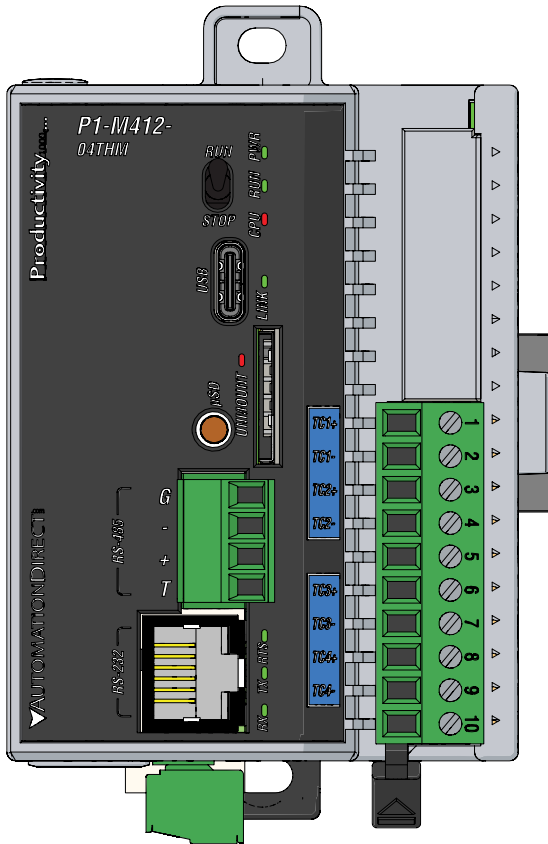




P1-M412-04THM

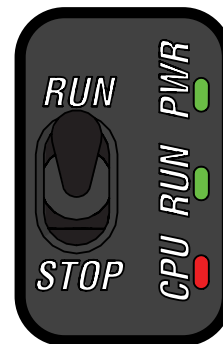
The P1-M412-04THM is a P1000 CPU with four differential channels for receiving thermocouple and voltage input signals. This PLC can be used as a stand-alone controller for small applications, or expanded with 2 additional P1000 I/O modules.

CPU Specifications	2
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Terminal Block sold separately, (see wiring options on page 4).

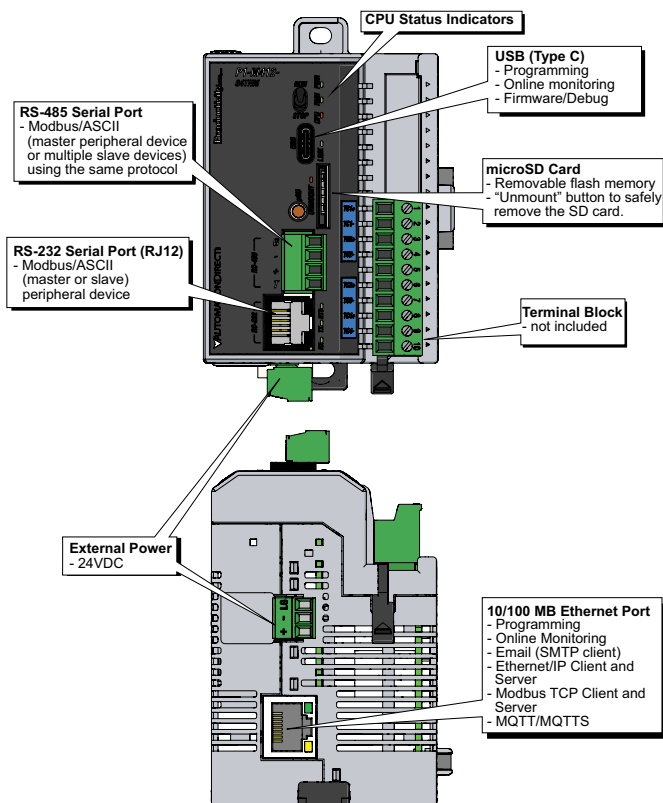
CPU Specifications		
User Memory	32MB (Includes program, data and documentation)	
Memory Type	Flash and RAM	
Retentive Memory	27KB	
Scan Time	1.7 ms (1K Boolean, Max I/O)	
External Power Required	24VDC $\pm 2\%$ @ 6W plus 1.25 W per additional I/O module.	
Protection Circuit	Not built into module – Install protection element such as Edison S5061-R, Time Delay, 1A Fuse	
Communication; 4 Integrated Ports	USB IN: Programming, Monitoring, Debug, Firmware ETHERNET: (10/100Mbps Ethernet) Programming, Monitoring, Debug, Firmware, Email SMTP Client, Modbus TCP Client (8 Servers) and Server (4 Clients), Ethernet IP Scanner (4) and Adapter (2), Custom Protocol over Ethernet, ProNet, MQTT/MQTTs. RS-232: (RJ-12, 1200-115.2 k baud) ASCII, Modbus RS-485: Removable Terminal Included, (1200-115.2k Baud) ASCII, Modbus RTU	
Data Logging	MicroSD card slot	
Hardware Limits of System	Onboard I/O Points: 4 Channel Thermocouple and Voltage input Expansion I/O Point Limit: 32 (2 modules with up to 16 points each)	
Instruction Types	Application Functions Array Functions Counters/Timers Communications Data Handling Drum Sequencers Math Functions	PID Program Control String Functions System Functions Contacts Coils
Real Time Clock	None	

CPU Status Indicators	
PWR	Green LED is illuminated when power is ON
RUN	Green LED is illuminated when CPU is in RUN mode
CPU	Red LED is illuminated during power ON reset, power down, or watch-dog time-out



CPU Run/Stop Switch Specifications	
RUN position	Executes user program, run-time edits possible
STOP position	Does not execute user program, normal program load position

CPU Front and Bottom Panels

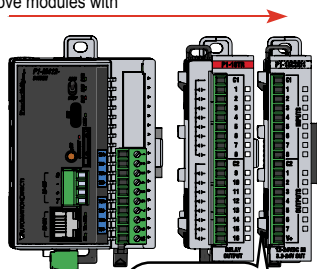


Thermocouple Input Specifications	
Input Channels	4 differential
Data Format	Floating Point
Common Mode Range	± 0.5 V
Common Mode Rejection	100dB @ DC
Input Impedance	$> 5M\Omega$
Maximum Ratings	Fault Protected Inputs to ± 50 V
Resolution	16-bit, ± 0.1 °C or °F
Thermocouple Input Ranges	Type J -190° to 760°C (-310° to 1400°F) Type E -210° to 1000°C (-346° to 1832°F) Type K -150° to 1372°C (-238° to 2505°F) Type R 65° to 1768°C (149° to 3214°F) Type S 65° to 1768°C (149° to 3214°F) Type T -230° to 400°C (-382° to 752°F) Type B 529° to 1820°C (984° to 3308°F) Type N -70° to 1300°C (-94° to 2372°F) Type C 65° to 2320°C (149° to 4208°F)
Thermocouple Linearization	Automatic
Cold Junction Compensation	Automatic
Sample Duration Time	270ms
All Channel Update Rate	1.08 s
Open Circuit Detection Time	Within 5s
Conversion Method	Sigma-Delta
Accuracy vs. Temperature	± 50 ppm per °C (maximum)
Maximum Inaccuracy	± 3 °C maximum (excluding thermocouple error)
Linearity Error	± 1 °C maximum (± 0.5 °C typical) Monotonic with no missing codes
Warm-up Time	30 minutes for $\pm 1\%$ repeatability 2 minutes to reach voltage specifications
External Power Supply Required	None

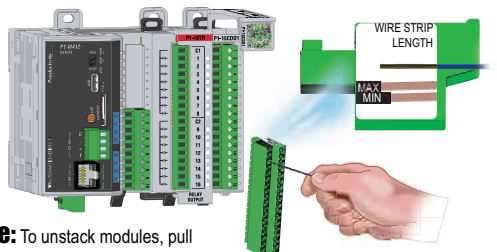
Module Installation

WARNING: Do not add or remove modules with field power applied.

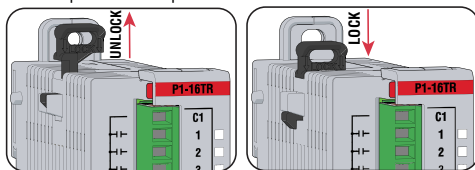
Step One: With latch in "locked" position, align connectors on the side of each module and stack by pressing together. Click indicates lock is engaged.



Step Two: Attach field wiring using the removable terminal block or ZIPLink wiring system.

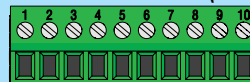


Step Three: To unstack modules, pull locking latch up into the unlocked position and then pull modules apart.



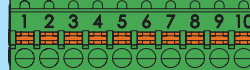
Wiring Options

1 Screw Terminal Block (included)



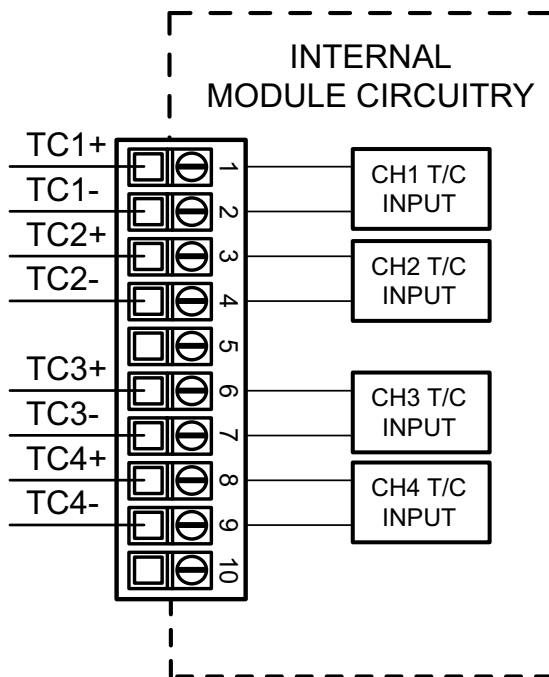
P1-10RTB
(Quantity 1)

2 Spring Clamp Terminal Block

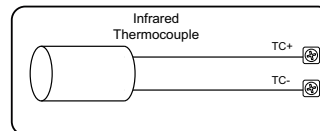
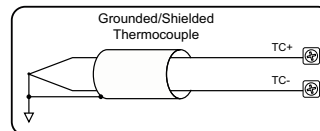
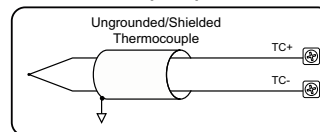


P1-10RTB-1
(Quantity 1)

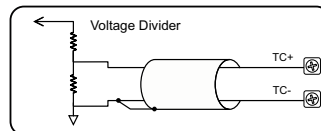
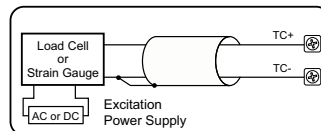
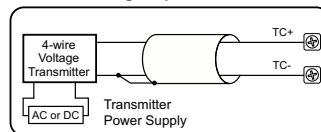
Schematic and Wiring Diagram



Thermocouple Input Circuits



Voltage Input Circuits

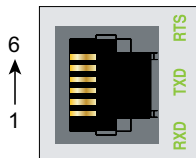


NOTES:

1. Connect shield to thermocouple signal/ground only. Do not connect to both ends.
2. Install jumper wire on each unused input, TC+ to TC-.
3. With grounded thermocouples, take precautions to prevent having a voltage potential between thermocouple tips. A voltage of 0.5 V or greater between tips will skew measurements.
4. Use shielded, twisted thermocouple extension wire that matches the thermocouple type. Use thermocouple-compatible junction blocks.

Port Specifications

RS-232 Specifications	
Port Name	RS-232
Description	Non-isolated RS-232 DTE port connects the CPU as a Modbus/ASCII master or slave to a peripheral device. Includes ESD and built-in surge protection
Data Rates	Selectable, 1200, 2400, 4800, 9600, 19200, 33600, 38400, 57600, and 115200
+5V Cable Power Source	210mA maximum at 5V, $\pm 5\%$. Reverse polarity and overload protected
TXD	RS-232 Transmit output
RXD	RS-232 Receive input
RTS	Handshaking output for modem control
GND	Logic ground
Maximum Output Load (TXD/RTS)	3k Ω , 1000 pF
Minimum Output Voltage Swing	± 5 V
Output Short Circuit Protection	± 15 mA
Port Status LED	Green LED is illuminated when active for TXD, RXD and RTS
Cable Options	EA-MG-PGM-CBL D2-DSCBL USB-RS232-1 with D2-DSCBL FA-CABKIT FA-ISOCAN for converting RS-232 to isolated RS-485



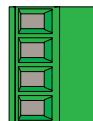
6-pin RJ12 Female Modular Connector

Pin #	Signal	
6	GND	Logic Ground
5	RTS	RS-232 Output
4	TXD	RS-232 Output
3	RXD	RS-232 Input
2	+5V	210mA Maximum
1	GND	Logic Ground

RS-485 Port Specifications	
Port Name	RS-485
Description	Non-isolated RS-485 port connects the CPU as a Modbus/ASCII master or slave to a peripheral device. Includes ESD/EFT protection and automatic echo cancellation when transmitter is active
Data Rates	Selectable, 1200, 2400, 4800, 9600, 19200, 33600, 38400, 57600, and 115200
TXD+/RXD+	RS-485 transceiver high
TXD-/RXD-	RS-485 transceiver low
GND	Logic ground
Input Impedance	19k Ω
Termination Resistance (TB Jumper Wire "T" to "+")	120 Ω . To use, add a jumper between "T" and "+". Resistor is internally connected between "T" and "-".
Maximum Load	50 transceivers, 19k Ω each, 60 Ω termination
Output Short Circuit Protection	± 250 mA, thermal shut-down protection
Electrostatic Discharge Protection	Contact ± 4 KV, Air ± 8 KV per IEC1000-4-2 Cable is installed for testing
Electrical Fast Transient Protection	± 1 KV per IEC1000-4-4
Minimum Differential Output Voltage	1.5 V with 60 Ω load
Fail Safe Inputs	Logic high input state if inputs are unconnected
Maximum Common Mode Voltage	-7.5 V to 12.5 V
Port Status LED	Green LED illuminated when active for TXD and RXD
Cable Options	Go to AutomationDirect.com for RS-232 and RS-485 cables



RS-485

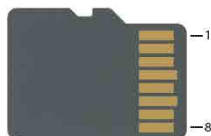


PCON-KIT

Pin #	Signal
G	GND
-	TXD-/RXD-
+	TXD+/RXD+
T	TERMINATION

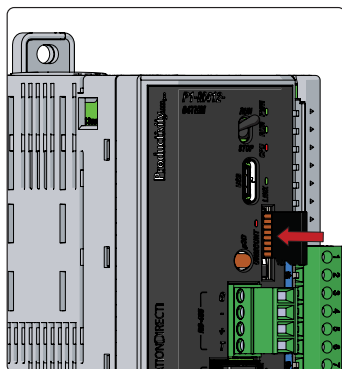
microSD Specifications				
Port Name	microSD			
Description	Standard microSD socket for data logging			
Maximum Card Capacity	32GB SDHC			
Transfer Rate (Class 4 memory card)*	Mbps	Minimum	Typical	Maximum
	Read	14.3	14.4	14.6
	Write	4.8	4.9	5.1
Port Status LED	Green LED is illuminated when card is inserted/detected			

*Supported microSD MICSD-16G



Pin	SD
1	DAT2
2	CD/DAT3
3	CMD
4	VDD
5	CLK
6	VSS
7	DAT0
8	DAT1

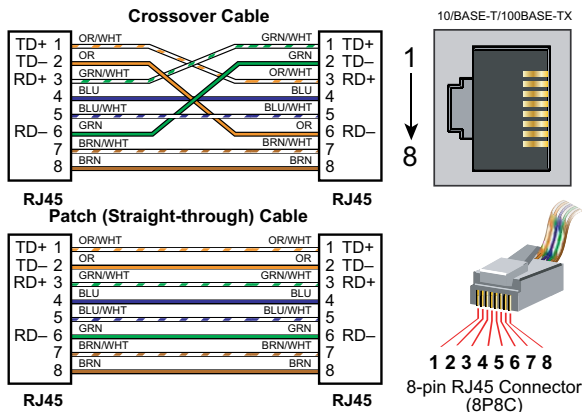
NOTE: Card not included with unit.



Port Specifications

Ethernet Specifications	
Port Name	ETHERNET
Description	Standard transformer isolated Ethernet port with built-in surge protection for programming and online monitoring. See table on page 2 for supported devices and protocols.
Transfer Rate	10 Mbps and 100 Mbps (auto-crossover)
Port Status LED	LINK (Amber LED) is solid when network LINK is established. ACT (Green LED) flashes when port is active.

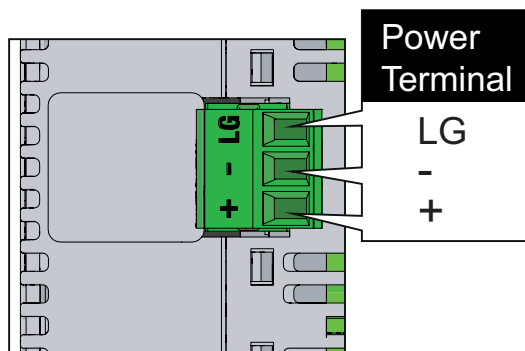
USB-C Specifications	
Port Name	USB-C
Description	Standard USB-C Slave input for programming and online monitoring and firmware update with built-in surge protection. Not compatible with older full speed USB devices.
Transfer Rate	480 Mbps
Port Status LED	Green LED is illuminated when LINK is established to programming software.
Cables	USB Type A to Micro USB Type C: 6ft cable part # USB-CBL-AC6



Power Removable Terminal Block Specifications	
Part Number	PCON-KIT
Number of Positions	3 Screw Terminals
Pitch	3.5 mm
Wire Range	28–16 AWG Solid Conductor 28–16 AWG Stranded Conductor
Screw Driver Width	1/8 in (3.175 mm) Maximum
Screw Size	M2
Screw Torque	1.7 lb-in (0.4 N-m)

Input/Output Removable Terminal Block Specifications		
Part Number	P1-10RTB	P1-10RTB-1
Positions	10 Screw Terminals	10 Spring Clamp Terminals
Wire Range	30–16 AWG (0.051–1.31 mm ²) Solid / Stranded Conductor 3/64 in (1.2 mm) Insulation Max. 1/4 in (6–7 mm) Strip Length	28–16 AWG (0.081–1.31 mm ²) Solid / Stranded Conductor 3/64 in (1.2 mm) Insulation Max. 19/64 in (7–8 mm) Strip Length
Conductors	"USE COPPER CONDUCTORS, 75°C" or equivalent.	
Screw Driver	0.1 in (2.5 mm) Maximum*	
Screw Size	M2	N/A
Screw Torque	2.5 lb-in (0.28 N-m)	N/A

*Recommended Screw Driver TW-SD-MSL-1



General Specifications	
Operating Temperature	0° to 60°C (32° to 140°F)
Storage Temperature	-20° to 70°C (-4° to 158°F)
Humidity	5 to 95% (non-condensing)
Altitude	2,000 meters max
Pollution Degree	2
Environmental Air	No corrosive gases permitted
Vibration	IEC60068-2-6 (Test Fc)
Shock	IEC60068-2-27 (Test Ea)
Overvoltage Category	II
Field to Logic Side Isolation	1800VAC applied for 1 second
Heat Dissipation	1W
Enclosure Type	Open Equipment
Module Location	Controller in a Productivity1000 System.
Field Wiring	Removable terminal block (Included). The P1-M412-04THM is not compatible with the ZIPLink Wiring System.
Connector Type (included)	10-position Removable Terminal Block
Weight	143g (5.04 oz)
Agency Approvals	UL 61010-1 and UL 61010-2-201 File E139594, Canada & USA CE (EN 61131-2 EMC, EN 61010-1 and EN 61010-2-201 Safety)*

*See CE Declaration of Conformance for details.

Voltage Input Specifications	
Linear mV Device Input Ranges	0–39.0625 mVDC, ±39.0625 mVDC, ±78.125 mVDC, 0–156.25 mVDC, ±156.25 mVDC, 0–1250 mVDC
Max Voltage Input Offset Error	0.05% @ 0°–60 °C, typical 0.04% @ 25°C
Max Voltage Input Gain Error	0.06% @ 25°C
Max Voltage Input Linearity Error	0.05% @ 0°–60 °C, typical 0.03% @ 25°C
Max Voltage Input Impedance	0.2% @ 0°–60 °C, typical 0.06% @ 25°C

Configuration/Diagnostics	
Burn-out Detection: High Side/Disable °C/°F (T/C Only)	1 bit per module
Module Diagnostics Failure	1 bit per module
Burn-out (on if T/C input is open – no connection between TCn+ and TCn-)	1 bit per channel
Channel Under-range (T/C only)	1 bit per channel
Channel Over-range (T/C only)	1 bit per channel

WARNING: To minimize the risk of potential safety problems, you should follow all applicable local and national codes that regulate the installation and operation of your equipment. These codes vary from area to area and it is your responsibility to determine which codes should be followed, and to verify that the equipment, installation, and operation are in compliance with the latest revision of these codes.

Equipment damage or serious injury to personnel can result from the failure to follow all applicable codes and standards. We do not guarantee the products described in this publication are suitable for your particular application, nor do we assume any responsibility for your product design, installation, or operation.

If you have any questions concerning the installation or operation of this equipment, or if you need additional information, please call Technical Support at 770-844-4200.

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Document Name	Edition/Revision	Date
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