Specialty Module Specifications

In This Chapter...

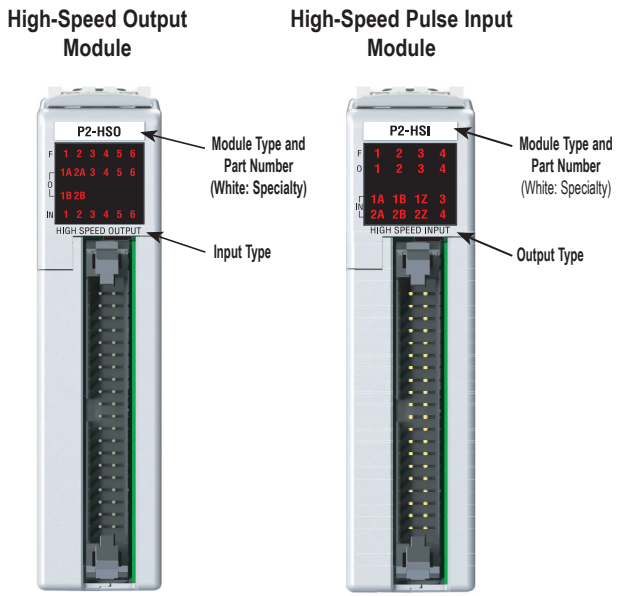
Specialty Modules Overview

Specialty I/O modules are available for use with the Productivity®2000 system including:

- P2-HSI High-Speed Pulse Input Module
- P2-HSO High-Speed Output Module
- P2-02HSC High-Speed Counter Module
- P2-04PWM Pulse Width Modulation Module
- P2-SCM Serial Communications Module
- PS-AMC Motion Control Module

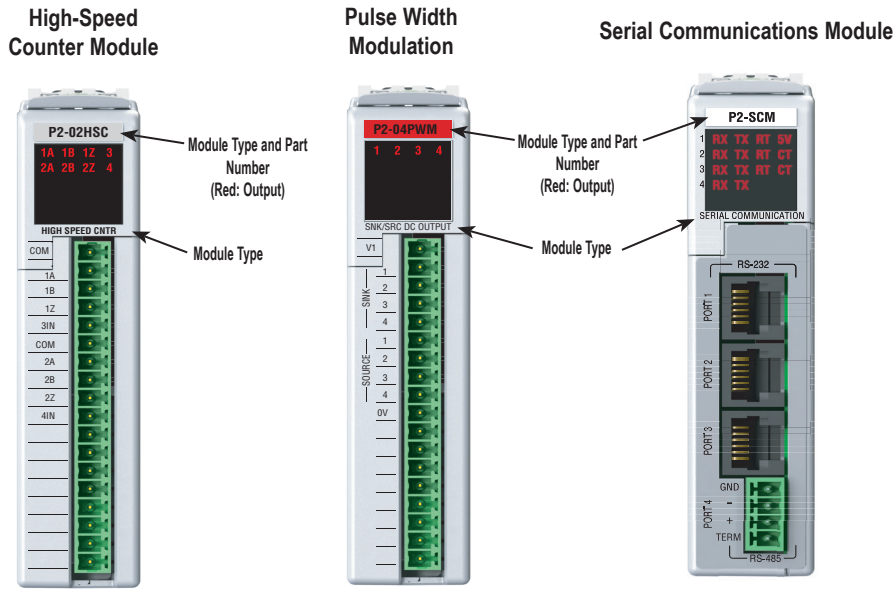
Each I/O module is identified as either an "Input" or "Output"module on its front panel. The white background on the part number denotes a specialty module. The specifications and wiring diagrams, along with configuration and signal information, are in this chapter.

Use the hardware configuration tool in the Productivity Suite programming software to set up the specialty I/O modules. See the Productivity Suite software help file for in-depth configuration and programming concepts.



Productivity2000 Specialty I/O Modules			
Part Number	**Number of Channels**	**Description**	**See Page**
P2-HSI	2	High-Speed Pulse Input (Current)	4–4
P2-HSO	2	High-Speed Output (Current)	4–13

Specialty Modules Overview (continued)

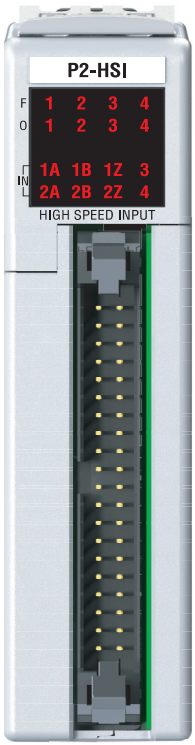


Productivity2000 Specialty I/O Modules			
Part Number	**Number of Channels**	**Description**	**See Page**
P2-02HSC	2	High-Speed Counter (100kHz)	4–23
P2-04PWM	4	Pulse-Width Modulation (Voltage)	4–29
P2-SCM	4	Serial Communications	4–33

P2-HSI High-Speed Pulse Input Module

The P2-HSI High-Speed Pulse (1MHz) Input Module provides differential (line receiver, 5V max) and single ended (5-24V) inputs that accept up to 1MHz of pulse/direction and quadrature signals on each of the two independent input channels. Additionally, four 5-24 VDC general purpose high-speed inputs and four general purpose, 5-24 VDC 0.5 amp, outputs are included for use with any Productivity®2000 system.

Use the hardware configuration tool in the Productivity Suite programming software to setup the P2-HSI module. See the Productivity Suite help file.



General Specifications

Module Type	Intelligent
Modules per Base	15 Maximum (See Note)
I/O Points Used	None, mapped directly to tags in CPU
Operating Temperature	0°C– 60°C (32°F–140°F)
Storage Temperature	-20ºC–70ºC (-4ºF–158ºF)
Humidity	5 to 95% (non-condensing)
Environmental Air	No corrosive gases permitted
Vibration	IEC 60068-2-6 (Test Fc)
Shock	IEC 60068-2-27 (Test Ea)
Field to Logic Side Isolation	1800VAC applied for 1s
Insulation Resistance	>10MΩ @ 500VDC
Heat Dissipation	5.76 W
Enclosure Type	Open Equipment
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)*
Module Location	Any I/O slot in a Productivity®2000 system
Field Wiring	Use ZIPLink wiring system ONLY. See "Wiring Options" in Chapter 5.
Weight	90g (3.2 oz)

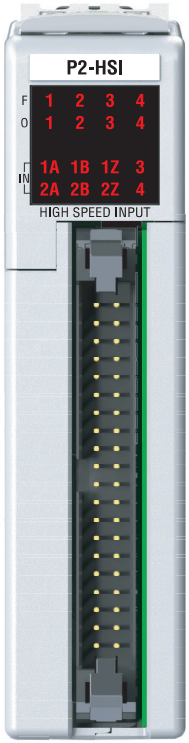
** Meets EMC and Safety requirements. See the D.O.C. for details.*

NOTE: *For complete system limits, please refer to the "Hardware and Communication Limits" table in the Productivity Suite online "Help" file "Hardware Configuration", topic P050.*

No terminal block sold for this module; ZIPLink required. See Chapter 5 for part numbers of ZIPLink cables and connection modules required with this module.

P2-HSI High-Speed Pulse Input Module (continued)

HSI LED Indicators



Status LEDs	
Fault Status LEDs	(F) 1, 2, 3 & 4 (one per status output)
Input LEDs	(IN) 1A, 1B, 1Z, 2A, 2B, 2Z, IN3 & IN4 (one per status input)
Output Status LEDs	(O) OUT1, OUT 2, OUT3 & OUT4

Note: All front panel fault LED's blinking indicates loss of 24VDC external power to module.

Connector Specifications	
Connector Type	IDC style header with latch, Omron XG4A-4034
Number of Pins	40 point
Pitch	0.1 in (2.54 mm)

Power Specifications	
External Power	24VDC -15% / +10%, Class 2
Maximum Voltage	26.4 VDC
Minimum Voltage	20.4 VDC
Current Consumption Excluding Outputs	50mA
Maximum Current Consumption Total of the 4 Status Outputs	2A

NOTE: *The most recent Productivity Suite software and firmware versions may be required to support new modules and new features.*

P2-HSI High-Speed Pulse Input Module (continued)

HSI Input Specifications

Differential (5V) Input Specifications	
Pulse Inputs*	Differential inputs (6 pts: 1A, 1B, 1Z, 2A, 2B, 2Z)
Isolation	Each input is isolated from other circuits
Input Signal Type, per Channel Select	Differential
Input Volts	5VDC
Input Volts Maximum	±5.6 VDC, limited by protection
Input Impedance	200Ω minimum, 500Ω maximum
Input Rated Current	5VDC, 15mA (8mA typical, 15mA maximum)
Input Minimum ON Voltage	3.0 VDC
Input Maximum OFF Voltage	1.0 VDC
Input Minimum ON Current	5.0 mA
Input Maximum OFF Current	2.0 mA
OFF to ON Response Time	1A, 1B, 2A, 2B: 0.48 µs 1Z, 2Z, 3IN, 4IN: 6µs
ON to OFF Response Time	1A, 1B, 2A, 2B: 0.48 µs 1Z, 2Z, 3IN, 4IN: 6µs
Max. Input Frequency	1A, 1B, 2A, 2B: 1MHz 1Z, 2Z, 3IN, 4IN: 200kHz

**The Z pulse input (1Z & 2Z) is capable of capturing a 1MHz wide pulse for the purpose of resetting an encoder count but a 3 microsecond pause (300kHz) is required between pulses.*
NOTE: The voltage difference between the input pairs must be between 3 volts and 5.6 volts.

P2-HSI High-Speed Pulse Input Module (continued)

HSI Input Specifications

Single Ended (5-24V) Input Specifications	
Status Input	Single ended inputs (8 pts: 1A, 1B, 1Z, 2A, 2B, 2Z, 3IN, 4IN)
Isolation	Each input is isolated from other circuits
Input Volts Range	5–24 VDC
Input Volts Maximum	±34VDC, limited by protection
Input Impedance	1kΩ minimum, 5kΩ maximum
Inputs Rated Current	5–24 VDC, 16mA 5.2 mA typical @ 5VDC 22mA maximum @ 34VDC
Input Minimum ON Voltage	4.5 VDC
Input Maximum OFF Voltage	2.0 VDC
Input Minimum ON Current	5.0 mA
Input Maximum OFF Current	1.4 mA
OFF to ON Response Time	1A, 1B, 2A, 2B: 0.48 µs 1Z, 2Z, 3IN, 4IN: 6µs
ON to OFF Response Time	1A, 1B, 2A, 2B: 0.48 µs 1Z, 2Z, 3IN, 4IN: 6µs
Max. Input Frequency*	1A, 1B, 2A, 2B: 1MHz 1Z, 2Z, 3IN, 4IN: 200kHz

** Inputs are not limited to this speed however, single ended signals are not usually reliable above 200kHz due to cabling capacitance.*

P2-HSI High-Speed Pulse Input Module (continued)

HSI Status Output Specifications

Status Output Specifications		
Status Outputs	4 sink/source	
Output Signal Type, per Channel Select	Current Sinking	Current Sourcing
Operating Voltage[1]	5–24 VDC	5–24 VDC[1]
Output Volts Maximum	36VDC	26.4 VDC[1]
Output Current Maximum	500mA	
Overcurrent Protection	Short circuit detect and current limit with automatic retry for each output	
Output Self Limiting Current	1.2 to 2.4 A	
Max Inrush Current	Self limited	
Output Voltage Drop	0.7 VDC @ 0.5 A	
Thermal Protection	Independent over temperature protection each output	
Output Voltage Clamp During Inductive Switching	+45VDC	-20VDC
Maximum OFF to ON Response	25µs[2]	
Maximum ON to OFF Response	25µs[2]	

NOTES:
1. Operating voltage of current sourcing outputs must be no greater than external power.
2. Measured at 5VDC operating voltage, 0.5 A load curent.

Frequency Response

Inaccuracy of Frequency Measurements Due to Time Base Errors	
25MHz Crystal for Time Base	
Inaccuracy at 25°C, Maximum	±30PPM
Inaccuracy 0–60°C, Referenced to 25°C	±30PPM
Inaccuracy Due to Aging, Maximum	±5PPM/Year
Max. Time Base Inaccuracy 0–60°C and 10 Years Operation	0.01%

Resolution of Frequency Measurements for "Fast Mode"		
Input Frequency	Sampling Period	Resolution
1Hz to 1MHz	1000ms	±1Hz
10Hz to 1MHz	100ms	±10Hz
100Hz to 1MHz	10ms	±100Hz
1MHz	1ms	±1000Hz

P2-HSI High-Speed Pulse Input Module (continued)

Frequency Response

Inaccuracy of Frequency Measurements[1,2] for "Slow Mode"			
Input Frequency	**Step/Dir**	**Quadrature 1X**	**Quadrature 4X**
1Hz	±0.002 Hz	±0.002 Hz	±0.002 Hz
10Hz	±0.009 Hz	±0.009 Hz	±0.009 Hz
100Hz	±0.015 Hz	±0.015 Hz	±0.015 Hz
1kHz	±1Hz	±1Hz	±1Hz
10kHz	±100Hz	±100Hz	±100Hz
100kHz	±1000Hz	±1000Hz	±1000Hz
1MHz	±40000Hz	±40000Hz	±40000Hz

Inaccuracy of Frequency Measurements[1,2] for "Fast Mode"				
Input Frequency	**Sampling Period**	**Step/Dir**	**Quadrature 1X**	**Quadrature 4X**
1Hz	±1 Second	±1Hz	±1Hz	±1Hz
10Hz				
100Hz				
1kHz				
10kHz				
100kHz				
1MHz				

Inaccuracy of Frequency Measurements[1,2,3,4] for "Auto Mode"			
Input Frequency	**Step/Dir**	**Quadrature 1X**	**Quadrature 4X**
1Hz	±1Hz	±1Hz	±1Hz
10Hz			
100Hz			
1kHz			
10kHz	±100Hz	±100Hz	±100Hz
100kHz	±1000Hz	±1000Hz	±1000Hz
1MHz	±10000Hz	±10000Hz	±10000Hz

1. For stable input signal at given input frequency.
2. For total measurement error add the time base error to the tabulated error.
3. Maximum sample period: 1 second.
4. Minimum sample period: 0.001 seconds.

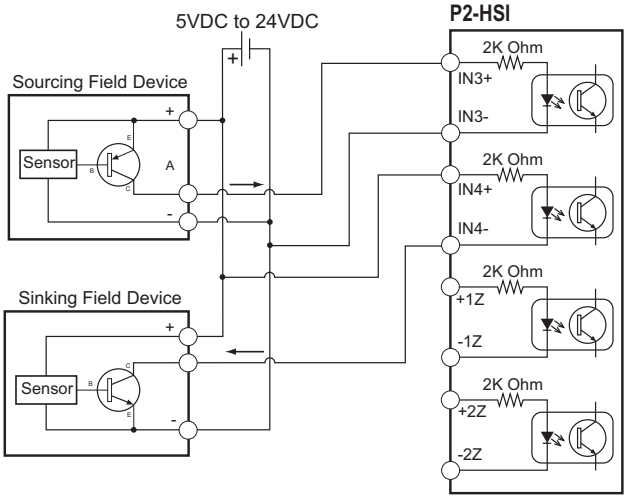
***NOTE:** Refer to the I/O Module Configuration Help file topic (P212) in the Productivity Suite Software for more information on Mode selections.*

Module Range:	Target position range ±2.147 billion (32-bit signed integer)

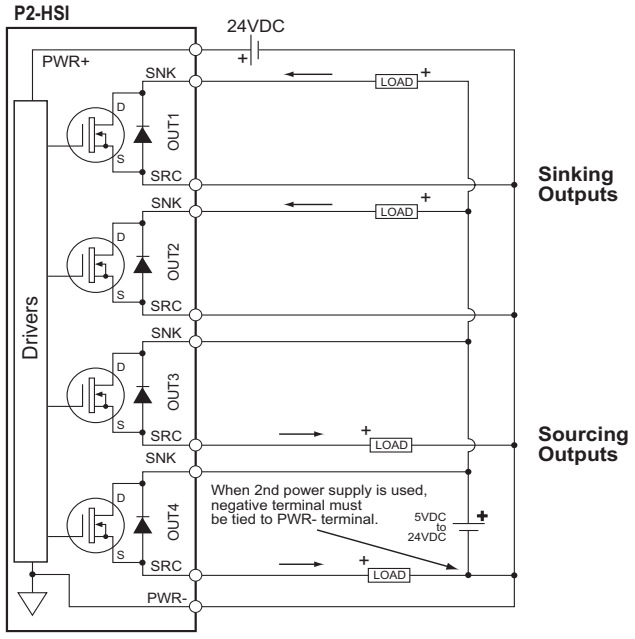
P2-HSI High-Speed Pulse Input Module (continued)

HSI Wiring Examples

Status Inputs Wiring Diagram

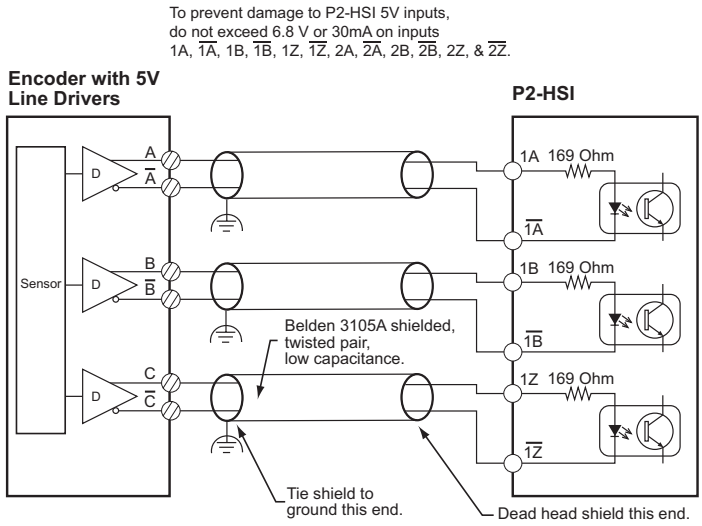


Status Outputs Wiring Diagram

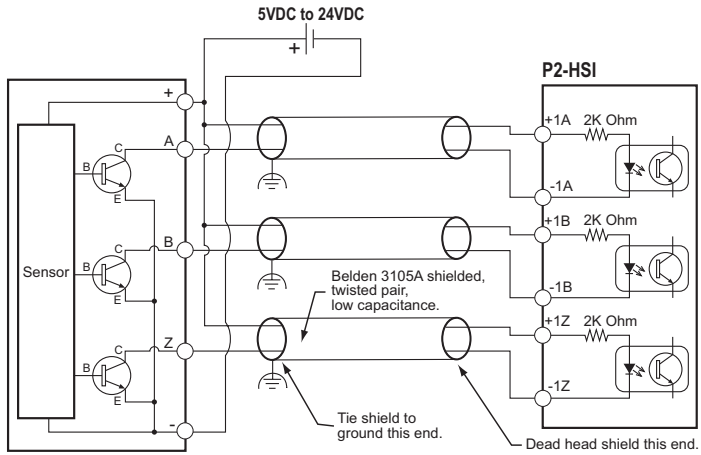


P2-HSI High-Speed Pulse Input Module (continued)

5V Encoder Inputs Wiring Diagram

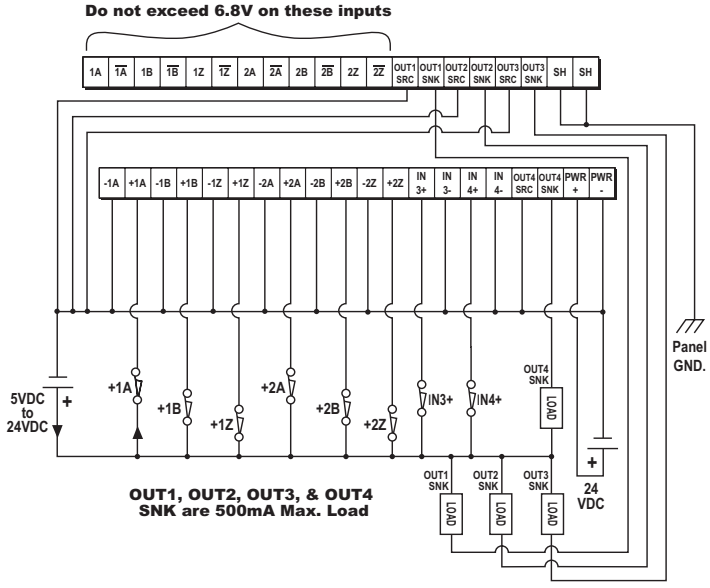


24V Encoder Inputs Wiring Diagram

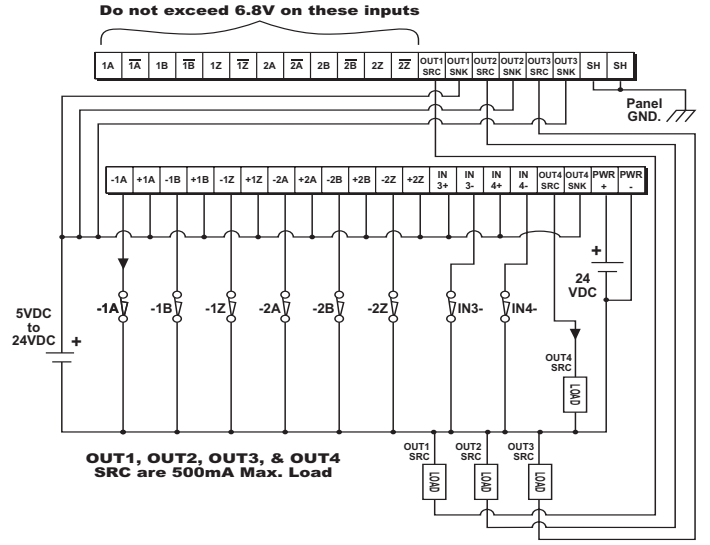


P2-HSI High-Speed Pulse Input Module (continued)

Sinking I/O Wiring Diagram



Sourcing I/O Wiring Diagram



P2-HSO High-Speed Output Module

The P2-HSO High-Speed Output Module provides up to of (1MHz) pulse/direction, up/down and quadrature pulse output on each of two independent output channels. Additionally, six 5-24 VDC general purpose inputs and four 5-24 VDC general purpose outputs are included for use with the Productivity®2000 system. Use the hardware configuration tool in the Productivity Suite programming software to setup the HSO module. See the Productivity Suite help file.

For applications requiring specialized motion control, consider the PS-AMC module.

General Specifications

Module Type	Intelligent
Modules per Base	15 Maximum (See Note)
I/O Points Used	None, mapped directly to tags in CPU
Operating Temperature	0°C– 60°C (32°F–140°F)
Storage Temperature	-20°C–70°C (-4°F–158°F)
Humidity	5 to 95% (non-condensing)
Environmental Air	No corrosive gases permitted
Vibration	IEC 60068-2-6 (Test Fc)
Shock	IEC 60068-2-27 (Test Ea)
Field to Logic Side Isolation	1800VAC applied for 1 second
Insulation Resistance	>10MΩ @ 500VDC
Heat Dissipation	6.26 W
Enclosure Type	Open Equipment
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)*
Module Location	Any I/O slot in a Productivity2000 system
Field Wiring	Use ZIPLink wiring system ONLY. See "Wiring Options" in Chapter 5.
Weight	90g (3.2 oz)

** Meets EMC and Safety requirements. See the D.O.C. for details.*

NOTE: *The most recent Productivity Suite software and firmware versions may be required to support new modules and new features.*

NOTE: *For complete system limits, please refer to the "Hardware and Communication Limits" table in the Productivity Suite online "Help" file "Hardware Configuration", topic P050.*

No terminal block sold for this module; ZIPLink required. See Chapter 5 for part numbers of ZIPLink cables and connection modules required with this module.

P2-HSO High-Speed Output Module (continued)

HSO LED Indicators

Status LEDs	
Fault Status LEDs	(F) 1, 2, 3, 4, 5, 6 (one per pulse output and one per status output)
Input LEDs	(IN) 1, 2, 3, 4, 5, 6 (one per status input)
Output Status LEDs	(O) OUT 1A & 1B, OUT 2A & 2B, OUT 3, 4, 5, 6

Note: All front panel fault LED's blinking indicates loss of 24VDC external power to module.

Connector Specifications	
Connector Type	IDC style header with latch, Omron XG4A-4034
Number of Pins	40 point
Pitch	0.1 in (2.54 mm)

Power Specifications	
External Power	24VDC -15% / +10%, Class 2
Maximum Voltage	26.4 VDC
Minimum Voltage	20.4 VDC
Current Consumption Excluding Outputs	130mA
Maximum Current Consumption Total of the 4 Status Outputs	2A

P2-HSO High-Speed Output Module (continued)

HSO Output Specifications

Pulse Output Specifications		
Pulse Outputs	2 Channels	
Output Pulse Type, per Channel Select	Selectable for pulse & direction, up/down or quadrature	
Output Signal Type, per Channel Select	RS-422 Line Driver Current Sinking and Sourcing	Open Drain FET Outputs Current Sinking
Output Volts	RS-422 levels	24VDC
Output Volts Maximum	5VDC	36VDC
Protection for Overcurrent and Short Circuit to Power	Current limit and thermal shutdown[2]	Current limit and thermal shutdown[1]
Protection Short to Ground	Yes	Yes
Overcurrent Trip Level	Output current limit ±200mA max[2]	100mA minimum
Maximum Continuous Output Current	±60mA	40mA
Maximum Switching Frequency, 1m cable3	1MHz	500kHz
Maximum Switching Frequency, 10m cable3	1MHz	200kHz

Notes:
1. Any fault shuts off the output. Fault is indicated and output is kept off until a new move start is received.
2. RS-422 thermal faults auto reset after device cool down.
3. Outputs are not limited to these speeds but single ended signals produced by the FETs are not usually reliable above these speeds due to cabling capacitance.

Status Input Specifications	
Status Input	6 sink/source
Isolation	Each status input is individually isolated from all other circuits
Input Volts Range	5-24 VDC
Input Volts Maximum	34VDC, limited by protection
Input Impedance	1kΩ minimum, 5kΩ maximum
Inputs Rated Current	5–24 VDC, 16mA 5.2 mA typical @ 5VDC 22mA maximum @ 34VDC
Input Minimum ON Voltage	4.5 VDC
Input Maximum OFF Voltage	2.0 VDC
Input Minimum ON Current	5.0 mA
Input Maximum OFF Current	1.4 mA
OFF to ON Response Time	4µs
ON to OFF Response Time	4µs

Notes:
Mechanical contacts are not recommended to be used as counter or encoder inputs as they may cause unreliable readings. The bounce of mechanical contacts can cause the input to see more edges than intended.

P2-HSO High-Speed Output Module (continued)

Status Output Specifications		
Status Outputs	4 sink/source	
Output Signal Type, per Channel Select	Current sinking	Current Sourcing
Operating Voltage[2]	5–24 VDC	5–24 VDC[2]
Output Volts Maximum[2]	36VDC	26.4 VDC[2]
Output Current Maximum	500mA	
Overcurrent Protection	Short circuit detect, overcurrent shutdown[1]	
Output Self Limiting Current	1.2 to 2.4 A	
Max Inrush Current	Self limited	
Output Voltage Drop	0.7 VDC @ 0.5 A	
Thermal Protection	Independent over temperature protection each output	
Output Voltage Clamp During Inductive Switching	+45VDC	-20VDC
Maximum OFF to ON Response	25µs[3]	
Maximum ON to OFF Response	25µs[3]	

NOTES:
1. *Any fault shuts off the output. Fault is indicated and output is kept off until a new move start is received.*
2. *Operating voltage for current sourcing outputs must be less or equal to the external power.*
3. *Measured at 5VDC operating voltage, 0.5 A load.*

Resolution of Frequency Output Measurements	
Output Frequency	**Resolution**
1kHz	0.01 Hz
10kHz	0.67 Hz
100kHz	67Hz
1MHz	6622Hz

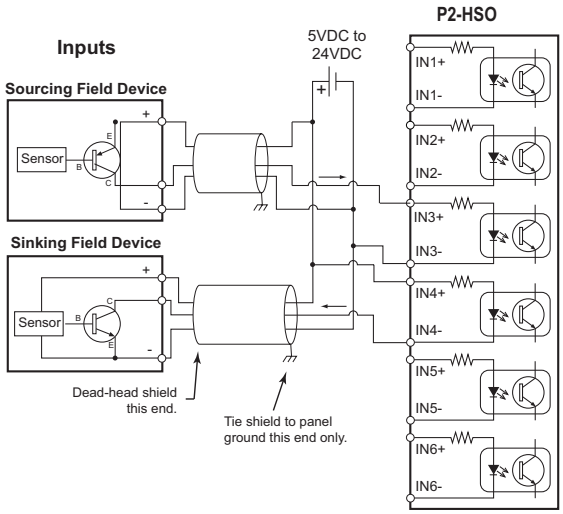
Inaccuracy of Output Frequency Due to Time Base Errors	
25 MHz crystal for time base	
Inaccuracy at 25°C, maximum	±30PPM
Inaccuracy 0–60°C, referenced to 25°C	±30PPM
Inaccuracy due to aging, maximum	±5PPM/Year
Max. time base inaccuracy 0–60°C and 10 years operation	0.01%

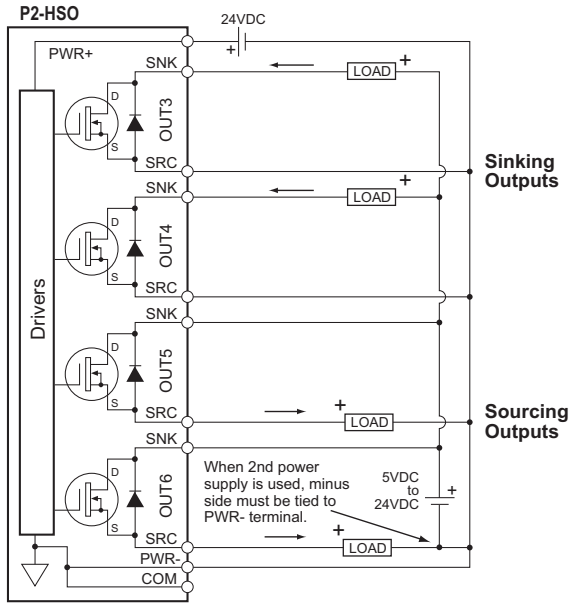
Module Range:	Target position range ±2.147 billion (32-bit signed integer)

P2-HSO High-Speed Output Module (continued)

HSO Wiring Examples

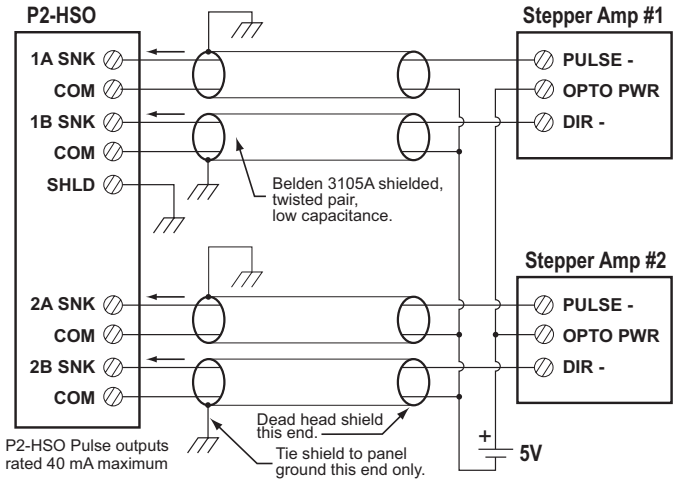
Status Inputs and Outputs



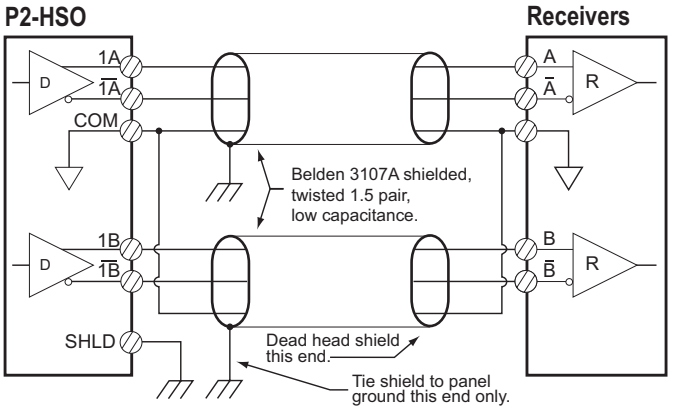


P2-HSO High-Speed Output Module (continued)

Sinking Pulse Output Wiring Diagram

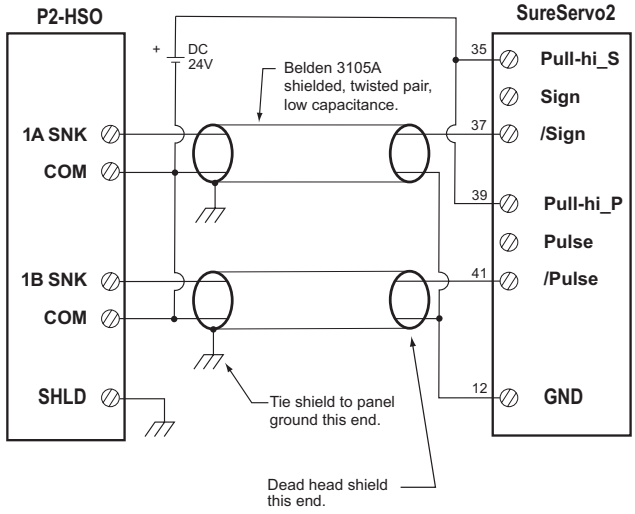


Line Driver Pulse Output Wiring Diagram

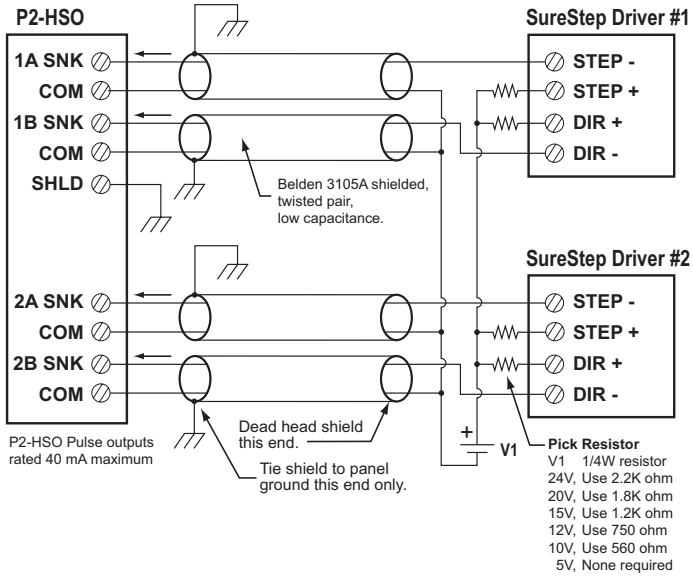


P2-HSO High-Speed Output Module (continued)

SureServo Wiring Diagram

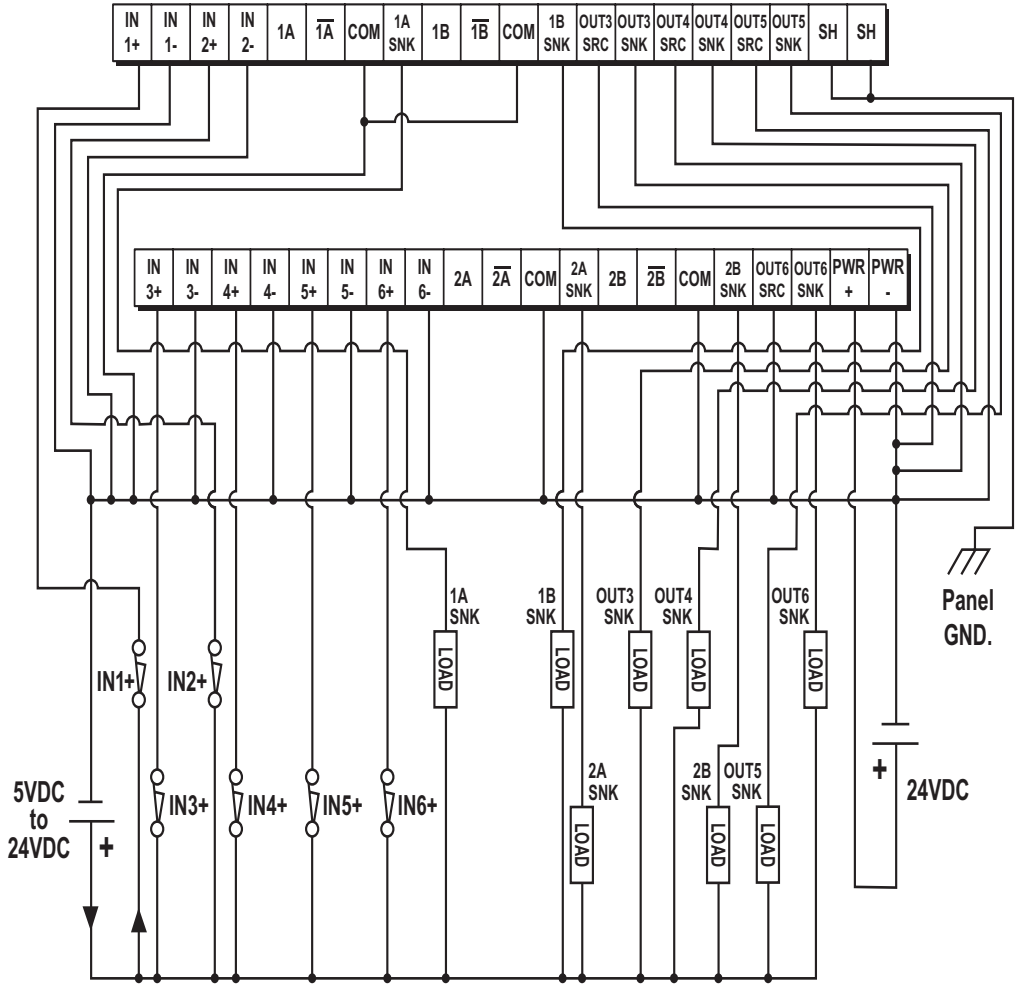


SureStep Wiring Diagram



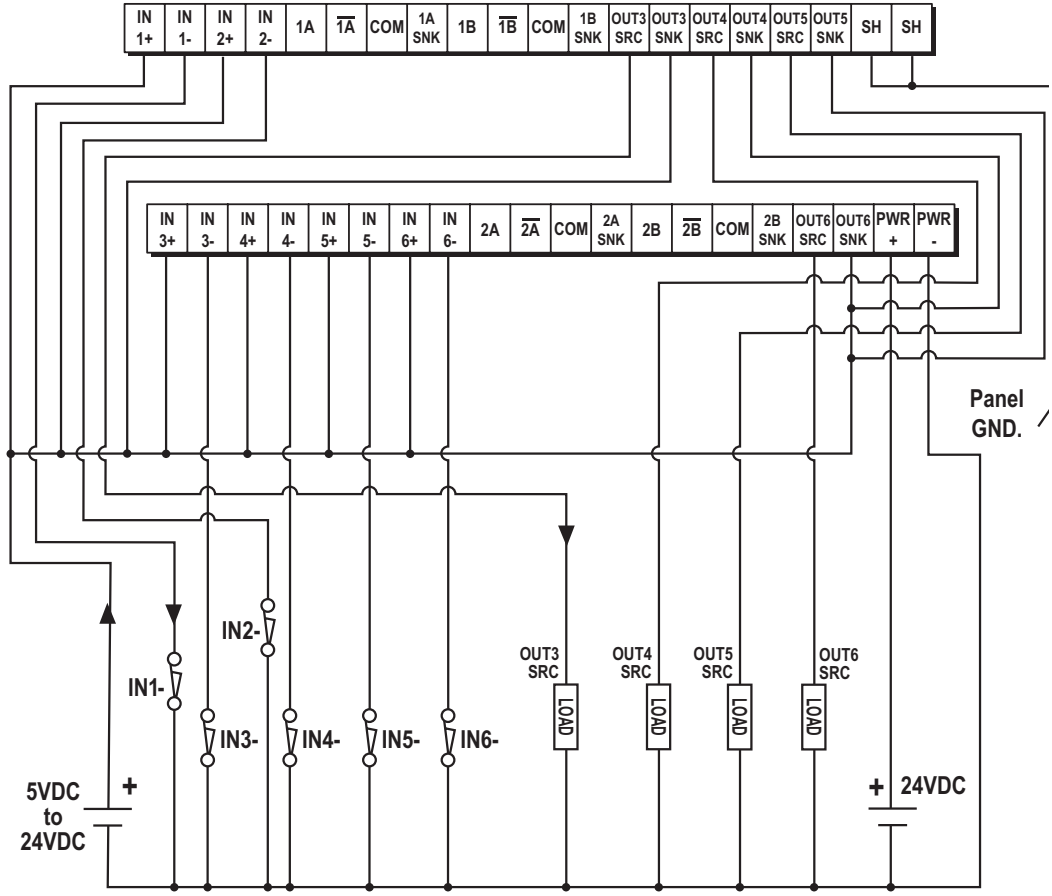
P2-HSO High-Speed Output Module (continued)

Sinking I/O Wiring Diagram



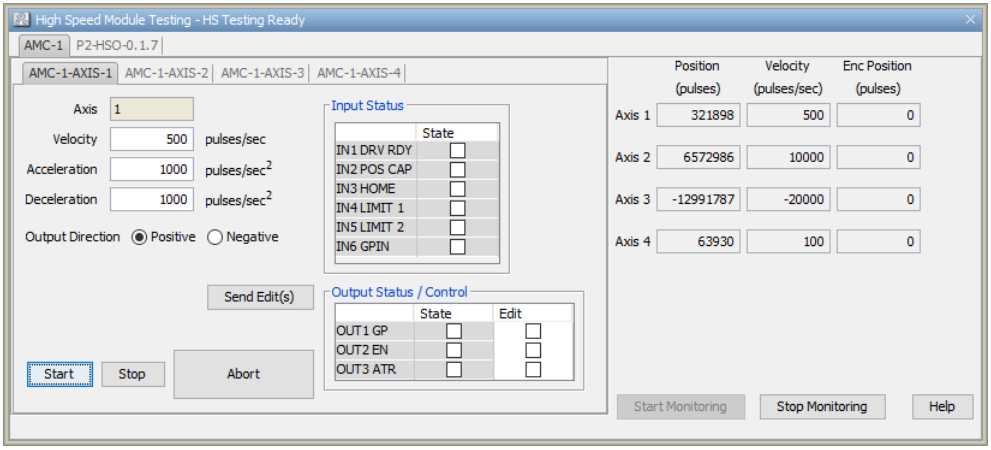
P2-HSO High-Speed Output Module (continued)

Sourcing I/O Wiring Diagram



High-Speed Module Tester Utility

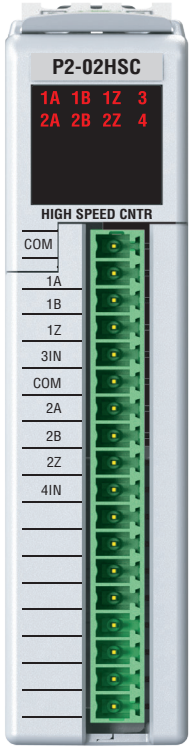
The High-Speed Module Tester is a software utility that allows a user to test P2-HSO and PS-AMC modules inputs and outputs. It is highly recommended that you simulate your P2-HSO and PS-AMC functions before attempting to control the module from your CPU program. This software utility, seen below, can be useful with debugging, confirming field wiring and verifying external device operation.



Refer to the Productivity Suite Help file for more information on the High-Speed Module Tester Utility.

P2-02HSC High-Speed Counter Module

The P2-02HSC High-Speed Counter Module provides two independent single-ended 5–24 VDC inputs that accept up to 100kHz of pulse/direction and quadrature signals. Additionally, two 5–24 VDC general-purpose high-speed inputs are included for use with the Productivity®2000 system.



Terminal Block sold separately.
P/N P2-RTB or P2-RTB-1

Input Specifications

Inputs per Module	Single ended counter inputs (6pts: 1A, 1B, 1Z, 2A, 2B, 2Z) General-purpose inputs (3IN, 4IN)
Input Voltage Range	5–24 VDC
Operating Voltage Range	4.25–27.6 VDC
Input Current	1.5 mA typical @ 4.25 VDC 11mA maximum @ 27.6 VDC
Input Impedance	2.5 kΩ
Minimum ON Current	1mA
Maximum OFF Current	0.4 mA
Minimum ON Voltage	4.5 VDC
Maximum OFF Voltage	2.2 VDC
OFF to ON, ON to OFF Response	2µs
Minimum Direction Setup Time	20µs
Maximum Input Frequency	100kHz
Module Range	Target position range ±2.147 billion (32-bit signed integer)
Status Indicators Logic Side	8 points
Commons	2 (4 points/common)

NOTE: *The most recent Productivity Suite software and firmware versions may be required to support new modules and new features.*

NOTE: *For complete system limits, please refer to the "Hardware and Communication Limits" table in the Productivity Suite online "Help" file "Hardware Configuration", topic P050.*

P2-02HSC High-Speed Counter Module (continued)

General Specifications	
Operating Temperature	0°C– 60°C (32°F–140°F)
I/O Points Used	None, mapped directly to tags in CPU
Storage Temperature	-20ºC–70ºC (-4ºF–158ºF)
Humidity	5 to 95% (non-condensing)
Altitude	2,000 meters max.
Pollution Degree	II
Environmental Air	No corrosive gases permitted
Vibration	IEC 60068-2-6 (Test Fc)
Shock	IEC 60068-2-27 (Test Ea)
Overvoltage Category	2
Field to Logic Side Isolation	1800VAC applied for 1s
Insulation Resistance	>10MΩ @ 500VDC
Heat Dissipation	2400mW
Terminal Type (sold separately)	18-position removable terminal block
Weight	93g (3.3 oz)
Agency Approvals	UL 61010-1 and UL 61010-2-201 File E139594, Canada and USA CE (EN 61131-2 EMC, EN 61010-1 and EN 61010-2-201 Safety)*

**Meets EMC and Safety Requirements. See the D.O.C. for details.*

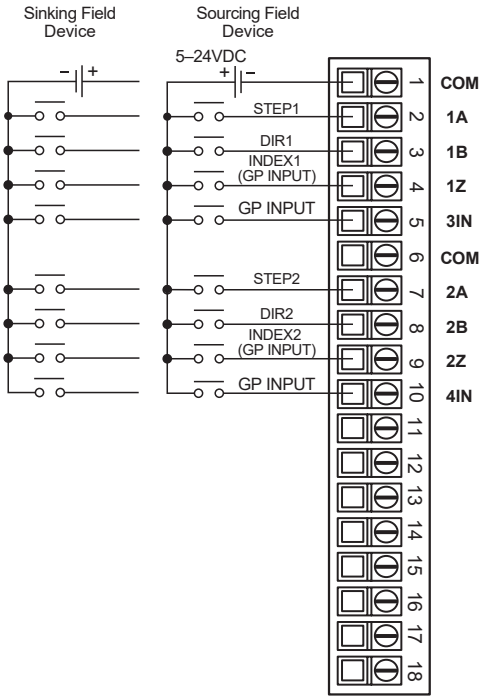
Removable Terminal Block Specifications		
Part Number	**P2-RTB**	**P2-RTB-1**
Number of positions	18 screw terminals	18 push release terminals
Wire Range	30–16 AWG (0.051–1.31 mm²) Solid/stranded conductor 3/64 in (1.2 mm) insulation max. 1/4 in (6–7 mm) strip length	28–16 AWG (0.081–1.31 mm²) Solid/stranded conductor 3/64 in (1.2 mm) insulation max. 19/64 in (7–8 mm) strip length
Conductors	USE COPPER CONDUCTORS, 75ºC or equivalent.	
Screw Driver Width	0.1 in. (2.5 mm) maximum	NA
Screw Size	M2	N/A
Screw Torque	2.5 lb·in (0.28 N·m)	N/A

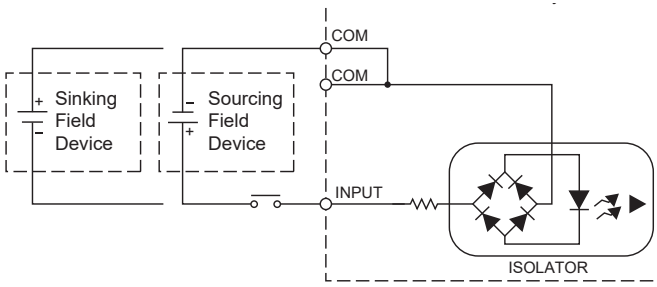
** Recommended screwdriver TW-SD-MSL-1*

P2-02HSC High-Speed Counter Module (continued)

Wiring Diagrams

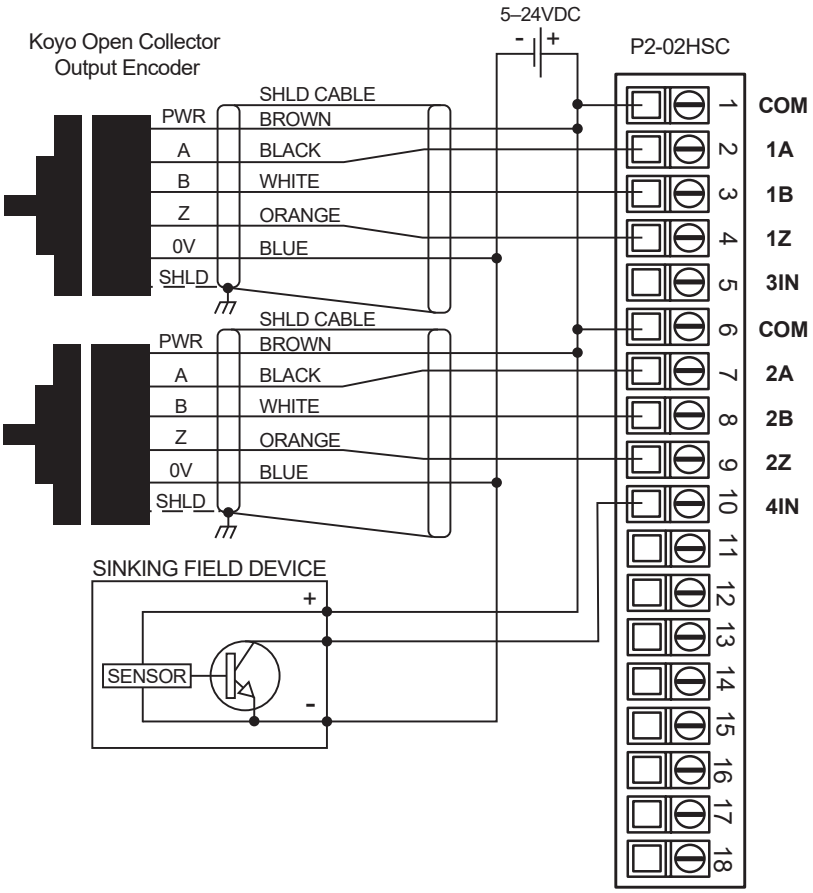
High Speed General Purpose Inputs





P2-02HSC High-Speed Counter Module (continued)

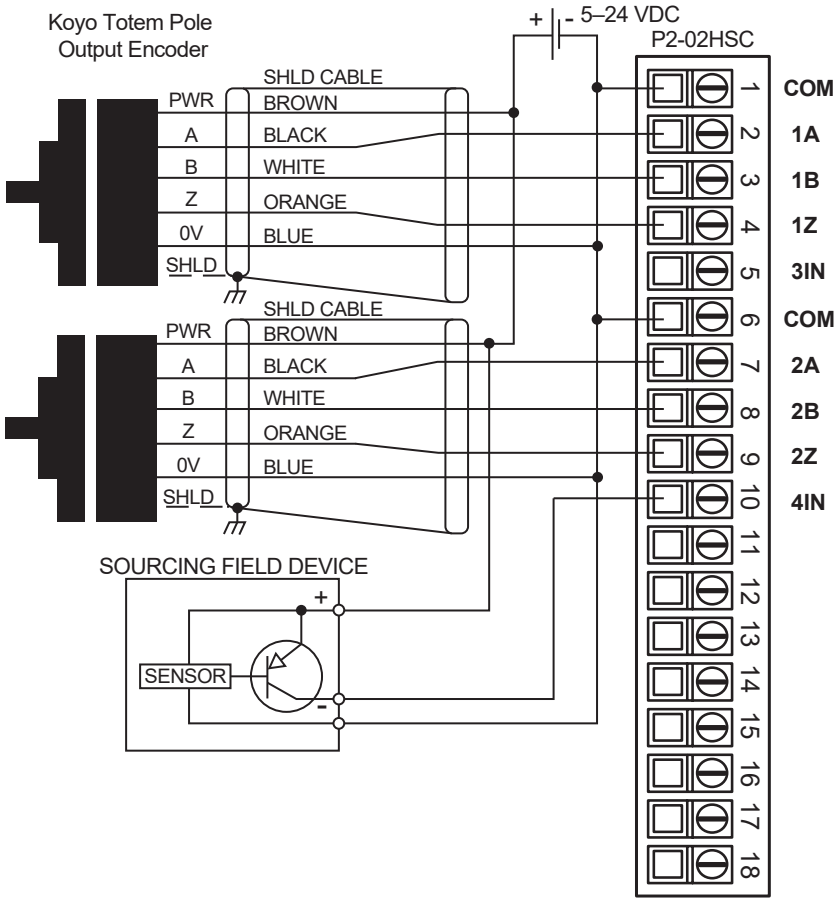
Wiring Example for Koyo Open Collector Output Encoder



Line Driver Output Encoders Not Reccommended for P2-02HSC

P2-02HSC High-Speed Counter Module (continued)

Wiring Example for Koyo Totem Pole Output Encoder

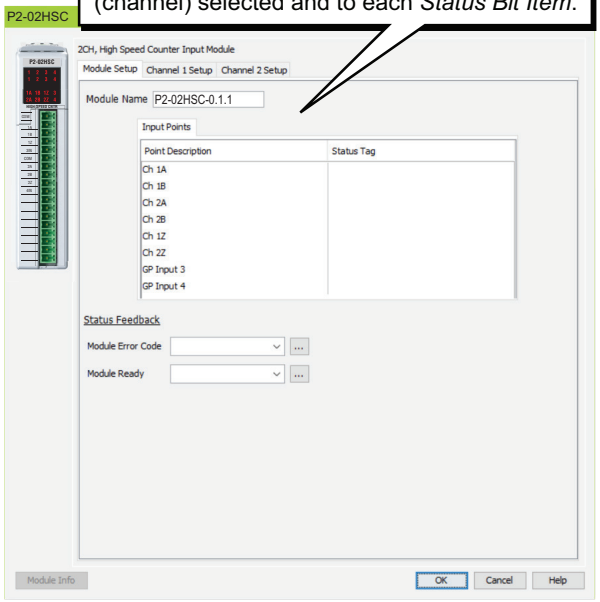


P2-02HSC High-Speed Counter Module (continued)

Module Configuration

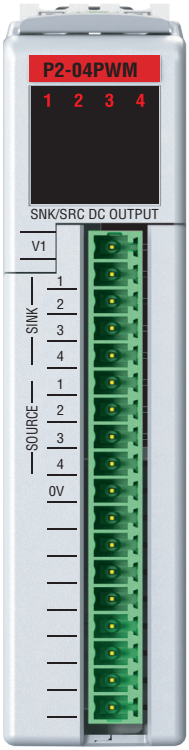
Using the Hardware Configuration tool in the Productivity Suite programming software, drag and drop the P2-02HSC module into the base configuration.

Select *Automatic Module Verification* or *No Verification and Enable Hot Swap*. If desired, assign a *User Tagname* to each input point (channel) selected and to each *Status Bit Item*.



P2-04PWM Module

The P2-04PWM pulse width modulation module provides four channels of sinking or sourcing 0–20 kHz, 0–100% duty cycle outputs for use with the Productivity®2000 system.



Terminal Block sold separately.

We recommend using pre-wired ZIPLink cables and connection modules. See Chapter 5. If you wish to hand-wire your modules, removable terminal blocks are sold separately. Order part number P2-10RTB or P2-10RTB-1

Output Specifications

Outputs per Module	4 PWM outputs	
Output Type	Open drain N-CH MOSFET (sinking)	Open drain P-CH MOSFET(sourcing)
Rated Voltage	5–24 V	
Operating Voltage Range	4.75–28.8 VDC	
Maximum Output Current Only Sinking Load Only Sourcing Load Both Sinking and Sourcing Loads	 200mA 0mA 100mA	 0mA 200mA 100mA
Minimum Load Current	5mA @ 5V	
Maximum Leakage Current	0.1 mA @ 28.8	
On Voltage Drop	0.6 V @ 50mA 1V @ 200mA	0.8 V @ 50mA 1.7 V @ 200mA
Maximum Inrush Current	500mA for 50ms	
Maximum Frequency Inaccuracy	0.5% of range	
Maximum Duty Cycle Inaccuracy	0.6% of range, below 10kHz 1.2% of range, 10–20 kHz	
Maximum Load Resistance for Stated Accuracy	1KΩ	
Accuracy vs. Temperature	±50PPM max.	
Start/Stop PWM Response	2ms	
PWM Frequency	0–20 kHz	
PWM Duty Cycle	0–100% below 10kHz 5–95% 10–20 kHz	
Status Indicators	Logic Side 4 points	
Commons	1 non-isolated	
Maximum Applicable Fuses	1A	
External Power Supply Required	5–24 VDC @ 40mA, Class 2	

Power Specifications

Maximum Voltage	28.8 V
Minimum Voltage	4.75 V
Current Consumption Excluding Outputs	40mA
Maximum Current Consumption Total for 4 sink or 4 source Outputs	800mA

NOTE: The most recent Productivity Suite software and firmware versions may be required to support new modules and new features.

P2-04PWM Module (continued)

General Specifications	
Operating Temperature	0°C to 60°C (32°F to 140°F)
Storage Temperature	-20ºC to 70ºC (-4ºF to 158ºF)
I/O Points Used	None, mapped directly to tags in CPU
Humidity	5 to 95% (non-condensing)
Environmental Air	No corrosive gases permitted
Vibration	IEC 60068-2-6 (Test Fc)
Shock	IEC 60068-2-27 (Test Ea)
Field to Logic Side Isolation	1800VAC applied for 1s
Insulation Resistance	>10MΩ @ 500VDC
Heat Dissipation	2200mW
Field Wiring	Use ZIPLink wiring system or removable terminal block (sold separately). See “Wiring Options” in Chapter 5.
Terminal Type (Sold Separately)	18-position removable terminal block
Weight	95g (3.4 oz)
Agency Approvals	UL 61010-1 and UL 61010-2-201 File E139594, Canada and USA CE (EN 61131-2 EMC, EN 61010-1 and EN 61010-2-201 Safety)*

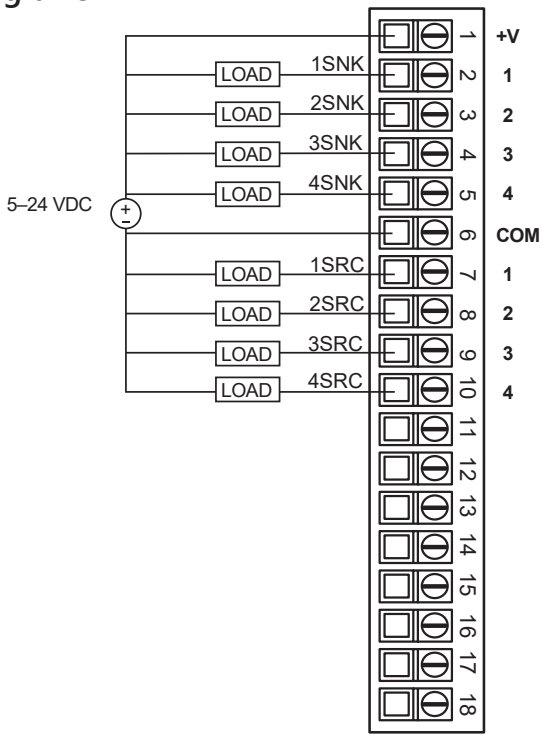
** Meets EMC and Safety requirements. See CE Declaration of Conformance for details.*

Removable Terminal Block Specifications		
Part Number	**P2-RTB**	**P2-RTB-1**
Number of positions	18 screw terminals	18 push release terminals
Wire Range	30–16 AWG (0.051–1.31 mm²) 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 mm²) Solid/stranded conductor 3/64 in (1.2 mm) insulation max. 19/64 in (7–8 mm) strip length
Conductors	USE COPPER CONDUCTORS, 75ºC or equivalent.	
Screw Driver Width	0.1 in. (2.5 mm) maximum	NA
Screw Size	M2	N/A
Screw Torque	2.5 lb·in (0.28 N·m)	N/A

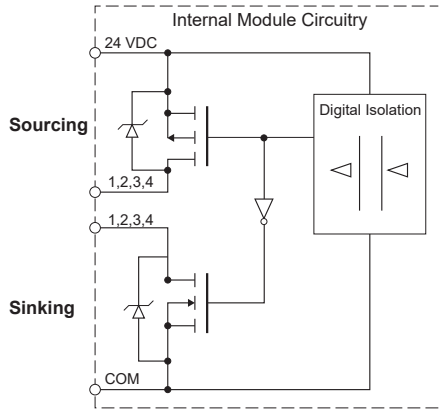
** Recommended screwdriver TW-SD-MSL-1*

P2-04PWM Module (continued)

Wiring Diagrams



NOTE: *Both channels (sinking/sourcing) output the same frequency and duty cycle that is assigned to the tag in Hardware Configuration window.*

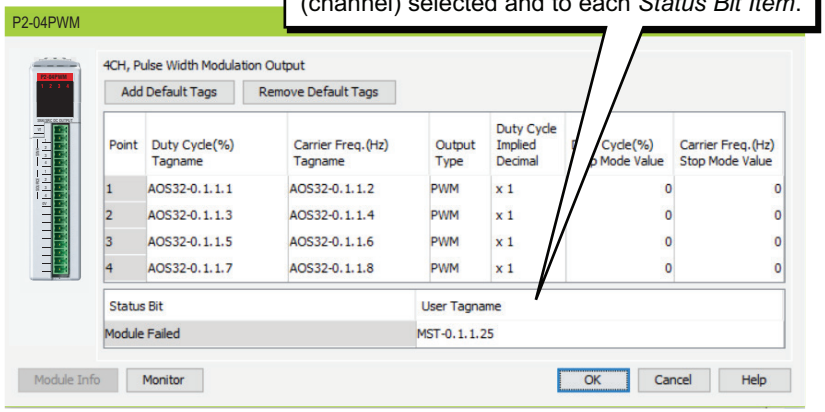


P2-04PWM Module (continued)

Module Configuration

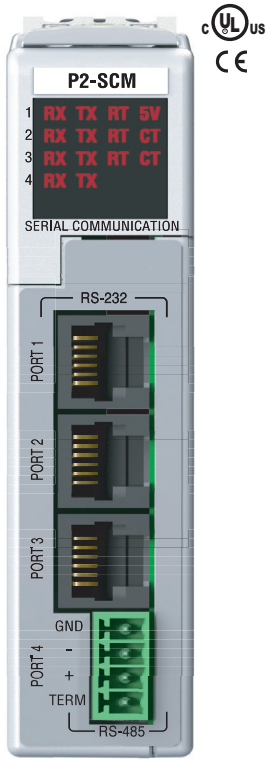
Using the Hardware Configuration tool in the Productivity Suite programming software, drag and drop the P2-04PWM module into the base configuration.

Select *Automatic Module Verification* or *No Verification and Enable Hot Swap*. If desired, assign a *User Tagname* to each input point (channel) selected and to each *Status Bit Item*.



P2-SCM Module

The P2-SCM Serial Communications Module provides three RS-232 ports and one RS-485 port for Modbus master/slave networking or connection to serial devices using ASCII or custom communication protocols.



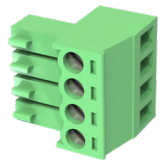
General Specifications

Module Type	Intelligent
Modules per Base	15 maximum (See Note)
I/O Points Used	None, mapped directly to tags in CPU
Field Wiring Connector	3 RJ12; 1 4-position terminal block
Operating Temperature	0°C– 60°C (32°F–140°F)
Storage Temperature	-20ºC–70ºC (-4ºF–158ºF)
Humidity	5 to 95% (non-condensing)
Environmental Air	No corrosive gases permitted
Vibration	IEC 60068-2-6 (Test Fc)
Shock	IEC 60068-2-27 (Test Ea)
Field to Logic Side Isolation	None
Insulation Resistance	No isolation
Agency Approvals	UL508 File E139594, Canada & USA CE (EN61131-2007)
Module Location	Any slot in any base in a Productivity®2000 system
Weight	90g (3.2 oz)

Removable Terminal Block Specifications

Number of Positions	4 Screw Terminals, 3.5 mm Pitch
Wire Range	16–28 AWG Solid/stranded conductor USE COPPER CONDUCTORS, 75°C or equivalent
Screwdriver Size	TW-SD-VSL-1 (recommended)
Screw Torque	0.4 N·m

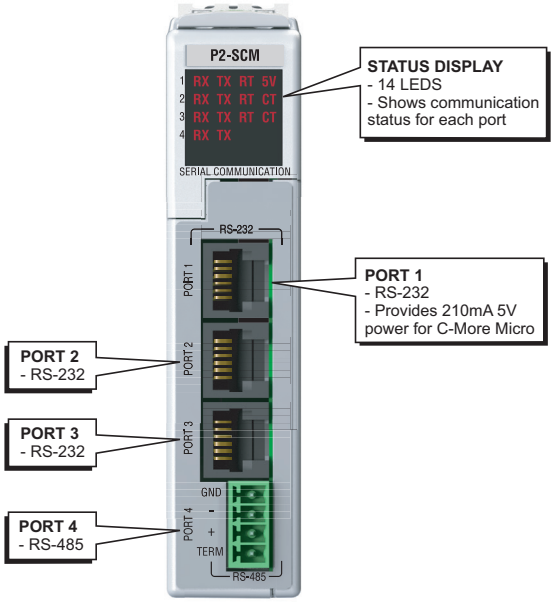
Removable Terminal Connector included.
Spare connectors available,
(part no. P3-RS485CON-1).



NOTE: *For complete system limits, please refer to the "Hardware and Communication Limits" table in the Productivity Suite online "Help" file "Hardware Configuration", topic P050.*

P2-SCM Specifications, (continued)

SCM LED Indicators

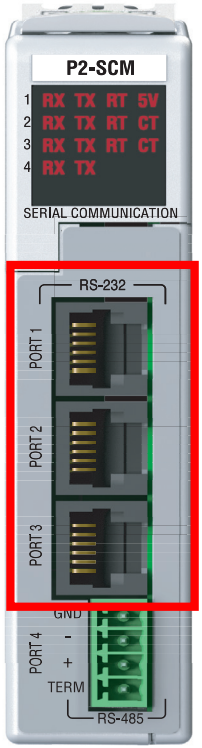


Diagnostic LEDs				
LED	Port 1	Port 2	Port 3	Port 4
RXD	X	X	X	X
TXD	X	X	X	X
RTS	X	X	X	
CTS		X	X	
5V	X			

1. *All RS232 & RS485 LED's reflect the actual electrical level of the signal; there is no direct firmware control of LED's.*
2. *RS232 LED's RXD, TXD, RTS & CTS are turned ON when the voltage on the RS232 wire is positive:*
   a. - This occurs when the UART I/O signal is low (GND).
   b. - They are turned OFF when the voltage on the RS232 wire is negative.
3. *RS485 LED's RXD, TXD, are turned ON when the UART I/O signal is low (GND).*
4. *5V LED is ON when 5V power is good, 5V LED is OFF when 5V is shorted to ground.*

P2-SCM Module Communications

RS-232 Serial Ports



RS-232 Ports 1, 2 & 3				
Electrical Specifications	**Min**	**Typ**	**Max**	**Units**
Output ON, Space Condition (3kΩ, 1000pF Load)	5.0	5.2	N/A	Volts
Output OFF, Mark Condition (3kΩ, 1000pF Load)	N/A	-5.2	-5.0	Volts
Output Short-Circuit Current		15	N/A	mA
Short-Circuit Duration		N/A	No Limit	Seconds
Output Resistance	300		N/A	Ohm
Input ON Threshold	N/A	1.6	2.4	Volt
Input OFF Threshold	0.6	1.2	N/A	Volt
Input Resistance	3k	5k	7k	Ohm

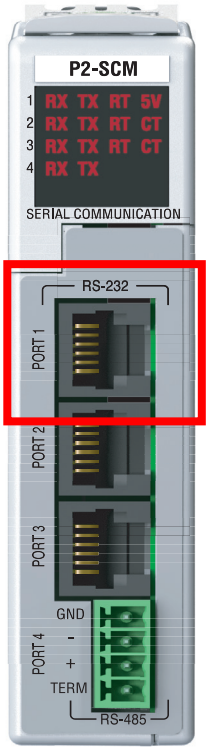
Line Specifications for RS-232 Ports		
RS-232 Line Specifications	**Options**	**Units**
Data Rate Setting	1200, 2400, 4800, 9600, 19200, 33600, 38400 baud	Baud
Data Rate Error	±2	%
Data Bits Setting1	7 or 8	Bits
Stop Bits Setting	1	Bits
Parity Setting	None1, Odd or Even	Parity
Data Transmission	Half duplex or full duplex	N/A
Network	Point-to-Point	

1. 7-Bit data are only supported with odd or even parity.

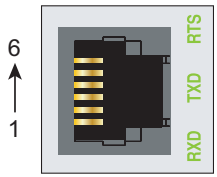
P2-SCM Module Communications (continued)

RS-232 Serial Port 1

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



Port 1	
Port Type	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, and 38400 baud
+5V Cable Power Source	210mA maximum at 5V, ±5%. Reverse polarity and overload protected
TXD	RS-232 Transmit output
RX	RS-232 Receive input
RTS	Handshaking output for modem control
GND	Logic ground
Maximum Output Load (TXD/ RTS)	3kΩ, 1000pF
Minimum Output Voltage Swing	±5V
Output Short Circuit Protection	±15mA
Port Status LED	Red 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-ISOCON for converting RS-232 to isolated RS-485



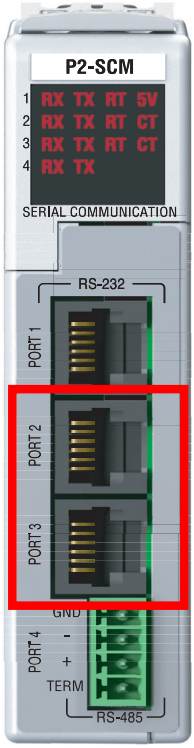
6-pin RJ12 Female Modular Connector

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

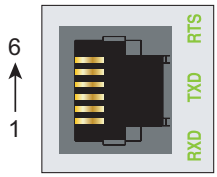
P2-SCM Module Communications (continued)

RS-232 Serial Port 2 and 3

Non-isolated RS-232 DTE port connects the CPU as a MODBUS/ASCII master or slave to a peripheral device.



Port 2 and 3	
Port Type	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, and 38400 baud
TXD	RS-232 Transmit output
RX	RS-232 Receive input
RTS	Handshaking output for modem control
GND	Logic ground
Maximum Output Load (TXD/RTS)	3kΩ, 1000pF
Minimum Output Voltage Swing	±5V
Output Short Circuit Protection	±15mA
Port Status LED	Red LED is illuminated when active for TXD, RXD and RTS
Cable Options	D2-DSCBL USB-RS232-1 with D2-DSCBL FA-CABKIT FA-ISOCON for converting RS-232 to isolated RS-485



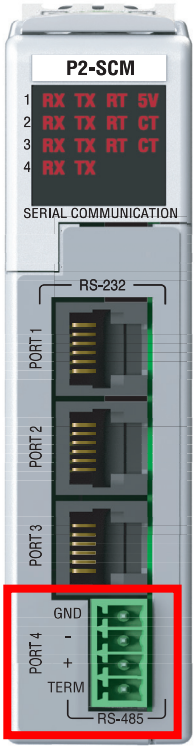
6-pin RJ12 Female Modular Connector

Pin #	Signal	
6	GND	Logic Ground
5	RTS	RS-232 Output
4	TXD	RS-232 Output
3	RXD	RS-232 Input
2	CTS	RS-232 Input
1	GND	Logic Ground

P2-SCM Module Communications (continued)

RS-485 Port 4

Non-isolated RS-485 port connects the CPU as a MODBUS/ASCII master or slave to a peripheral device(s).



Port 4				
Electrical Specifications	**Min**	**Typ**	**Max**	**Units**
Driver Differential Output (54Ω Load)	1.5	N/A	N/A	Volts
Driver Common-Mode Output	N/A		3	Volts
Driver Short-Circuit Output Current			250	mA
Short-Circuit Duration (Thermal Shutdown)			No Limit	Seconds
Receiver Differential Input Threshold	200		N/A	mV
Receiver Common-Mode Input	-7		12	Volt
Input Resistance	12k		N/A	Ohm
Termination Resistance (TB Jumper wire 'T' to '+')	N/A	120		Ohm
Data Rate	1200	N/A	38400	Baud
Data Rate Error	N/A	N/A	±2	%
Cable Length (38400 baud maximum)			1200	Meter

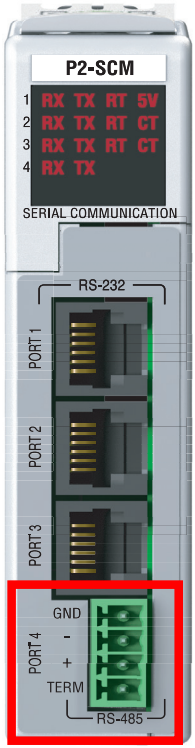
1. 7-bit data are only supported with odd or even parity

Line Specifications for Port 4		
RS-485 Line Specifications	**Options**	**Units**
Data Rate Setting	1200, 2400, 4800, 9600, 19200, 33600, 38400 baud	Baud
Data Bits Setting1	7 or 8	Bits
Stop Bits Setting	1	Bits
Parity Setting	None1, Odd or Even	Parity
Data Transmission	Half duplex	N/A

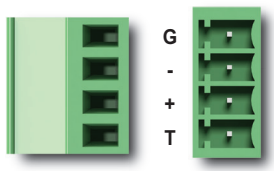
1. 7-Bit data are only supported with odd or even parity.

P2-SCM Module Communications (continued)

RS-485 Port 4



Port 4	
Port Type	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 baud
TXD+/RXD	RS-485 transceiver high
TXD-/RXD-	RS-485 transceiver low
GND	Logic Ground
Input Impedance	19kΩ
Maximum Load	50 transceivers, 19kΩ each, 60Ω termination
Output Short Circuit Protection	±250mA, thermal shut-down protection
Electrostatic Discharge Protection	±8kV per IEC1000-4-2
Electrical Fast Transient Protection	±2kV per IEC1000-4-4
Minimum Differential Output Voltage	1.5 V with 60Ω 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	RED LED Illuminated when active for TXD and RXD
Cable Options	L19827-xx



RS-485

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