

# Productivity<sup>®</sup>Open Overview

ProductivityOpen leverages the modern processing power of Arduino and the proven industrial value of the Productivity1000 input and output modules while making use of the wide variety of Arduino MKR form factor shields.

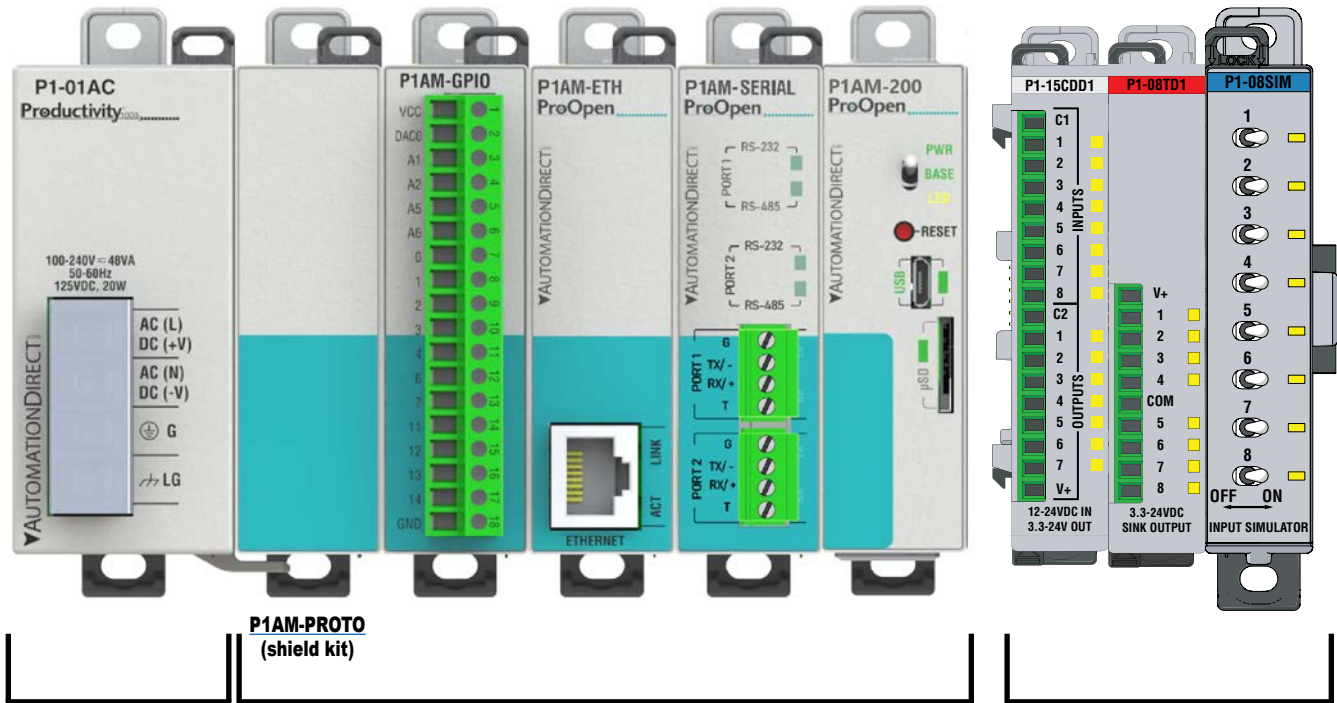
The P1AM-100 module is programmed with the Arduino IDE or ProductivityBlocks, an optional proprietary block programming environment. The P1AM-200 CPU is programmed with either the Arduino IDE or CircuitPython, using any IDE or text editor.

## Features

- Supports Productivity1000 input and output modules
- Supports Arduino MKR form factor shields
- UL-listed CPU
- UL-listed ProductivityOpen branded shields



Productivity <sup>®</sup> Open Modules		
Part Number	Price	Description
<b>P1AM-100</b>	\$69.00	Arduino compatible CPU
<b>P1AM-200</b>	\$109.00	Arduino compatible CPU
<b>P1AM-ETH</b>	\$55.00	Ethernet shield
<b>P1AM-SERIAL</b>	\$55.00	Serial shield, RS-232 & RS-485
<b>P1AM-GPIO</b>	\$61.00	Extended I/O shield
<b>P1AM-PROTO</b>	\$44.50	Custom housing kit
<b>P1AM-START1</b>	\$288.00	Maker community start kit
<b>P1AM-START2</b>	\$223.00	Industrial community start kit



**Productivity1000 Power Supply**

**The power of Arduino in ProductivityOpen.**

**Productivity1000 Industrial grade, I/O Modules**

# Productivity<sup>®</sup> Open Overview

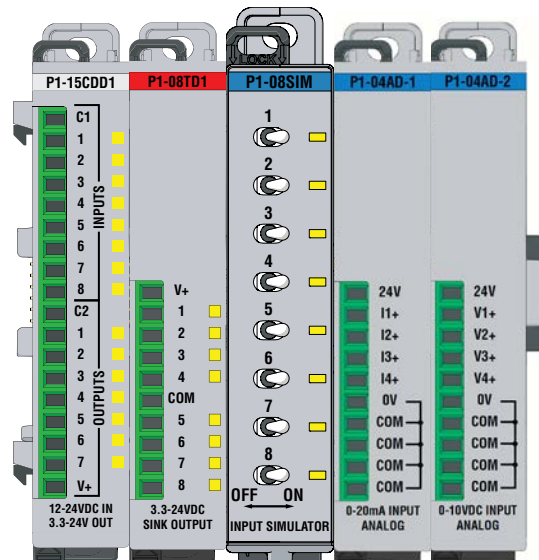
## Productivity1000 I/O Modules

A variety of discrete and analog I/O modules from our Productivity1000 line is available for use with the P1AM-100 and P1AM-200 CPUs.

Productivity1000 Discrete Modules			
Part Number	Number of Inputs	Description	
<b>Input Modules</b>			
<b>P1-08SIM</b>	8	Input Simulator Module	
<b>P1-08ND3</b>	8	Sinking/Sourcing 12–24 VDC Input	
<b>P1-08ND-TTL</b>	8	Sinking/Sourcing 3.3 - 5 VDC Input	
<b>P1-16ND3</b>	16	Sinking/Sourcing 12–24 VDC Input	
<b>P1-08NE3</b>	8	Sinking/Sourcing 24V AC/DC	
<b>P1-16NE3</b>	16	Sinking/Sourcing 24V AC/DC	
<b>P1-08NA</b>	8	AC Isolated 100–240 VAC	
<b>Output Modules</b>			
	Number of Outputs		
<b>P1-08TD1</b>	8	Sinking DC Output	
<b>P1-08TD2</b>	8	Sourcing DC Output	
<b>P1-08TD-TTL</b>	8	Sourcing DC Output	
<b>P1-15TD1</b>	15	Sinking DC Output	
<b>P1-15TD2</b>	15	Sourcing DC Output	
<b>P1-08TA</b>	8	AC Output	
<b>P1-08TRS</b>	8	Isolated Relay Output	
<b>P1-16TR</b>	16	Relay Output	
<b>Input/Output Modules</b>			
	Inputs	Outputs	
<b>P1-15CDD1</b>	8	7	Input: Sinking/Sourcing; Output: Sinking
<b>P1-15CDD2</b>	8	7	Input: Sinking/Sourcing; Output: Sourcing
<b>P1-16CDR</b>	8	8	Input: Sinking/Sourcing; Output: Relay

Productivity1000 Specialty Modules	
Part Number	Description
<b>Input Modules</b>	
<b>P1-04PWM</b>	4 channels of sinking/sourcing 0–20 kHz, 0–100% duty cycle outputs
<b>P1-02HSC</b>	2 independent single-ended 5–24 VDC inputs that accept up to 100kHz of pulse/direction and quadrature signals and 2 5–24 VDC general-purpose high-speed inputs.

Productivity1000 Analog Modules			
Part Number	Number of Inputs	Description	
<b>Input Modules</b>			
<b>P1-04AD</b>	4	Analog Input (Current/Voltage)	
<b>P1-04AD-1</b>	4	Analog Input (Current)	
<b>P1-04AD-2</b>	4	Analog Input (Voltage)	
<b>P1-04ADL-1</b>	4	Analog Input (Current)	
<b>P1-04ADL-2</b>	4	Analog Input (Voltage)	
<b>P1-08ADL-1</b>	8	Analog Input (Current)	
<b>P1-08ADL-2</b>	8	Analog Input (Voltage)	
<b>P1-04RTD</b>	4	RTD Input	
<b>P1-04THM</b>	4	Thermocouple Input	
<b>P1-04NTC</b>	4	Thermistor Input	
<b>Output Modules</b>			
	Number of Outputs		
<b>P1-04DAL-1</b>	4	Analog Output (Current)	
<b>P1-04DAL-2</b>	4	Analog Output (Voltage)	
<b>P1-08DAL-1</b>	8	Analog Output (Current)	
<b>P1-08DAL-2</b>	8	Analog Output (Voltage)	
<b>Input/Output Modules</b>			
	Inputs	Outputs	
<b>P1-4ADL2DAL-1</b>	4	2	Analog Input/Analog Output (Current)
<b>P1-4ADL2DAL-2</b>	4	2	Analog Input/Analog Output (Voltage)



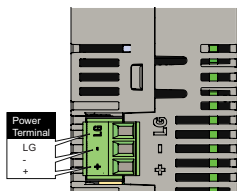
# P1AM-200 Arduino Compatible CPU

**P1AM-200 \$109.00**

The P1AM-200 is an Arduino-compatible CPU. It uses the Atmel SAMD51P20 and can be programmed in C++ using the Arduino IDE or in CircuitPython using any text editor. It interfaces with all P1000 Series I/O modules connected to the right side and most Arduino MKR form factor shields connected to the left side.



**P1AM-200**



**WARNING:** Use only a P1000 power supply **OR** an external 24V power supply, not both simultaneously.

User Specifications	
<b>User Memory</b>	1MB Internal flash with 16Kb used for bootloader. 16MB External QSPI Flash; 2Kb EEPROM
<b>Memory Type</b>	Flash: 1MB; SRAM: 256Kb; QSPI Flash: 16MB; EEPROM: 2Kb
<b>Base Controller and I/O Power Requirement <sup>1</sup></b>	24VDC ±2%Plan 1.25 W per P1000 I/O module @ 0.5 W for the SAMD chip and base controller @ 9W for max. header power draw
<b>Recommended Fuse (External)</b>	Edison S5061-R, Time Delay, 1A fuse For 9-15 modules: Edison S506-R, Time Delay, 2A fuse
<b>Peripherals</b>	MicroB USB, Arduino MKR-compatible, microSD card slot for data logging (32GB max), User controlled neopixel LED
<b>Hardware Limits of System <sup>2</sup></b>	15 Productivity1000 I/O Modules; Arduino MKR shields
<b>Programming</b>	Programmed in C/C++ with the Arduino IDE or CircuitPython with a text editor.

<sup>1</sup> If you do not use a Productivity1000 power supply (P1-01AC, P1-02AC, or P1-01DC), then use a power supply that has transformer isolation. Use independent 24VDC supplies for the CPU and inductive loads to keep the CPU power clean and free of voltage spikes caused by switching solenoids, motors and relay coils.

<sup>2</sup> See "MKR Expansion Bus Pins" table and notes for shield power budget restrictions.

<sup>3</sup> See Header Power Limitations in P1AM User Manual.

General Specifications	
<b>Operating Temperature</b>	0° to 60°C (32° to 140°F)
<b>Storage Temperature</b>	-20° to 70°C (-4° to 158°F)
<b>Humidity</b>	5 to 95% (non-condensing)
<b>Altitude</b>	2,000 meters, max.
<b>Pollution Degree</b>	2
<b>Environmental Air</b>	No corrosive gases permitted
<b>Vibration</b>	IEC60068-2-6 (Test Fc)
<b>Shock</b>	IEC60068-2-27 (Test Ea)
<b>Heat Dissipation</b>	4W
<b>Overvoltage Category</b>	II
<b>Enclosure Type</b>	Open Equipment
<b>Module Location</b>	Productivity1000 I/O modules connect on the right side of module. Productivity1000 power supply, P1AM Shields and MKR Shields connect on the left side on the module.
<b>Weight</b>	82g (2.89 oz)
<b>Agency Approvals</b>	UL 61010-1 and UL 61010-2-201 File E139594, Canada & USA; CE

\* See CE Declaration of Conformance for details.



CPU Status Indicators	
<b>PWR</b>	Green LED is illuminated when power is ON
<b>BASE</b>	Green LED is illuminated when BASE controller is powered and has been initialized
<b>LED</b>	Yellow LED is illuminated when commanded by user program. LED can be referred to as LED_BUILTIN or Pin 32.

Toggle Switch Specifications
<ul style="list-style-type: none"> <li>Switch can be read using the "digitalRead" function.</li> <li>Switch can be referred to as "SWITCH_BUILTIN" or Pin 31.</li> </ul>

# P1AM-200 Arduino Compatible CPU



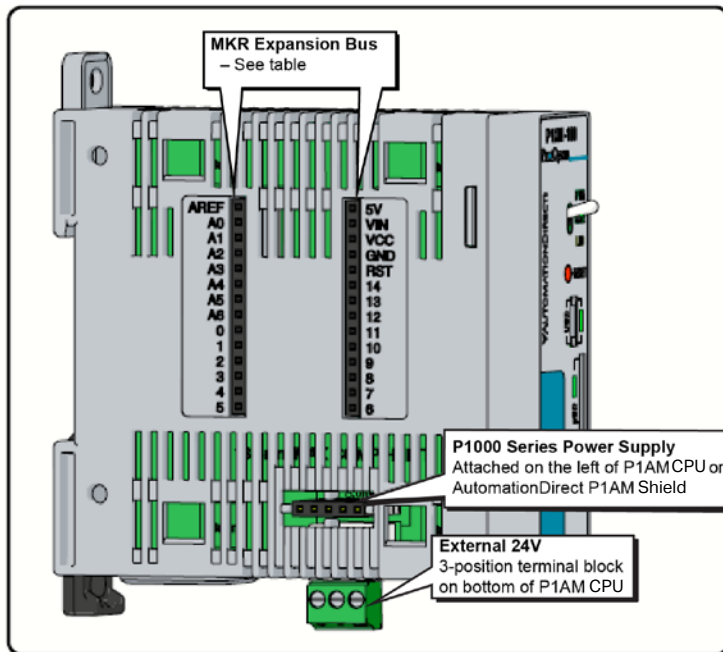
P1AM-200

### Reset Switch Specifications

- Press once to manually reset code execution, the Base Controller, and all P1000 Series modules.
- Press twice quickly to put the P1AM CPU into bootloader mode.

### Neopixel Specifications

- Neopixel compatible single-wire LED.
- NEOPIXEL\_PIN or Digital pin 49 (Arduino), board.NEOPIXEL (CircuitPython)



P1AM-200 Connector Bus View

MKR Expansion Bus Pins	
<b>GPIO</b>	A0–A6, 0–14
<b>Analog Input Pins</b>	A0–A6
<b>Analog Output Pins</b>	A0
<b>PWM Pins</b>	0–8, 10, A3, A4
<b>Interrupt Pins</b>	0, 1, 4–8, A1, A2
<b>5V</b>	5V supply output
<b>Vin</b>	5V regulated supply
<b>VCC</b>	3.3 V supply output
<b>GND</b>	Ground
<b>RST</b>	Reset
<b>AREF</b>	Analog Input Reference

**Critical Notes:**  
 Pins A3, A4, and 8–10 are used for the base controller.  
 Do not exceed 46mA combined from pins 0, 1, and 4–10.  
 Do not exceed 3.3 V on any I/O pin.  
 Do not exceed 7mA on any I/O pin.  
 Do not apply power to 5V or VCC



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