

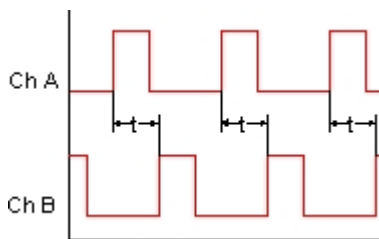


### Features

- Times single events or accumulated time from 1  $\mu$ s to 999,999 hrs
- Timing resolution to 0.2  $\mu$ s
- Selectable HH.MM.SS clock format or decimal format
- Inputs from NPN or PNP proximity switches, contact closures, digital logic, magnetic pickups down to 12 mV, or AC inputs up to 250 Vac
- Triggers on positive or negative pulse edges
- External controls for reset, meter hold and decimal points
- Universal AC power, 85-264 Vac
- Isolated 5, 10 or 24 Vdc excitation supply to power sensors
- NEMA 4X, 1/8 DIN case
- Optional serial I/O: Ethernet, USB, RS232, RS485, Ethernet-to-RS485 converter
- Optional relay outputs: dual or quad relays, contact or solid state
- Optional isolated analog output: 4-20 mA, 0-20 mA, 0-10V, -10 to +10V
- Optional low voltage power: 10-48 Vdc or 12-32 Vac
- Optional Extended Timer: features of standard timer plus rate based on 1/time

### Description

The Laureate stopwatch meter is designed to time single events, such as sporting events or processes, which produce start and stop pulses. It can also time the width of a single pulse. Highest resolution is 0.2  $\mu$ s, since timing is achieved by counting 5.5 MHz clock pulses. For long intervals, the display is updated continuously during timing. Laureate™ stopwatch timers use the FR dual-channel signal conditioner and Standard counter main board.



- **A-A Stopwatch Mode.** Time can be measured between a start pulse and a stop pulse, both on Channel A, from either the positive or negative edges.
- **A-B Stopwatch Mode.** Time can also be measured between a start pulse on Channel A (positive or negative edge) and a stop pulse on Channel B (positive or negative edge). This mode allows inputs from different sources. In addition, the A and B inputs can be tied together to start the stopwatch with one polarity and stop it with the other polarity.
- **Rate Based on 1/Time Mode.** Highly accurate rate can be displayed by taking the inverse of time. Extensive arithmetic capabilities allow display in engineering units, such as meter/sec. This mode requires use of an Extended counter.

**Display.** The event time (Item #1) may be displayed H, M or S format with six-digit resolution. The longest single-event timing interval is 999,999 hours. The highest resolution is 0.2  $\mu$ s. The event time may also be displayed in HH.MM.SS clock format with

1 s resolution. The stopwatch display is updated during timing at a rate controlled by a gate time, up to 25/s. It is reset to zero when the next start pulse occurs. Accumulated time from multiple events (Item #2) is also tracked and may be displayed up to 999,999 hours.

**Inputs to the FR dual-channel signal conditioner** can be proximity switches with PNP or NPN output, TTL or CMOS logic, magnetic pickups, contact closures, low-level outputs from turbine flow meters down to 12 mV, and high-level AC line inputs up to 250 Vac. A built-in isolated 5, 10, or 24 Vdc excitation supply can power proximity switches and other sensors, thus eliminating the need for an external power supply.

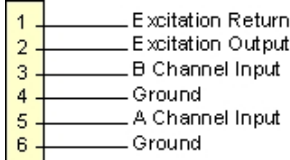
**Digital filtering** is selectable for electrically noisy environments, including a batch averaging filter and an adaptive moving average filter which provides a choice of 8 time constants from 80 ms to 9.6 s. When a significant change in signal level occurs, that filter adapts by briefly switching to the shortest time constant to follow the change, then reverts back to the selected time constant. In a selectable Auto filter mode, the filter time constant is automatically selected based on detected signal noise.

**Designed for system use.** Optional plug-in boards include Ethernet and other serial communication boards, dual or quad relay boards, and an isolated analog output board. Laureates may be powered from 85-264 Vac or optionally from 12-32 Vac or 10-48 Vdc. The display is available with red or green LEDs. The 1/8 DIN case meets NEMA 4X (IP65) specifications from the front when panel mounted. Any setup functions and front panel keys can be locked out for simplified usage and security. A built-in isolated 5, 10, or 24 Vdc excitation supply can power transducers and eliminate the need for an external power supply. All power and signal connections are via UL / VDE / CSA rated screw clamp plugs.

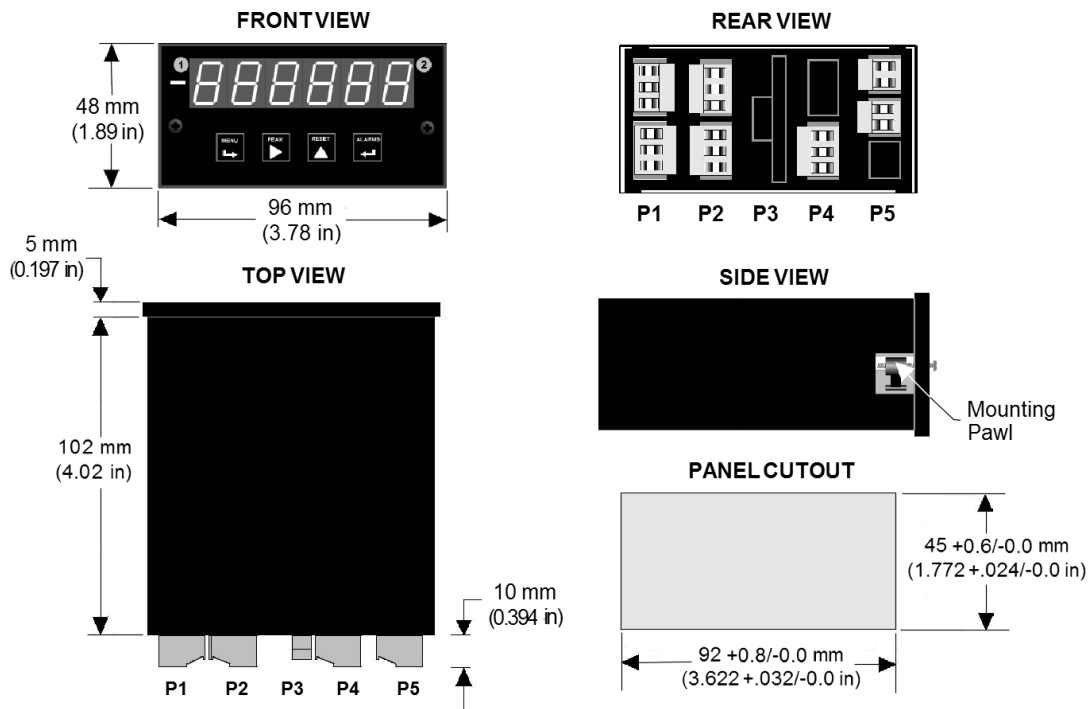


## Specifications

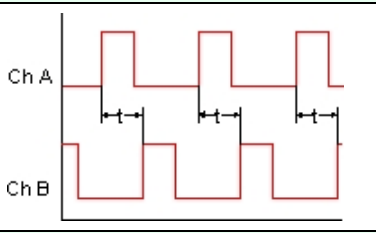
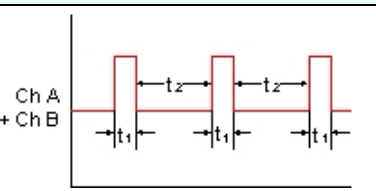
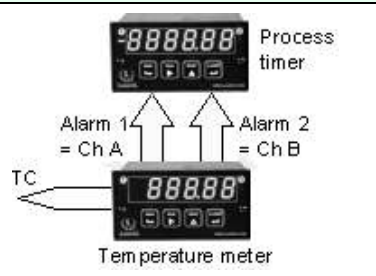
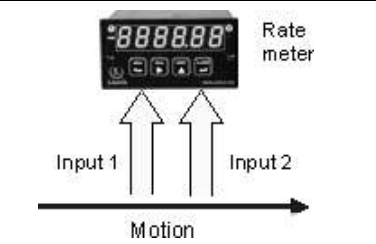
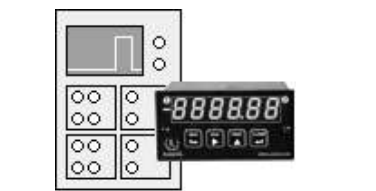
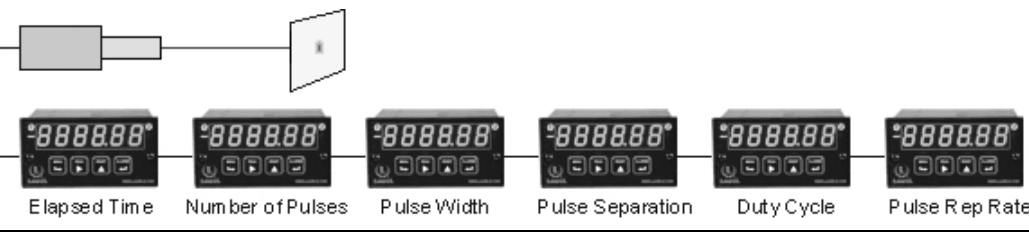
<b>Display</b>	
Readout Range Indicators	6 LED digits, 7-segment, 14.2 mm (.56"), red or green -999999 to +999999 Four LED lamps
<b>Inputs</b>	
Types Grounding Minimum Signal Maximum Signal Noise Filter Contact Debounce	AC, pulses from NPN, PNP transistors, contact closures, magnetic pickups. Common ground for channels A & B Nine ranges from (-12 to +12 mV) to (+1.25 to +2.1V). 250 Vac 1 MHz, 30 kHz, 250 Hz (selectable) 0, 3, 50 ms (selectable)
<b>Stopwatch Mode</b>	
Timing Modes: With Ch A only With Ch A tied to Ch B With Ch A and Ch B  Timing Interval Timing Resolution Selectable Decimal Time Selectable Clock Time Output & Display Update	+ to + edge, or - to - edge. + to - edge, or - to + edge. + edge of A to + edge of B, + edge of A to - edge of B, - edge to A to - edge of B, - edge of A to - edge of B 1 $\mu$ s to 999,999 hrs 0.2 $\mu$ s to 1 hr 999999 H, M or S format with decimal point HH.MM.SS format 30 ms + gate time programmable from 10 ms to 199.99 s
<b>Accuracy</b>	
Time Base Span Tempco Long-term Drift	Crystal calibrated to $\pm 2$ ppm $\pm 1$ ppm/ $^{\circ}$ C (typ) $\pm 5$ ppm/year
<b>Power</b>	
Voltage, standard Voltage, optional Frequency Power Isolation	85-264 Vac or 90-300 Vdc (DC operation not UL approved) 12-32 Vac or 10-48 Vdc DC or 47-63 Hz 250V rms working, 2.3 kV rms per 1 min test
<b>Excitation Output (standard)</b>	
5 Vdc 10 Vdc 24 Vdc Output Isolation	5 Vdc $\pm 5\%$ , 100 mA 10 Vdc $\pm 5\%$ , 120 mA 24 Vdc $\pm 5\%$ , 50 mA 50 Vdc to meter ground
<b>Analog Output (optional)</b>	
Output Levels Current compliance Voltage compliance Scaling Resolution Isolation	4-20 mA, 0-20 mA, 0-10V, -10 to +10V (single-output option) 4-20 mA, 0-20 mA, 0-10V (dual-output option) 2 mA at 10V ( > 5 k $\Omega$ load) 12V at 20 mA ( < 600 $\Omega$ load) Zero and full scale adjustable from -99999 to +99999 16 bits (0.0015% of full scale) 250V rms working, 2.3 kV rms per 1 min test (dual analog outputs share the same ground)
<b>Relay Outputs (optional)</b>	
Relay Types Current Ratings Output common Isolation	2 Form C contact relays or 4 Form A contact relays (NO) 2 or 4 Form A, AC/DC solid state relays (NO) 8A at 250 Vac or 24 Vdc for contact relays 130 mA at 140 Vac or 180 Vdc for solid state relays Isolated commons for dual relays or each pair of quad relays 250V rms working, 2.3 kV rms per 1 min test

Serial Data I/O (optional)	
Board Selections	Ethernet, Ethernet-to-RS485 server, USB, USB-to-RS485 server, RS485 (dual RJ11), RS485 Modbus (dual RJ45), RS232
Protocols	Modbus RTU, Modbus ASCII, Laurel ASCII protocol
Data Rates	300 to 19200 baud
Digital Addresses	247 (Modbus), 31 (Laurel ASCII),
Isolation	250V rms working, 2.3 kV rms per 1 min test
Environmental	
Operating Temperature	0°C to 6°C
Storage Temperature	-40°C to 85°C
Relative Humidity	95% at 40°C, non-condensing
Protection	NEMA-4X (IP-65) when panel mounted
Electrical Connections	
	

## Mechanical



## Application Examples

<b>Time Interval Mode for Time Delay</b>	
	<p>For periodic pulses applied to A and B channels, time delays can be measured down to 0.2 <math>\mu</math>s resolution from the rising or falling edge of A to the rising or falling edge of B (selectable).</p>
<b>Time Interval Mode for Time Delay</b>	
	<p>The width of periodic pulses (<math>t_1</math> or <math>t_2</math>) can be measured by tying the A and B channels together. As for time delay, readings are averaged over a user-selectable gate time.</p>
<b>Timing Process Dynamics</b>	
	<p>The start and stop pulses used for timing can be generated by the dual relay board in a Laureate panel meter or digital counter. For instance, the start and stop pulse edges can be created as temperature passes two alarm setpoints, or temperature cycles in a hysteresis control mode.</p>
<b>Rate Based on 1 / Time</b>	
	<p>The start and stop pulses used for timing can be generated by the dual relay board in a Laureate panel meter or digital counter. For instance, the start and stop pulse edges can be created as temperature passes two alarm setpoints, or temperature cycles in a hysteresis control mode.</p>
<b>Replacing an Oscilloscope with a Laureate Meter</b>	
	<p>An oscilloscope is great for viewing and timing pulses in a lab. However, in fixed installations where digital timing accuracy and control outputs are required, a low-cost Laureate time interval meter will be the instrument of choice. Resolution to 0.2 <math>\mu</math>s is feasible.</p>
<b>Instrumenting a Pulsed Laser System</b>	
	
<p>Some of the many possibilities in instrumenting a pulsed laser system with Laureate dual-channel counters: elapsed time, number of pulses, pulse width, pulse separation, duty cycle, and pulse rep rate.</p>	

## Ordering Guide

Create a model a model number in this format: **L5000FR, IPC**

<b>Main Board</b>	<p><b>L5</b> Standard Main Board, Green LEDs  <b>L6</b> Standard Main Board, Red LEDs  <b>L7</b> Extended Main Board, Green LEDs  <b>L8</b> Extended Main Board, Red LEDs</p> <p><b>Note:</b> Use of the Extended Main Board makes this counter also suitable for A-B time interval, frequency, rate, period, square root of rate, up or down total, arithmetic functions, simultaneous rate and total, phase, duty cycle, batching, and custom curve linearization.</p>
<b>Power</b>	<p><b>0</b> Isolated 85-264 Vac  <b>1</b> Isolated 12-32 Vac or 10-48 Vdc</p>
<b>Relay Output</b> (isolated)	<p><b>0</b> None  <b>1</b> Two 8A Contact Relays  <b>2</b> Two 130 mA Solid State Relays  <b>3</b> Four 8A Contact Relays  <b>4</b> Four 130 mA Solid State Relays</p>
<b>Analog Output</b> (isolated)	<p><b>0</b> None  <b>1</b> Single isolated 4-20 mA, 0-20 mA, 0-10V, -10 to +10V  <b>2</b> Dual isolated 4-20 mA, 0-20 mA, 0-10V</p>
<b>Digital Interface</b> (isolated)	<p><b>0</b> None  <b>1</b> RS232  <b>2</b> RS485 (dual RJ11 connectors)  <b>4</b> RS485 Modbus (dual RJ45 connectors)  <b>5</b> USB  <b>6</b> USB-to-RS485 converter  <b>7</b> Ethernet  <b>8</b> Ethernet-to-RS485 converter</p>
<b>Input Type</b>	<p><b>FR</b> Dual-Channel Pulse Input Signal Conditioner</p>
<b>Add-on Options</b>	<p><b>BL</b> Blank lens without button pads  <b>CBL01</b> RJ11-to-DB9 cable  <b>CBL02</b> USB-to-DB9 adapter  <b>CBL05</b> USB Cable, A to B  <b>IPC</b> Clear front panel cover sealed to NEMA 4X / IP65  <b>BOX1</b> NEMA-4X wall-mount enclosure  <b>BOX2</b> BOX1 plus IPC</p>