



Applied Processor and Measurement, Inc.

Technical Bulletin TB-0001 – Differences Between the Model 205, Model 400 and Model 402 PWM Controllers

This technical bulletin compares the features and specifications of the Model 205, 400U, 400L and 402 PWM Controllers. The Model 205 is designed for benchtop / laboratory type use and is highly flexible, quick to apply, and easy to use. The Model 400 is designed for test stand type applications where analog, PLC, or computer control of the output duty cycle is desired. The Model 400 is also a smaller, and a lower cost unit. The Model 402 may be used in either lab or test stand applications and is the lowest cost unit. The table below compares key features and specifications of the Model 205, Model 400 and Model 402 PWM Controllers.

Feature / Specification	Model 205 PWM Controller	Model 400U PWM Controller USB Interface	Model 400L PWM Controller (Legacy) RS232 Interface (NOTE: the Model 400U is recommended for new designs)	Model 402 PWM Controller
Style	benchtop	signal conditioner – DIN mountable	signal conditioner – DIN mountable	serial cable dongle
Operating Modes	<ul style="list-style-type: none"> • manual (pushbutton / LCD) • serial port • analog control of duty cycle • analog control of frequency and duty cycle 	<ul style="list-style-type: none"> • analog control of duty cycle • analog control of frequency and duty cycle (Model 400A) • USB port control of frequency and duty cycle 	<ul style="list-style-type: none"> • analog control of duty cycle • serial port control of duty cycle 	<ul style="list-style-type: none"> • serial port control of frequency and duty cycle
Frequency Range	1 to 25,000 Hz <ul style="list-style-type: none"> • 1Hz resolution to 1,000Hz • 50Hz resolution to 10,000Hz • 100Hz resolution to 25,000Hz 	0.08 to 5,000 Hz <ul style="list-style-type: none"> • 1Hz resolution to 5,000Hz 	2 to 500 Hz <ul style="list-style-type: none"> • 1Hz resolution to 500Hz • can be operated to 1000Hz 	10 to 1,500 Hz <ul style="list-style-type: none"> • 1Hz resolution to 1,000Hz • 50Hz resolution to 1,500Hz
Frequency Adjustment	frequency setting adjustable freely during PWM operation	frequency setting adjustable freely during PWM operation	frequency must be pre-configured, cannot be varied 'on-the-fly' during PWM operation	frequency setting adjustable freely during PWM operation
Duty Cycle Range / Resolution	<ul style="list-style-type: none"> • 0 to 100% • 0.1% resolution at all frequencies and duty cycle settings in all operational modes – no restrictions 	<ul style="list-style-type: none"> • 0 to 100% • 1.0%, 0.5%, 0.2% resolution (configurable) • some restrictions (note 1) 	<ul style="list-style-type: none"> • 0 to 100% • 1.0%, 0.5%, 0.2% resolution (configurable) • some restrictions (note 1) 	<ul style="list-style-type: none"> • 0 to 100% • 0.1% resolution at all frequencies • some restrictions (note 1)
Timebase	40 MHz	24 MHz	18.432 MHz	18.432 MHz
PWM Generation Technology	digital field programmable gate array (FPGA) logic	microcomputer timer / counter	microcomputer timer / counter	microcomputer timer / counter
Operator Interface	inherent – LCD, pushbutton interface on unit	none (status LEDs only)	none (status LEDs only)	none
Configuration Interface	pushbutton / LCD or serial port	USB	serial port	serial port



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Feature / Specification	Model 205 PWM Controller	Model 400U PWM Controller USB Interface	Model 400L PWM Controller (Legacy) RS232 Interface	Model 402 PWM Controller
Output	low side drive, power MOSFET, 50W max, 50V max	low side drive, power MOSFET, 50W max, 50V max	low side drive, power MOSFET, 50W max, 50V max	low side drive, power MOSFET, 50W max, 32V max
Fuse on Output	yes, standard 3AG type, internal	yes, internal	yes, internal	yes, standard mini-blade type, externally accessible
Analog Input	control of both frequency and duty cycle from 0 to 5V inputs, single-ended (differential option available)	control of duty cycle from fully differential 0 to 5V input, analog control of frequency available (Model 400A)	control of duty cycle only from one, fully differential 0 to 5V input	none
Serial Port	RS-232, Tx,Rx,Gnd (not isolated) 9600,N,8,1, no handshaking DB-9M	USB (not isolated) mini-B	RS-232, Tx,Rx,Gnd (not isolated) 9600,N,8,1, no handshaking miniDIN6 (need adapter to DB-9M)	RS-232, Tx,Rx,Gnd 9600,N,8,1, no handshaking DB-9M Model 402R – non-isolated Model 402T – electrically isolated
Power Requirements	9 to 24V DC, 75 mA	9 to 24V DC, 35 mA	9 to 24V DC, 35 mA	Model 402R, 9 to 28 V DC, 20mA Model 402T, 9 to 14 V DC, 125mA
Operating Temperature	5 to 50 deg C	-40 to 80 deg C	-40 to 80 deg C	-40 to 60 deg C
Dimensions (approximate)	7.5 in. x 4 in. x 1 in.	3.625 in. x 2.25 in. x 1 in.	3.625 in. x 2.25 in. x 1 in.	4.25 in. x 1.7 in. x 1 in.
I/O Connections	standard binding posts	terminal strip, screw down wiring	terminal strip, screw down wiring	pluggable terminal strip, screw down plug wiring
Lead-Free / RoHS	No	Yes	No	Yes – both the 402R and 402T
Field Reprogrammable	Yes	No	No	No
Customizations Available	Yes	Yes	Yes	Yes

Note 1. The minimum and maximum duty cycle obtainable from the Model 400 (USB or Legacy RS232) and the Model 402 PWM Controller is based on the frequency of operation. There are some restrictions at values near 0 or 100% at higher PWM frequencies. Refer to the user manual for exact restrictions. Up to maximum frequency, for both the Models 400 (U and L) and the 402, the minimum duty cycle is below 5% and the maximum duty cycle is greater than 95%. At duty cycle settings of 0% to less than the minimum, the output duty cycle will be forced to 0%. At settings of duty cycle greater than the maximum to 100%, the output duty cycle will be forced to 100%. In general, for solenoids and flow control applications, meaningful operational duty cycle values are most often between 15 and 85%. Therefore, this limitation is typically not a factor in PWM control applications. Note that there are no such restrictions with the Model 205 – all values from 0 to 100% with a resolution of 0.1% are possible.



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- Questions?

Further questions on the capabilities of any of our PWM products may be addressed to Applied Processor and Measurement, Inc. sales or support. Customizations and OEM versions are available on request.

- Contact Information

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