 0-10 VDC; 15 K $\Omega$  input impedance.

**6A:** Square Law: 4-20 mA; 250  $\Omega$  input impedance.

## 1-5 Specifications (continued)

### Factored Output:

One pulse per each factored count

Sinking (NPN Transistor)

Open Collector sinks 250 mA maximum to 1 volt maximum from 30 VDC maximum

Internal buffer: 9999 pulses

Output speed: user selectable (see table below)

Speed (Hz)	10	200	2000	20000
Min. on/off (msec)	47.5	2.0	0.2	0.013

### Analog output:

(Not available with 4-20 mA, Square Law input type)

4-20 mA (or 0-20 mA)

Sinking, (NPN transistor), Open Collector

Compliance voltage: 3-24 VDC, non-inductive

Accuracy:  $\pm 100$  uA worst case

Update Rate: Follows ratemeter

### Control Outputs:

SPDT Relays

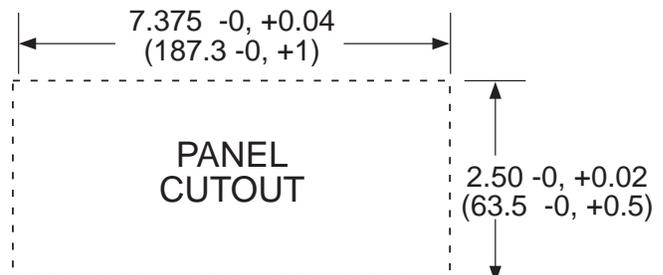
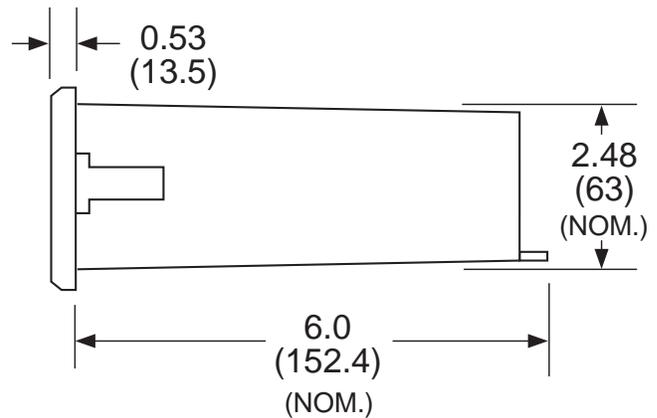
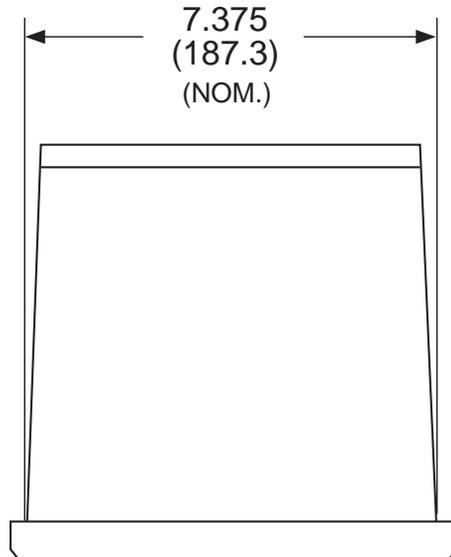
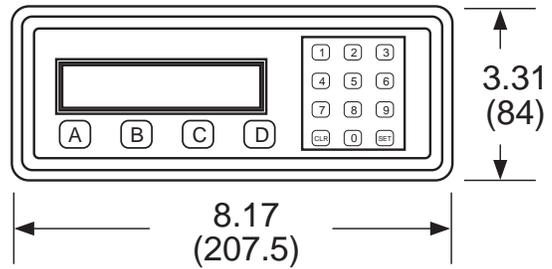
Contact rating: 10 A 120/240 VAC or 28 VDC.

### NPN Transistor Output

Open Collector sinks maximum of 100 mA from 10 VDC when active

Note: 10 VDC is provided at transistor outputs through the relay coils. If current greater than 2 mA is drawn, the relay will remain energized. Applying greater than 10 VDC may destroy the unit. The transistor will sink 100 mA in the "ON" state with relays installed.

## 1-6 Dimensions



All Dimensions in inches (mm)