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Yokogawa Corporation of America

# Y800$^{Plus}$ Frequency, Rate & Period Meter

## With dual, independently field-scalable channels


4006497

## Features

- **Frequencies from 0.005 Hz to 1 MHz**
- **6-digit resolution at update rates up to 25/s**
- **Selectable "count by" of 10 or 100 with rounding**
- **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 Counter: all capabilities of Standard counter, plus**
  - **Rate and total simultaneously**
  - **Custom curve linearization**
  - **Arithmetic functions A+B, A-B, AxB, A/B, A/B-1 (draw)**

## Description

**Standard Counter Version:**

- **The Y800$^{Plus}$ dual-channel frequency, rate & period meter** is a basic operating mode of the Y800$^{Plus}$ counter with the FR signal conditioner board. It can display frequency from 0.005 Hz to 1 MHz, rate in engineering units, and period (inverse of frequency). The normal displayed value can range up to 999,999 counts. Above that level, the display will flash and go into four-digit XXXXEX scientific notation. Each channel (A or B) may be independently scaled for frequency, rate or period. The displayed channel is selected via a front panel push-button. Examples of applications are the accurate display of AC line frequency, RPM, speed from proximity switch inputs, and flow from turbine flow meter inputs.
- **Fast, high resolution measurements.** The Y800$^{Plus}$ counter determines frequency by timing an integral number of periods over a specified gate time, and then taking the inverse of period. Rate is obtained by multiplying the input by a scale factor. The inverse period approach allows greater accuracy and faster update times than conventional meters which count signal pulses over a time interval. AC line frequency may be accurately measured to 50.0000 or 60.0000 Hz in a few line cycles. 1000 Hz signals may be measured to 0.01 Hz resolution at up to 25 readings per second. Fast response is ideal for alarm and control applications.
- **For noise reduction,** a count by 10 or 100 feature with rounding is selectable. Variations in the displayed reading can also be reduced by selecting a longer gate time. An adaptive digital filter is selectable to reduce variations due to noise while rapidly responding to actual changes in the signal.

**Extended Counter Version:**

- **Rate and total simultaneously.** One channel can display total while the other displays rate. The selection for either channel is via a front panel pushbutton. This mode is ideal for flow applications when the same signal is applied to both channels.
- **Custom curve linearization.** Exceptionally accurate custom curve linearization allows linearization of the low end of turbine flowmeters. For setup, up to 180 data points can be input into a spreadsheet or text file by the user. The computer then calculates nonlinear segments, which are downloaded into the meter via RS-232. The Extended version allows linearized rates to be totalized.
- **Arithmetic functions.** The Extended counter makes arithmetic functions available, namely A+B, A-B, AxB, A/B and A/B-1 (draw). For example, A+B allows two input flows to be summed for total flow, while A-B allows outflow to be subtracted from inflow for net flow. If transducers with a frequency output are used, AxB allows horsepower to be displayed based measured torque and RPM, or based on force and velocity. A/B can be used for the proper mixing of ingredients, while A/B-1 (draw) is used to compare rates for stretching or tensioning.

**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.

**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. Y800$^{Plus}$ counters 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.

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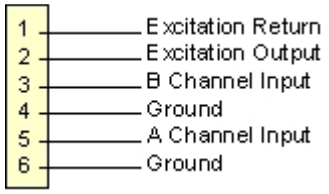
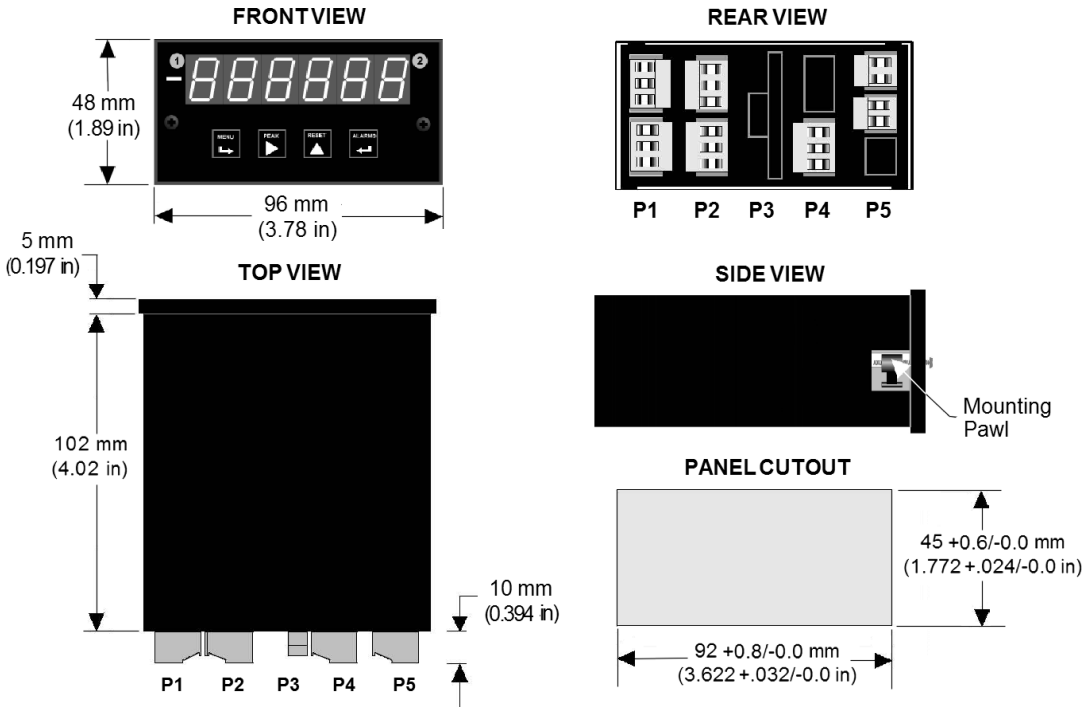
## Specifications

| | |
|---|---|
| **Display** | |
| Readout | 6 LED digits, 7-segment, 14.2 mm (.56"), red or green. |
| Display Range | -999999 to +999999, XXXXEX notation beyond 999999 |
| Zero Adjust | -999999 to +999999 |
| Span Adjust | 0 to 999999 |
| Indicators | Four LED lamps |
| **Inputs** | |
| Types | AC, pulses from NPN, PNP transistors, contact closures, magnetic pickups. |
| Signal Ground | Common ground for channels A & B |
| Channel A Frequency | 0.005 Hz to 1 MHz |
| Channel B Frequency | 0.005 Hz to 250 kHz |
| Minimum Signal | Nine ranges from (-12 to +12 mV) to (+1.25 to +2.1V) |
| Maximum Signal | 250 Vac |
| Noise Filter | 1 MHz, 30 kHz, 250 Hz (selectable) |
| Contact Debounce | 0, 3, 50 ms (selectable) |
| **Update Rate** | |
| Freq. Technique | Inverse period |
| Conversion Time | Gate time + 30 ms+ 0-2 signal periods |
| Gate Time | Selectable 10 ms to 199.99 s |
| Time Before Zero Out | Selectable 10 ms to 199.99 s |
| **Accuracy** | |
| Time Base | Crystal calibrated to ±2 ppm |
| Span Tempco | ± 1 ppm/°C (typ) |
| Long-term Drift | ± 5 ppm/year |
| **Power** | |
| Voltage, standard | 85-264 Vac or 90-300 Vdc (DC operation not UL approved) |
| Voltage, optional | 12-32 Vac or 10-48 Vdc |
| Frequency | DC or 47-63 Hz |
| Power Isolation | 250V rms working, 2.3 kV rms per 1 min test |
| **Excitation Output** (standard) | |
| 5 Vdc | 5 Vdc ± 5%, 100 mA |
| 10 Vdc | 10 Vdc ± 5%, 120 mA |
| 24 Vdc | 24 Vdc ± 5%, 50 mA |
| Output Isolation | 50 Vdc to meter ground |
| **Analog Output** (optional) | |
| Output Levels | 4-20 mA, 0-20 mA, 0-10V, -10 to +10V (single-output option)<br>4-20 mA, 0-20 mA, 0-10V (dual-output option) |
| Current compliance | 2 mA at 10V ( > 5 kΩ load) |
| Voltage compliance | 12V at 20 mA ( < 600Ω load) |
| Scaling | Zero and full scale adjustable from -99999 to +99999 |
| Resolution | 16 bits (0.0015% of full scale) |
| Isolation | 250V rms working, 2.3 kV rms per 1 min test<br>(dual analog outputs share the same ground) |
| **Relay Outputs** (optional) | |
| Relay Types | 2 Form C contact relays or 4 Form A contact relays (NO)<br>2 or 4 Form A, AC/DC solid state relays (NO) |
| Current Ratings | 8A at 250 Vac or 24 Vdc for contact relays<br>120 mA at 140 Vac or 180 Vdc for solid state relays |
| Output common | Isolated commons for dual relays or each pair of quad relays |
| Isolation | 250V rms working, 2.3 kV rms per 1 min test |

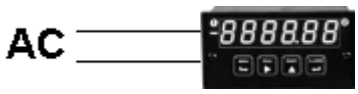
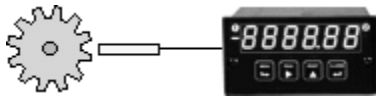
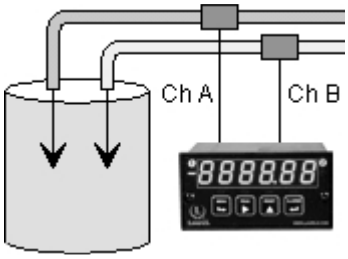
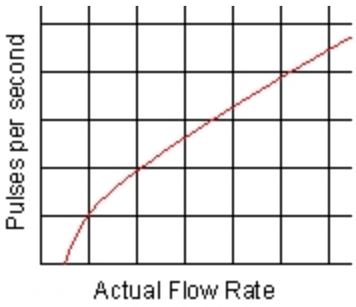
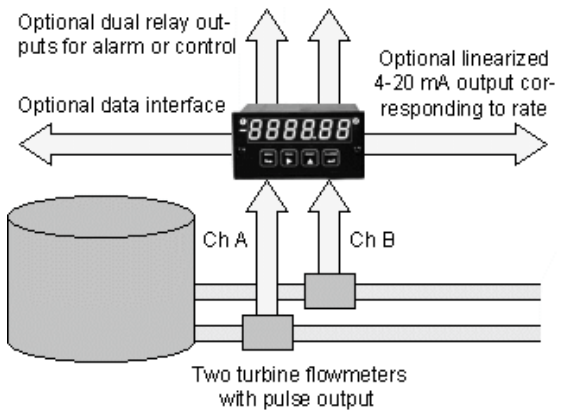
| **Serial Data I/O** (optional) | |
|---|---|
| Board Selections | Ethernet, Ethernet-to-RS485 server, USB, USB-to-RS485 server, RS485 (dual RJ11), RS485 Modbus (dual RJ45), RS232 |
| Protocols | Modbus RTU, Modbus ASCII, Custom ASCII protocol |
| Data Rates | 300 to 19200 baud |
| Digital Addresses | 247 (Modbus), 31 (Custom ASCII). |
| Isolation | 250V rms working, 2.3 kV rms per 1 min test |
| **Environmental** | |
| Operating Temperature | 0°C to 55°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

| | |
|---|---|
| **AC Line Frequency** | |
|  | The Y800[Plus] will accept line voltages up to 250 Vac and display line frequency to 6-digit accuracy (50.0000 or 60.0000) in a few line cycles. Fast low frequency response is achieved by timing the period and taking its inverse. |
| **RPM and Speed** | |
|  | The Y800[Plus] can sense the low-level signals from magnetic pickups or the NPN or PNP transistor output of active sensors. These can be powered directly by the meter. Display in RPM or units of speed is achieved by mathematically scaling the meter. |
| **Flow Rate and Simultaneous Total** | |
|  | The Y800[Plus] is compatible with all flow meters which generate pulses at a frequency proportional to flow rate. The Extended version can display scaled rate or total for the same input at the push of a button, and alarm from both the rate and total. The Extended version can also linearize flow transducers so as to extend their dynamic range. |
| **AC Line Frequency** | |
|  | The Extended Y800[Plus] offers A+B, A-B and A/B arithmetic functions. A+B allows two input flows to be summed for total flow, while A-B allows outflow to be subtracted from inflow for net flow. Flow ratios aid in the proper mixing of ingredients |
| **Custom Curve Linearization** | |
|  | The Extended Y800[Plus] can linearize the output turbine flow meters, which tend to be nonlinear on the low end. Linearizing improves the dynamic range and accuracy of turbine flow meters. |
| **System-level Capabilities** | |
| The Y800[Plus] dual channel rate meter can independently scale, display and alarm two pulse input channels. All signal or alarm data can further be transmitted via RS-232 or RS-485, including peak readings and arithmetic combinations of the two rates. The displayed rates can also be transmitted as an isolated 4-20 mA or 0-10V analog output. |  |

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## Ordering Guide

Create a model a model number in this format: **Y850000FR, IPC**

| | |
|---|---|
| **Main Board** | **Y85** Standard Main Board, Green LEDs<br>**Y86** Standard Main Board, Red LEDs<br>**Y87** Extended Main Board, Green LEDs<br>**Y88** Extended Main Board, Red LEDs |
| | **With Standard Main Board:** Scalable to ±999,999 for frequency, rate, square root of rate, up or down total, period, A-to-B time interval.<br>**With Extended Main Board:** Above, plus rate and total simultaneously, ratio (A/B), draw (A/B-1), other arithmetic functions (AxB, A+B, A-B), phase angle, stopwatch, up/down counting, batching operation, custom curve linearization. |
| **Power** | **0** Isolated 85-264 Vac<br>**1** Isolated 12-32 Vac or 10-48 Vdc |
| **Relay Output** (isolated) | **0** None<br>**1** Two 8A Contact Relays<br>**2** Two 120 mA Solid State Relays<br>**3** Four 8A Contact Relays<br>**4** Four 120 mA Solid State Relays |
| **Analog Output** (isolated) | **0** None<br>**1** Single isolated 4-20 mA, 0-20 mA, 0-10V, -10 to +10V<br>**2** Dual isolated 4-20 mA, 0-20 mA, 0-10V |
| **Digital Interface** (isolated) | **0** None<br>**1** RS232<br>**2** RS485 (dual RJ11 connectors)<br>**4** RS485 Modbus (dual RJ45 connectors)<br>**5** USB<br>**6** USB-to-RS485 converter<br>**7** Ethernet<br>**8** Ethernet-to-RS485 converter |
| **Input Type** | **FR** Dual-Channel Pulse Input Signal Conditioner |
| **Add-on Options** | **BL** Blank lens without button pads<br>**CBL01** RJ11-to-DB9 cable<br>**CBL02** USB-to-DB9 adapter<br>**CBL05** USB Cable, A to B<br>**IPC** Clear front panel cover sealed to NEMA 4X / IP65<br>**BOX1** NEMA-4X wall-mount enclosure<br>**BOX2** BOX1 plus IPC |