# Analog I/O Specifications

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# Analog I/O Modules Overview

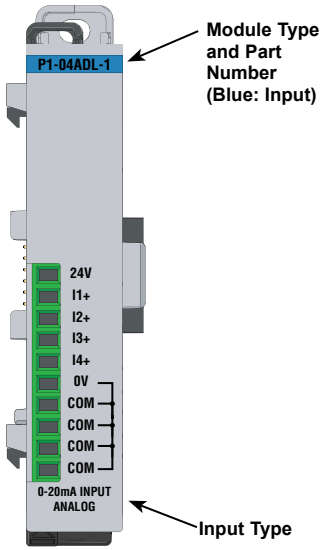
A variety of analog I/O modules are available for use with Productivity® 1000 system.

Each I/O module is identified as an "Input" or "Output"module on its front panel using the color coding scheme listed below. See Chapter 2 for discrete I/O module specifications and Chapter 6 for communications wiring and connectivity information. The following pages contain the analog I/O module specifications and associated wiring diagrams.

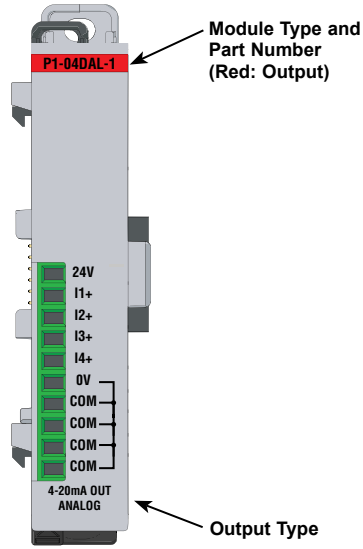
There are 16 analog I/O modules available; ten Input, four Output modules and two Input/Output combination modules. The specifications and wiring diagrams, along with configuration and signal scaling information, are in this chapter.

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

**Analog Input Modules**

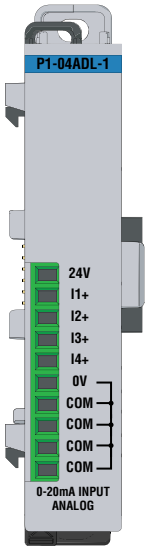



**Analog Output Modules**



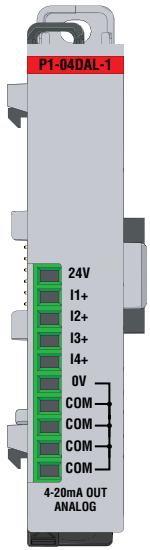
# Analog I/O Modules

## Analog Input Modules



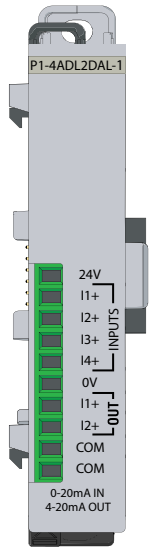

| Productivity1000 Analog Input Modules | | | |
|---|---|---|---|
| Part Number | Number of Channels | Description | See Page |
| P1-04AD | 4 | Analog Input (Current/Voltage) | 3–6 |
| P1-04AD-1 | 4 | Analog Input (Current) | 3-10 |
| P1-04AD-2 | 4 | Analog Input (Voltage) | 3-14 |
| P1-04ADL-1 | 4 | Analog Input (Current) | 3–18 |
| P1-04ADL-2 | 4 | Analog Input (Voltage) | 3–22 |
| P1-08ADL-1 | 8 | Analog Input (Current) | 3–26 |
| P1-08ADL-2 | 8 | Analog Input (Voltage) | 3–30 |
| P1-04RTD | 4 | RTD Input | 3-34 |
| P1-04THM | 4 | Analog Thermocouple Input | 3-39 |
| P1-04NTC | 4 | Analog Thermistor Input | 3–44 |

## Analog Output Modules




| Productivity1000 Analog Output Modules | | | |
|---|---|---|---|
| Part Number | Number of Channels | Description | See Page |
| P1-04DAL-1 | 4 | Analog Output (Current) | 3–48 |
| P1-04DAL-2 | 4 | Analog Output (Voltage) | 3–52 |
| P1-08DAL-1 | 8 | Analog Output (Current) | 3–56 |
| P1-08DAL-2 | 8 | Analog Output (Voltage) | 3-60 |

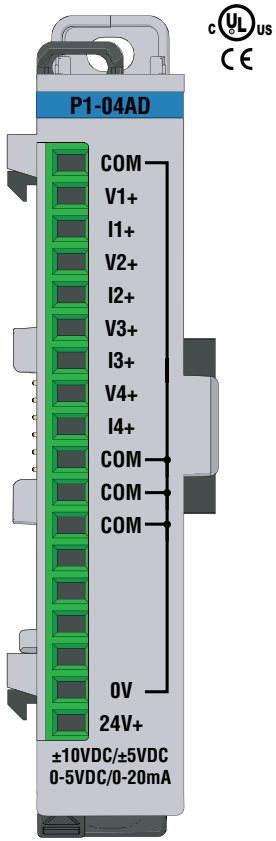
## Analog Input/Output Modules




| Productivity1000 Analog Input/Output Modules | | | |
|---|---|---|---|
| Part Number | Number of Channels | Description | See Page |
| P1-4ADL2DAL-1 | 4/2 | Analog Input/Analog Output (Current) | 3–64 |
| P1-4ADL2DAL-2 | 4/2 | Analog Input/Analog Output (Voltage) | 3–69 |

# P1-04AD Analog Input

The P1-04AD Voltage/Current Analog Input Module provides four channels for receiving ±5VDC, ±10VDC, 0–5 VDC, 0–10 VDC, and 0 to 20mA signals for use with the Productivity® 1000 system.




**Terminal block sold separately.**

## Input Specifications

| | |
|---|---|
| Inputs per Module | 4 |
| Module Signal Input Range | ±5VDC, ±10VDC, 0–5 VDC, 0–10 VDC, 0–20 mA |
| Signal Resolution | 16-bit |
| Resolution Value of LSB (least significant bit) | ±5V=152µV, ±10V=0.305 µV<br>0–5 V=76µV, 0–10 V=152µV,<br>0–20 mA=0.305 µA per count<br>(1LSB = 1 count) |
| Data Range | 0-65535 counts unipolar<br>-32768 to +32767 counts bipolar |
| Input Type | Single-ended (1 common) |
| Maximum Continuous Overload | ±31mA, current input<br>±100V, voltage input |
| Input Impedance | 1.1 M ±10% voltage input<br>250 ±0.1% 1/4W current input |
| Filter Characteristics | Low Pass 1st order, -3dB @ 48Hz |
| Sample Duration Time | 3.5 ms per channel<br>(Does not include ladder scan time) |
| All Channel Update Rate | 15ms |
| Open Circuit Detection Time | Zero reading within 1s (current input only) |
| Conversion Method | Successive approximation |
| Accuracy vs Temperature | ±10PPM / ºC maximum |
| Maximum Inaccuracy | 0.1% of range voltage, 0.2% of range current<br>(Including temperature drift) |
| Linearity Error (end to end) | ±0.01% of range max., ±10V & ±5V<br>±0.015% of range max., 0–5 V & 0–20 mA;<br>Monotonic with no missing codes |
| Input Stability and Repeatability | ±0.035% of range (after 10 min. warm-up) |
| Full Scale Calibration Error | ±0.2% of range maximum |
| Offset Calibration Error | ±0.065% of range maximum |
| Max Crosstalk | -96dB, of range maximum |
| Recommended Fuse (external) | Edison S500-32-R, 0.032 A fuse (On current inputs only) |
| External Power Supply Required | 24VDC (-20% / + 25%), 35mA |

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

# P1-04AD Analog Input (continued)

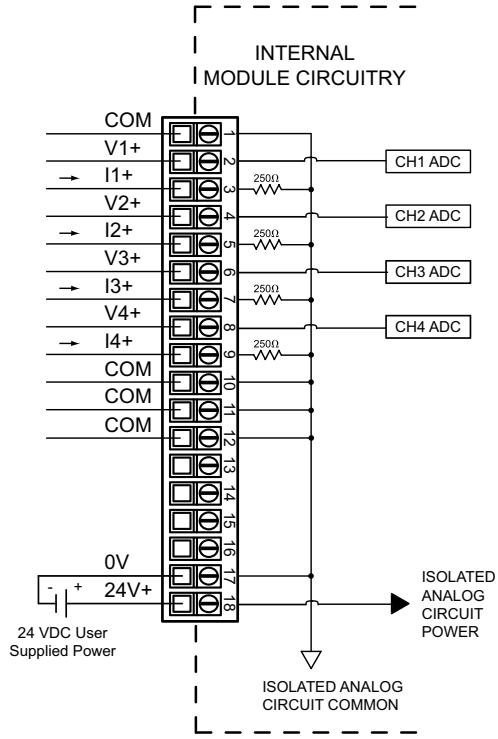
| General Specifications | |
|---|---|
| Operating Temperature | 0°C– 60°C (32°F–140°F) |
| Storage Temperature | -20ºC–70ºC (-4ºF–158ºF) |
| Humidity | 5 to 95% (non-condensing) |
| Altitude | 2,000 meters, max. |
| Pollution Degree | 2 |
| Environmental Air | No corrosive gases permitted |
| Vibration | IEC60068-2-6 (Test Fc) |
| Shock | IEC60068-2-27 (Test Ea) |
| Field to Logic Side Isolation | 1800VAC applied for 1s |
| Insulation Resistance | >10MΩ @ 500VDC |
| Heat Dissipation | 1400mW |
| Overvoltage Category | II |
| Enclosure Type | Open equipment |
| Field Wiring | Removable terminal block (sold separately).<br>Use ***ZIP***Link wiring system optional.<br>See "Wiring Options" in Chapter 5. |
| Terminal Type (sold separately) | 18-position removable terminal block |
| Weight | 71g (2.5 oz) |
| Agency Approvals | UL 61010-1 and UL 61010-2-201 File E139594, Canada and USA<br>CE (EN 61131-2 EMC, EN 61010-1 and EN 61010-2-201 Safety)* |

| Removable Terminal Block Specifications | | |
|---|---|---|
| Part Number | P1-10RTB | P1-10RTB-1 |
| Number of positions | 10 screw terminals | 10 spring clamp terminals |
| Wire Range | 30–16 AWG (0.051–1.31 mm²)<br>Solid/stranded conductor<br>3/64 in. (1.2 mm) insulation max.<br>1/4 in (6– 7 mm) strip length | 28–16 AWG (0.081–1.31 mm²)<br>Solid/stranded conductor<br>3/64 in (1.2 mm) insulation max.<br>19/64 in (7–8 mm) strip length |
| Conductors | USE COPPER CONDUCTORS, 75ºC 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 P/N: TW-SD-MSL-1.*

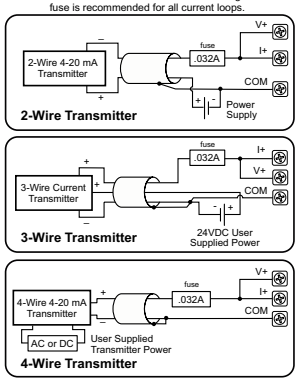
# P1-04AD Analog Input (continued)

## Wiring Diagrams




**Current Sinking Input Circuits**

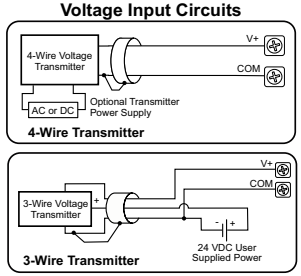
An Edison S500-32-R 0.032A fast-acting fuse is recommended for all current loops.




**Notes:**

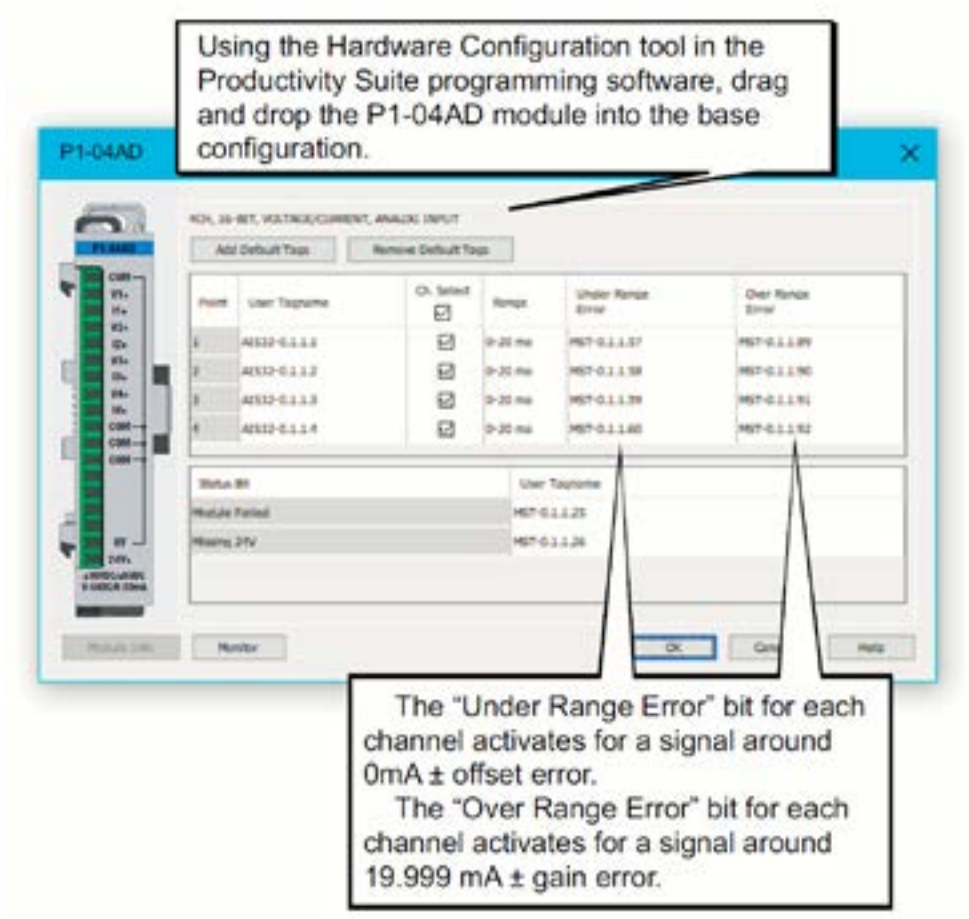
1. Shield connected to signal source common.
2. If current is chosen, I+ MUST be jumpered to V+. For example, when using 4–20 mA source for Input 3, I3+ must be connected to V3+.

**Voltage Input Circuits**



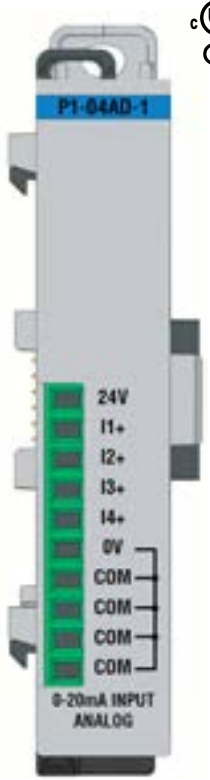
# P1-04AD Analog Input (continued)

## Module Configuration



# P1-04AD-1 Analog Input

The P1-04AD-1 Current Analog Input Module provides four channels for receiving 0 to 20mA signals for use with the Productivity® 1000 system.




| Input Specifications | |
|---|---|
| Inputs per Module | 4 |
| Module Signal Input Range | 0–20 mA |
| Signal Resolution | 16-bit |
| Resolution Value of LSB (least significant bit) | 0–20 mA=0.305 µA per count (1LSB = 1 count) |
| Data Range | 0-65535 counts |
| Input Type | Single-ended (1 common) |
| Maximum Continuous Overload | ±31mA |
| Input Impedance | 250 ±0.1% 1/4 W |
| Filter Characteristics | Low Pass, -3dB @ 100Hz |
| Sample Duration Time | 9ms per channel (Does not include ladder scan time) |
| All Channel Update Rate | 80ms |
| Open Circuit Detection Time | Zero reading within 1s |
| Conversion Method | Successive approximation |
| Accuracy vs Temperature | ±25PPM / ºC maximum |
| Maximum Inaccuracy | 0.1% of range (Including temperature drift) |
| Linearity Error (end to end) | ±0.015% of range Monotonic with no missing codes |
| Input Stability and Repeatability | ±0.015% of range (after 10 min. warm-up) |
| Full Scale Calibration Error | ±0.015% of range maximum |
| Offset Calibration Error | ±0.015% of range maximum |
| Max Crosstalk | -76dB, of range maximum |
| Recommended Fuse (external) | Edison S500-32-R, 0.032 A fuse |
| External Power Supply Required | 24VDC (-20% / + 25%), 35mA |

**Terminal block sold separately.**

**We recommend using pre-wired ZIPLink cables and connection modules. See Chapter 5.**
**If you wish to hand-wire your module, removable terminal blocks are sold separately. Order part number P1-10RTB or P1-10RTB-1**

# P1-04AD-1 Analog Input (continued)

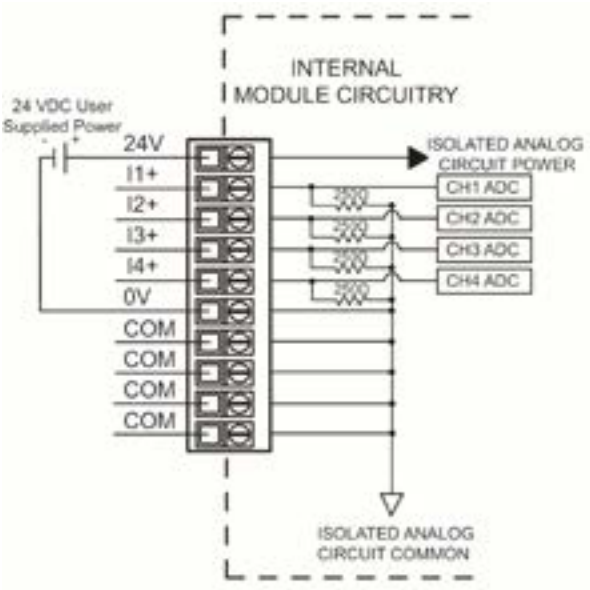
| General Specifications | |
|---|---|
| Operating Temperature | 0°C– 60°C (32°F–140°F) |
| Storage Temperature | -20ºC–70ºC (-4ºF–158ºF) |
| Humidity | 5 to 95% (non-condensing) |
| Altitude | 2,000 meters, max. |
| Pollution Degree | 2 |
| Environmental Air | No corrosive gases permitted |
| Vibration | IEC60068-2-6 (Test Fc) |
| Shock | IEC60068-2-27 (Test Ea) |
| Field to Logic Side Isolation | 1800VAC applied for 1s |
| Insulation Resistance | >10MΩ @ 500VDC |
| Heat Dissipation | 1400mW |
| Overvoltage Category | II |
| Enclosure Type | Open equipment |
| Module Location | Any I/O position in a Productivity1000 system |
| Field Wiring | Removable terminal block (sold separately).<br>Use ***ZIP***Link wiring system optional.<br>See "Wiring Options" in Chapter 5. |
| Terminal Type<br>(sold separately) | 10-position removable terminal block |
| Weight | 58g (2.0 oz) |
| Agency Approvals | UL 61010-1 and UL 61010-2-201 File E139594, Canada and USA<br>CE (EN 61131-2 EMC, EN 61010-1 and EN 61010-2-201 Safety)* |

| 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 mm²)<br>Solid / stranded conductor<br>3/64 in. (1.2 mm) insulation max.<br>1/4 in (6– 7 mm) strip length | 28–16 AWG (0.081–1.31 mm²)<br>Solid / stranded conductor<br>3/64 in (1.2 mm) insulation max.<br>19/64 in (7–8 mm) strip length |
| Conductors | USE COPPER CONDUCTORS, 75ºC 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 P/N: TW-SD-MSL-1.*

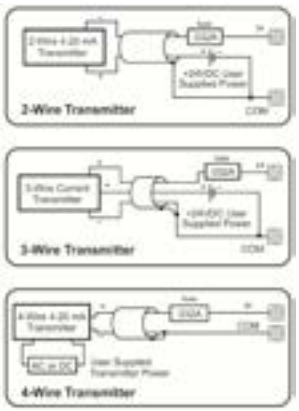
# P1-04AD-1 Analog Input (continued)

## Wiring Diagrams



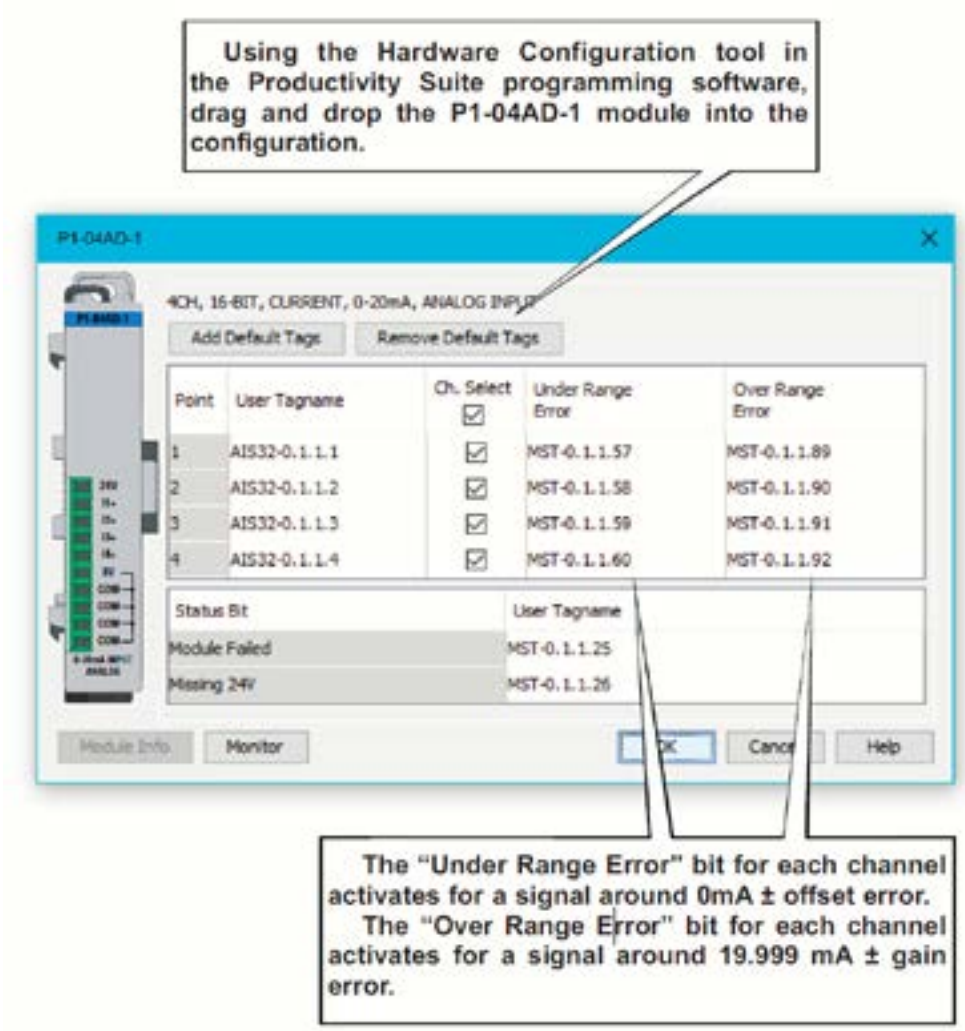

**Current Input Circuits**

An Edison S500-32-R 0.032 A fast-acting fuse is recommended for current loops.



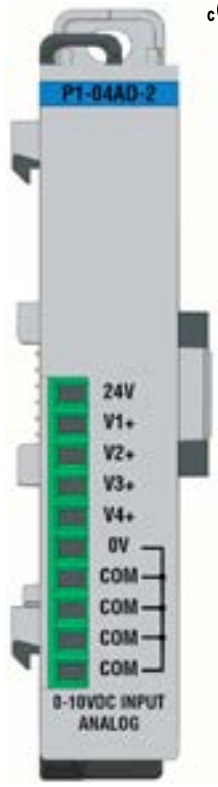
# P1-04AD-1 Analog Input (continued)

## Module Configuration



# P1-04AD-2 Analog Input

The P1-04AD-2 Voltage Analog Input Module provides four channels for receiving 0–10 VDC signals for use with the Productivity® 1000 system.




| Input Specifications | |
|---|---|
| Inputs per Module | 4 |
| Module Signal Input Range | 0–10 VDC |
| Signal Resolution | 16-bit |
| Resolution Value of LSB (least significant bit) | 0–10 VDC=152µV, (1LSB = 1 count) |
| Data Range | 0-65535 counts unipolar |
| Input Type | Single-ended (1 common) |
| Maximum Continuous Overload | ±100V |
| Input Impedance | 250kΩ (typical) |
| Filter Characteristics | Low Pass, -3dB @ 60Hz |
| Sample Duration Time | 7ms per channel (Does not include ladder scan time) |
| All Channel Update Rate | 50ms |
| Open Circuit Detection Time | Zero reading within 1s |
| Conversion Method | Successive approximation |
| Accuracy vs Temperature | ±25PPM / ºC maximum |
| Maximum Inaccuracy | 0.1% of range (Including temperature drift) |
| Linearity Error (end to end) | ±0.015% of range Monotonic with no missing codes |
| Input Stability and Repeatability | ±0.015% of range (after 10 min. warm-up) |
| Full Scale Calibration Error | ±0.015% of range maximum |
| Offset Calibration Error | ±0.015% of range maximum |
| Max Crosstalk | -76dB, of range maximum |
| External Power Supply Required | 24VDC (-20% / + 25%), 35mA |

**Terminal block sold separately.**

**We recommend using pre-wired ZIPLink cables and connection modules. See Chapter 5. If you wish to hand-wire your module, removable terminal blocks are sold separately. Order part number P1-10RTB or P1-10RTB-1**

# P1-04AD-2 Analog Input (continued)

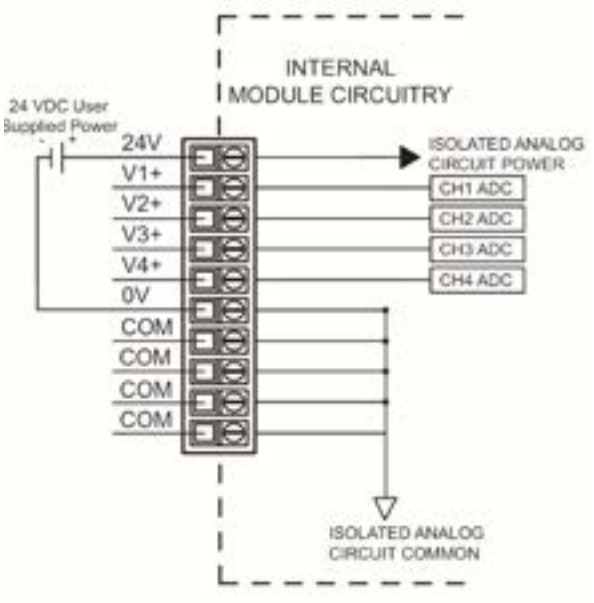
| General Specifications | |
|---|---|
| Operating Temperature | 0°C– 60°C (32°F–140°F) |
| Storage Temperature | -20ºC–70ºC (-4ºF–158ºF) |
| Humidity | 5 to 95% (non-condensing) |
| Altitude | 2,000 meters, max. |
| Pollution Degree | 2 |
| Environmental Air | No corrosive gases permitted |
| Vibration | IEC60068-2-6 (Test Fc) |
| Shock | IEC60068-2-27 (Test Ea) |
| Field to Logic Side Isolation | 1800VAC applied for 1s |
| Insulation Resistance | >10MΩ @ 500VDC |
| Heat Dissipation | 1400mW |
| Overvoltage Category | II |
| Enclosure Type | Open equipment |
| Module Location | Any I/O position in a Productivity1000 System |
| Field Wiring | Removable terminal block (sold separately).<br>Use ***ZIP***Link wiring system optional.<br>See "Wiring Options" in Chapter 5. |
| Terminal Type<br>(sold separately) | 10-position removable terminal block |
| Weight | 58g (2.0 oz) |
| Agency Approvals | UL 61010-1 and UL 61010-2-201 File E139594, Canada and USA<br>CE (EN 61131-2 EMC, EN 61010-1 and EN 61010-2-201 Safety)* |

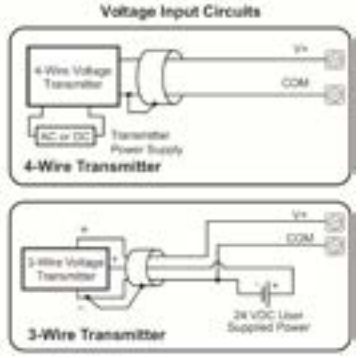
| Removable Terminal Block Specifications | | |
|---|---|---|
| Part Number | P1-10RTB | P1-10RTB-1 |
| Positions | 10 screw terminals | 10 spring clamp terminals |
| Wire Range | 30–16 AWG (0.051–1.31 mm²)<br>Solid/stranded conductor<br>3/64 in. (1.2 mm) insulation max.<br>1/4 in (6– 7 mm) strip length | 28–16 AWG (0.081–1.31 mm²)<br>Solid/stranded conductor<br>3/64 in (1.2 mm) insulation max.<br>19/64 in (7–8 mm) strip length |
| Conductors | USE COPPER CONDUCTORS, 75ºC 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 P/N: TW-SD-MSL-1.*

# P1-04AD-2 Analog Input (continued)

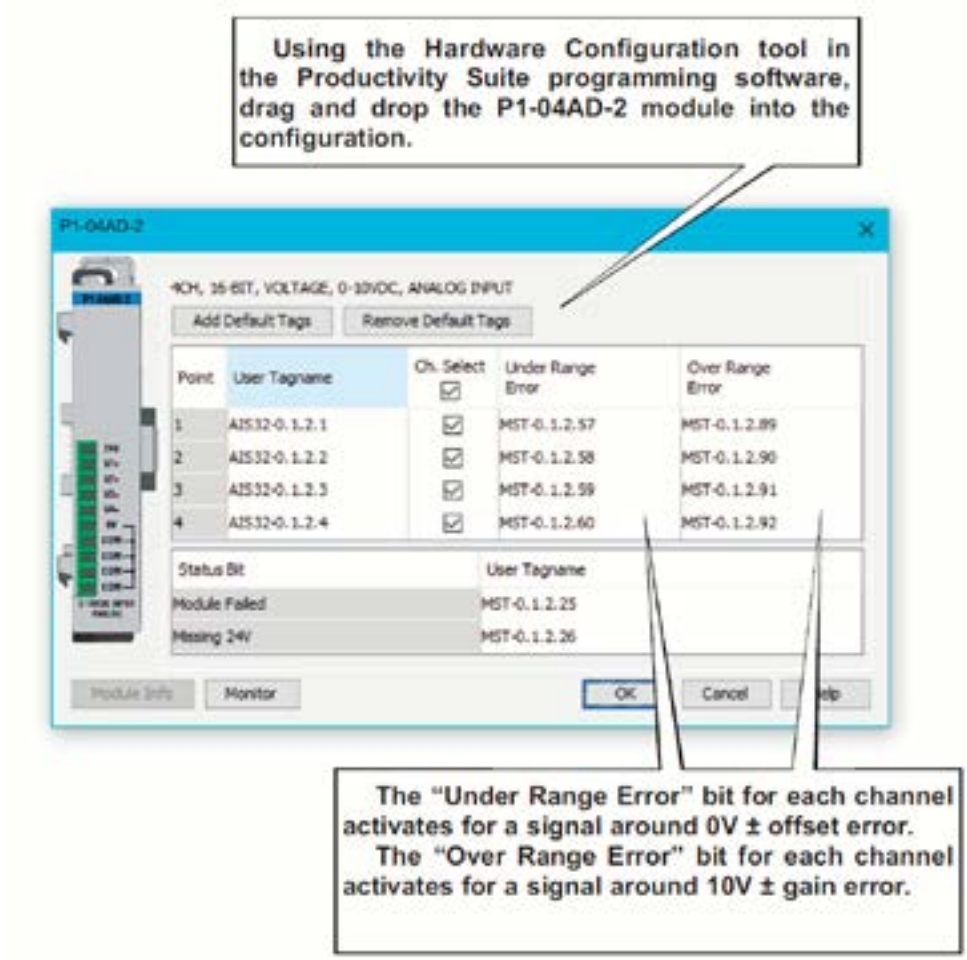
## Wiring Diagrams



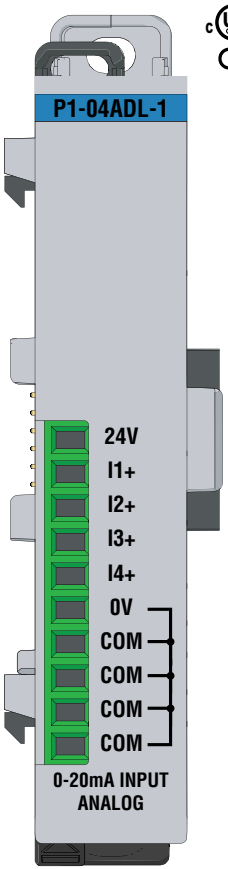
# P1-04AD-2 Analog Input (continued)

## Module Configuration



# P1-04ADL-1 Analog Input

The P1-04ADL-1 Low Resolution Analog Input Module provides four current sinking channels for converting 0–20 mA analog signals to a digital value of 0–8191 (13-bit) for use with the Productivity® 1000 system.




Terminal block sold separately.

| Input Specifications | |
|---|---|
| Input Channels | 4 |
| Input Range | 0–20 mA |
| Signal Resolution | 13-bit |
| Resolution Value of LSB (least significant bit) | 0–20 mA = 2.44 µA per count (1LSB = 1 count) |
| Data Range | 0–8191 counts |
| Input Type | Sinking, Single-ended (1 common) |
| Maximum Continuous Overload | ±31mA |
| Input Impedance | 243Ω, ±0.5%, 1/4W Current Input |
| Filter Characteristics | Low Pass, -3dB @ 120Hz |
| Sample Duration Time | 2.5 ms per channel (Does not include ladder scan time) |
| All Channel Update Rate | 10ms |
| Open Circuit Detection Time | Zero reading within 100ms |
| Conversion Method | Successive approximation |
| Accuracy vs Temperature | ±75PPM / ºC maximum |
| Maximum Inaccuracy | 0.5% of range (Including temperature drift) |
| Linearity Error (end to end) | ±0.037% of range Monotonic with no missing codes |
| Input Stability and Repeatability | ±0.024% of range |
| Maximum Full Scale Calibration Error | ±0.098% of range |
| Offset Calibration Error | ±0.098% of range |
| Max Crosstalk at DC, 50Hz and 60Hz | ±0.049% of range |
| Recommended Fuse (external) | Edison S500-32-R, 0.032 A fuse |
| External DC Power Required | 24VDC (-20% / + 25%), 30mA |

**We recommend using pre-wired ZIPLink cables and connection modules. See Chapter 5. If you wish to hand-wire your module, removable terminal blocks are sold separately. Order part number P1-10RTB or P1-10RTB-1**

# P1-04ADL-1 Analog Input (continued)

| General Specifications | |
|---|---|
| Operating Temperature | 0°C– 60°C (32°F–140°F) |
| Storage Temperature | -20ºC–70ºC (-4ºF–158ºF) |
| 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) |
| Field to Logic Side Isolation | 1800VAC applied for 1s |
| Insulation Resistance | >10MΩ @ 500VDC |
| Heat Dissipation | 1200mW |
| Overvoltage Category | II |
| Enclosure Type | Open equipment |
| Module Location | Any I/O position in a Productivity® 1000 system |
| Field Wiring | Use ***ZIP***Link wiring system or removable terminal block (not included). See “Wiring Options” in Chapter 5. |
| Terminal Type (sold separately) | 10-position removable terminal block |
| Weight | 71g (2.5 oz) |
| Agency Approvals | UL 61010-1 and UL 61010-2-201 File E139594, Canada and USA<br>CE (EN 61131-2 EMC, EN 61010-1 and EN 61010-2-201 Safety)* |

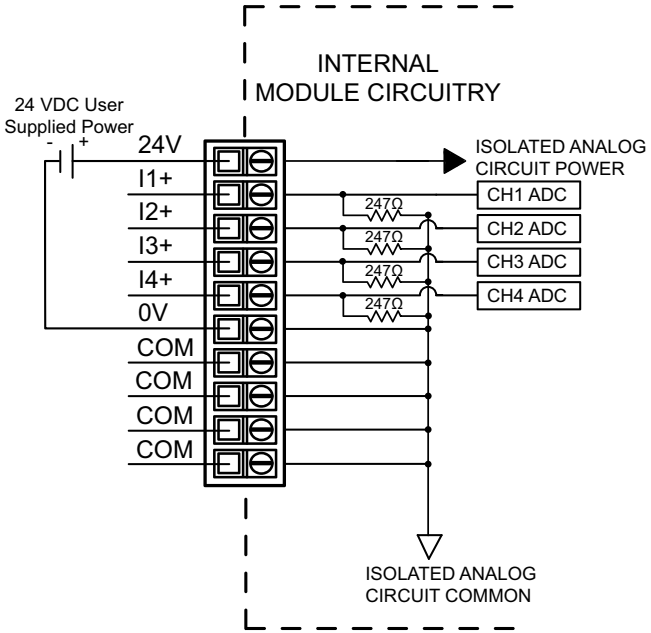
** See CE Declaration of Conformance for details.*

| Removable Terminal Block Specifications | | |
|---|---|---|
| Part Number | P1-10RTB | P1-10RTB-1 |
| Number of positions | 10 screw terminals | 10 spring clamp terminals |
| Wire Range | 30–16 AWG (0.051–1.31 mm²)<br>Solid/stranded conductor<br>3/64 in. (1.2 mm) insulation max.<br>1/4 in (6– 7 mm) strip length | 28–16 AWG (0.081–1.31 mm²)<br>Solid/stranded conductor<br>3/64 in (1.2 mm) insulation max.<br>19/64 in (7–8 mm) strip length |
| Conductors | USE COPPER CONDUCTORS, 75ºC 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 P/N: TW-SD-MSL-1.*

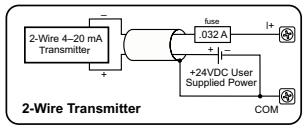
# P1-04ADL-1 Analog Input (continued)

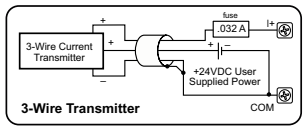
## Wiring Diagrams

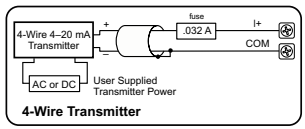



**Current Input Circuits**

An Edison S500-32-R 0.032 A fast-acting fuse is recommended for current loops.



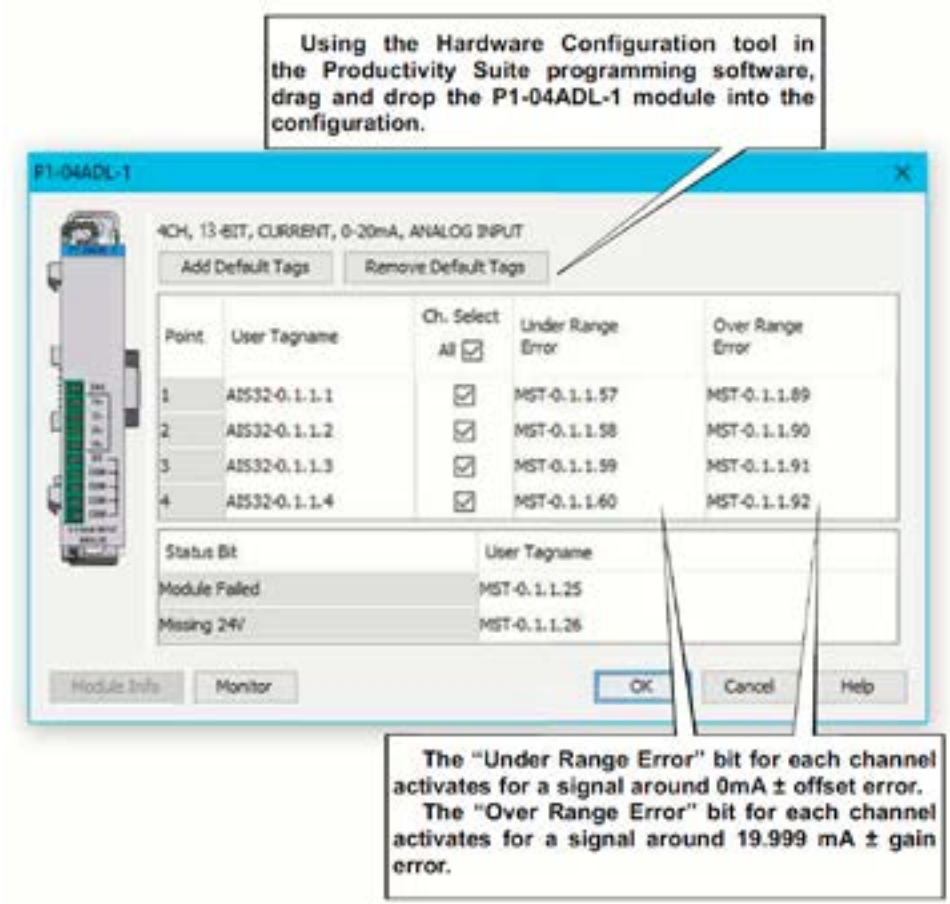




Note: Do not connect both ends of shield.

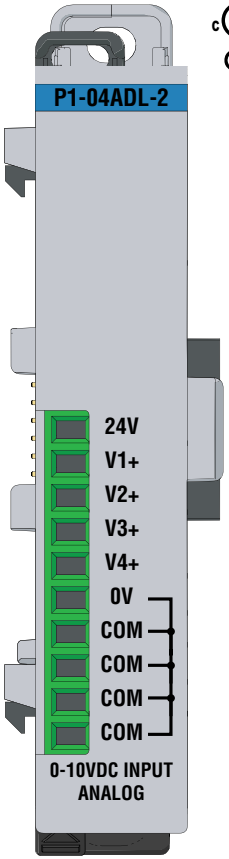
# P1-04ADL-1 Analog Input (continued)

## Module Configuration



# P1-04ADL-2 Analog Input

The P1-04ADL-2 Low Resolution Voltage Analog Input Module provides four channels for converting 0–10 VDC analog signals to digital values of 0–8191 (13-bit) for use with the Productivity® 1000 system.




**Terminal block sold separately.**

| Input Specifications | |
|---|---|
| Input Channels | 4 |
| Input Range | 0–10 VDC |
| Signal Resolution | 13-bit |
| Resolution Value of LSB | 0–10 VDC = 1.22 mV per count<br>(1 LSB = 1 count) |
| Data Range | 0–8191 counts |
| Input Type | Single-ended (1 common) |
| Maximum Continuous Overload | ±100VDC |
| Input Impedance | >150kΩ |
| Hardware Filter Characteristics | Low Pass, -3dB @ 300Hz |
| Sample Duration Time | 2.5 ms per channel<br>(does not include ladder scan time) |
| All Channel Update Rate | 10ms |
| Conversion Method | Successive approximation |
| Accuracy vs Temperature | ±75PPM / °C maximum |
| Maximum Inaccuracy | 0.5% of range<br>(including temperature drift) |
| Linearity Error (end to end) | ±0.036% of range<br>Monotonic with no missing codes |
| Input Stability and Repeatability | ±0.024% of range |
| Full Scale Calibration Error (including offset) | ±0.097% of range |
| Offset Calibration Error | ±0.097% of range |
| Max Crosstalk at DC, 50Hz and 60Hz | ±0.049% of range |
| External 24VDC Power Required | 24VDC (-20% / +25%), 30mA |

| Diagnosis/Status | |
|---|---|
| Under Range Error | 1 bit per channel |
| Over Range Error | 1 bit per channel |
| Module Failed | 1 bit per module |
| Missing 24V | 1 bit per module |

**We recommend using pre-wired ZIPLink cables and connection modules. See Chapter 5. If you wish to hand-wire your module, removable terminal blocks are sold separately. Order part number P1-10RTB or P1-10RTB-1**

# P1-04ADL-2 Analog Input (continued)

## General Specifications

| | |
|---|---|
| Operating Temperature | 0°C– 60°C (32°F–140°F) |
| Storage Temperature | -20ºC–70ºC (-4ºF–158ºF) |
| Humidity | 5 to 95% (non-condensing) |
| Altitude | 2000 meters max. |
| Pollution Degree | 2 |
| Environmental Air | No corrosive gases permitted |
| Vibration | IEC60068-2-6 (Test Fc) |
| Shock | IEC60068-2-27 (Test Ea) |
| Field to Logic Side Isolation | 1800VAC applied for 1s |
| Insulation Resistance | >10MΩ @ 500VDC |
| Heat Dissipation | 1200mW |
| Overvoltage Category | II |
| Enclosure Type | Open equipment |
| Module Location | Any I/O position in a Productivity®1000 system |
| Field Wiring | Use ***ZIP***Link wiring system or removable terminal block (not included). See “Wiring Options” in Chapter 5. |
| Terminal Type (sold separately) | 10-position removable terminal block |
| Weight | 62g (2.2 oz) |
| Agency Approvals | UL 61010-1 and UL 61010-2-201 File E139594, Canada and USA<br>CE (EN 61131-2 EMC, EN 61010-1 and EN 61010-2-201 Safety)* |

** See CE Declaration of Conformance for details.*

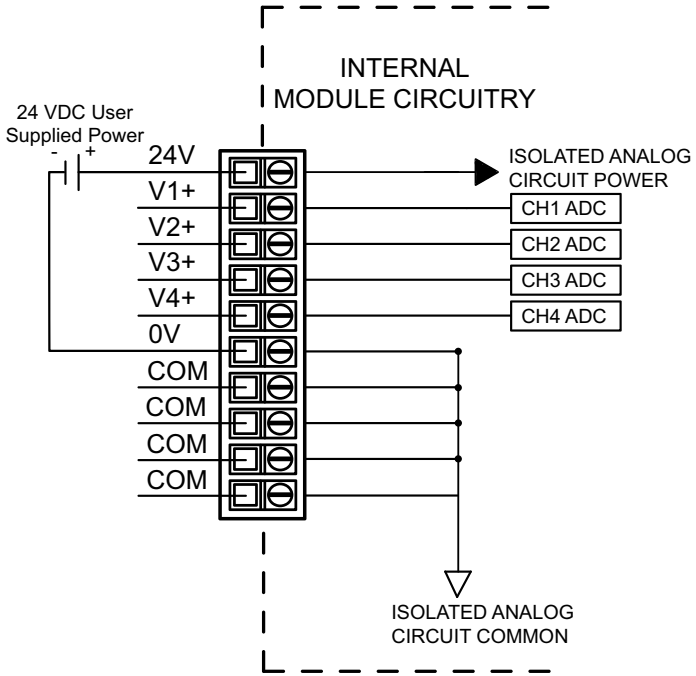
## Removable Terminal Block Specifications

| | | |
|---|---|---|
| Part Number | P1-10RTB | P1-10RTB-1 |
| Number of positions | 10 screw terminals | 10 spring clamp terminals |
| Wire Range | 30–16 AWG (0.051–1.31 mm²)<br>Solid/stranded conductor<br>3/64 in. (1.2 mm) insulation max.<br>1/4 in (6– 7 mm) strip length | 28–16 AWG (0.081–1.31 mm²)<br>Solid/stranded conductor<br>3/64 in (1.2 mm) insulation max.<br>19/64 in (7–8 mm) strip length |
| Conductors | USE COPPER CONDUCTORS, 75ºC 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 |

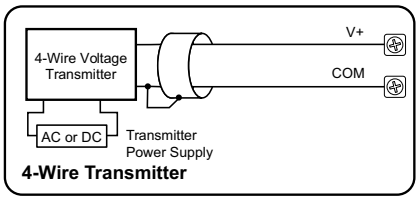
** Recommended screw driver P/N: TW-SD-SL-1 or TW-SD-MSL-1*

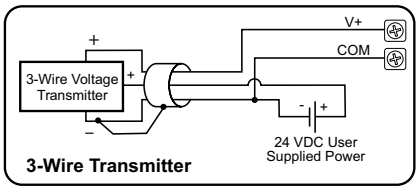
# P1-04ADL-2 Analog Input (continued)

## Wiring Diagrams

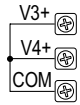



**Voltage Input Circuits**




Notes for maximum accuracy:
1. Jumper unused inputs to common.

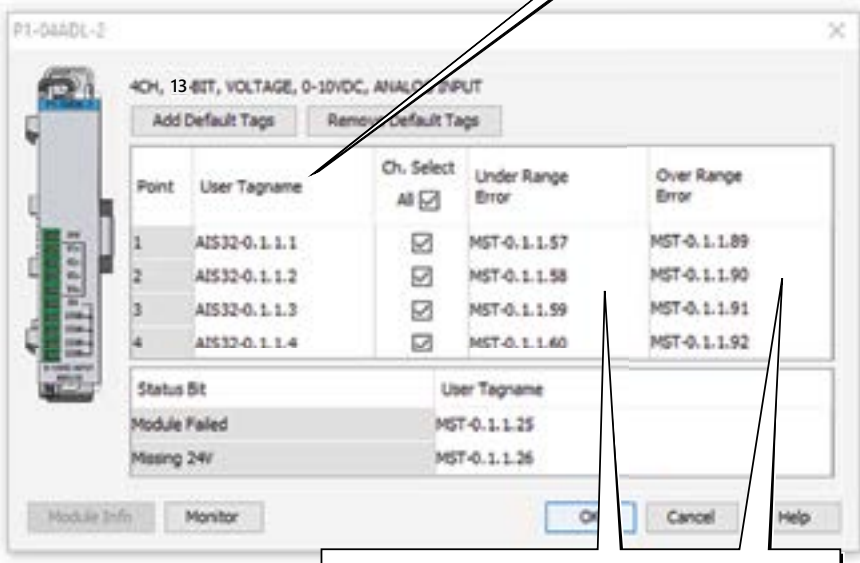


# P1-04ADL-2 Analog Input (continued)

## Module Configuration

**Using the Hardware Configuration tool in the Productivity Suite programming software, drag and drop the P1-04ADL-2 module into the configuration.**

**If desired, assign a *User Tagname* to each input point (channel) selected and to each *Status Bit Item*.**

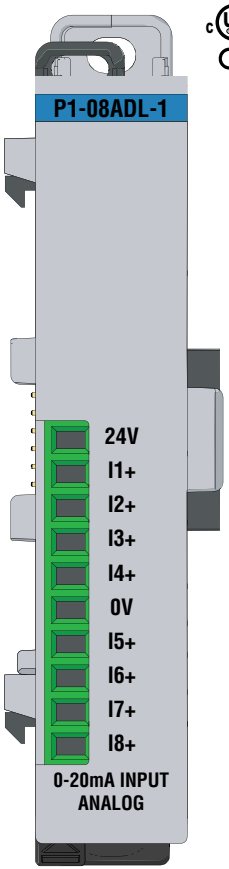



**The "Under Range Error" bit for each channel activates for a signal around 0V, ± offset error.**

**The "Over Range Error" bit for each channel activates for a signal around 10V, ± gain error.**

# P1-08ADL-1 Analog Input

The P1-08ADL-1 Low Resolution Analog Input Module provides eight current sinking channels for converting 0–20 mA analog signals to a digital value of 0–8191 (13-bit) for use with the Productivity® 1000 system.




Terminal block sold separately.

| Input Specifications | |
|---|---|
| Input Channels | 8 |
| Input Range | 0–20 mA |
| Signal Resolution | 13-bit |
| Resolution Value of LSB (least significant bit) | 0–20 mA = 2.44 µA per count (1LSB = 1 count) |
| Data Range | 0–8191 counts |
| Input Type | Sinking, Single-ended (1 common) |
| Maximum Continuous Overload | ±31mA |
| Input Impedance | 243Ω, ±1%, 1/8W Current Input |
| Filter Characteristics | Low Pass, -3dB @ 120Hz |
| Sample Duration Time | 2ms per channel (Does not include ladder scan time) |
| All Channel Update Rate | 20ms |
| Open Circuit Detection Time | Zero reading within 100ms |
| Conversion Method | Successive approximation |
| Accuracy vs Temperature | ±75PPM / ºC maximum |
| Maximum Inaccuracy | 0.5% of range (Including temperature drift) |
| Linearity Error (end to end) | ±0.037% of range Monotonic with no missing codes |
| Input Stability and Repeatability | ±0.024% of range |
| Maximum Full Scale Calibration Error | ±0.098% of range |
| Offset Calibration Error | ±0.098% of range |
| Max Crosstalk at DC, 50Hz and 60Hz | ±0.049% of range |
| Recommended External Fuse | Edison S500-32-R, 0.032 A fuse |
| External DC Power Required | 24VDC (-20% / + 25%), 30mA |

**We recommend using pre-wired ZIPLink cables and connection modules. See Chapter 5. If you wish to hand-wire your module, removable terminal blocks are sold separately. Order part number P1-10RTB or P1-10RTB-1**

# P1-08ADL-1 Analog Input (continued)

| General Specifications | |
|---|---|
| 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 | IEC60068-2-6 (Test Fc) |
| Shock | IEC60068-2-27 (Test Ea) |
| Field to Logic Side Isolation | 1800VAC applied for 1s |
| Insulation Resistance | >10MΩ @ 500VDC |
| Heat Dissipation | 1200mW |
| Enclosure Type | Open equipment |
| Module Location | Any I/O position in a Productivity®1000 system |
| Field Wiring | Use ZIPLink wiring system or removable terminal block (not included). See “Wiring Options” in Chapter 5. |
| Terminal Type (sold separately) | 10-position removable terminal block |
| Weight | 71g (2.5 oz) |
| Agency Approvals | UL 61010-1 and UL 61010-2-201 File E139594, Canada and USA<br>CE (EN 61131-2 EMC, EN 61010-1 and EN 61010-2-201 Safety)* |

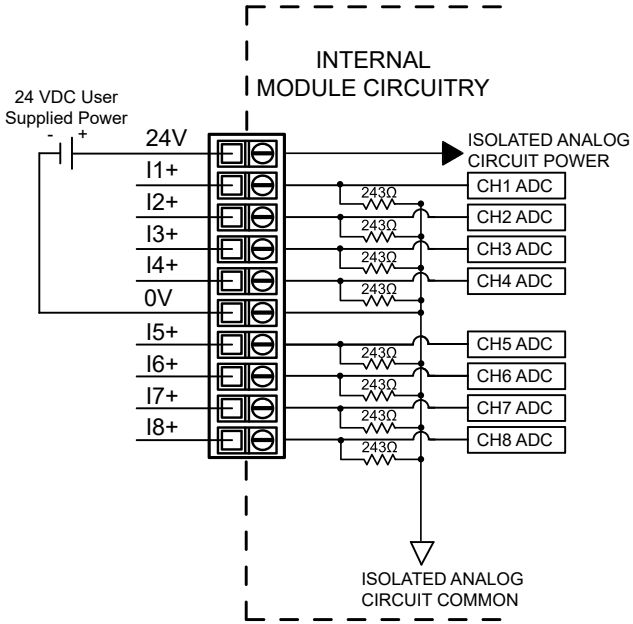
** See CE Declaration of Conformance for details.*

| Removable Terminal Block Specifications | | |
|---|---|---|
| Part Number | P1-10RTB | P1-10RTB-1 |
| Number of positions | 10 screw terminals | 10 spring clamp terminals |
| Wire Range | 30–16 AWG (0.051–1.31 mm²)<br>Solid/stranded conductor<br>3/64 in. (1.2 mm) insulation max.<br>1/4 in (6– 7 mm) strip length | 28–16 AWG (0.081–1.31 mm²)<br>Solid/stranded conductor<br>3/64 in (1.2 mm) insulation max.<br>19/64 in (7–8 mm) strip length |
| Conductors | USE COPPER CONDUCTORS, 75ºC 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 P/N: TW-SD-MSL-1.*

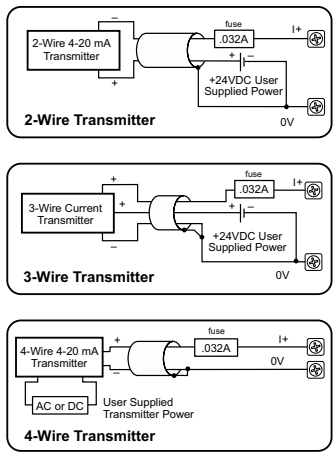
# P1-08ADL-1 Analog Input (continued)

## Wiring Diagrams




**Current Input Circuits**

An Edison S500-32-R 0.032A fast-acting fuse is recommended for current loops.



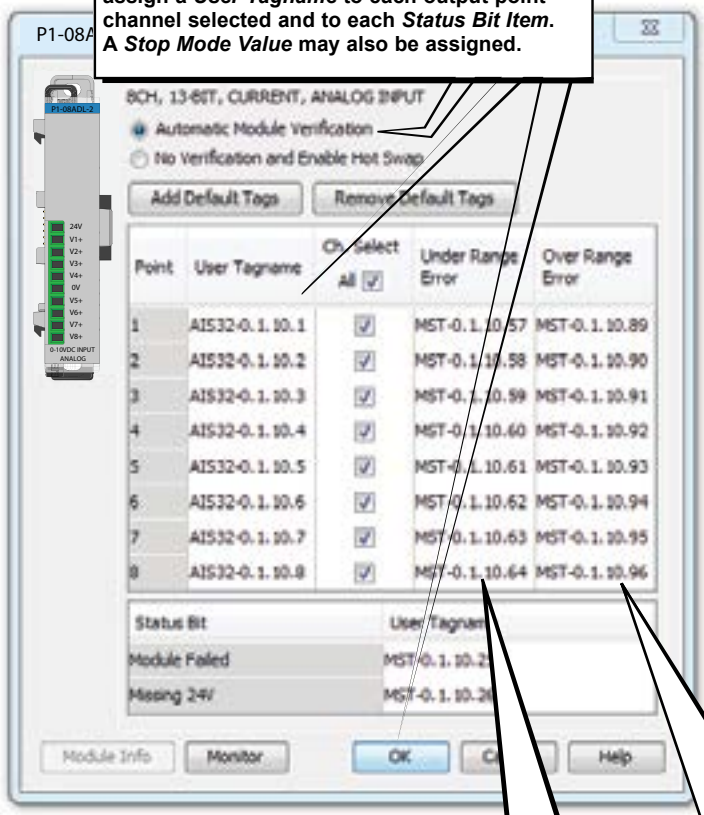

Note: Do not connect both ends of shield.

# P1-08ADL-1 Analog Input (continued)

## Module Configuration

**Using the Hardware Configuration tool in the Productivity Suite programming software, drag and drop the P1-08ADL-1 module into the base configuration.**

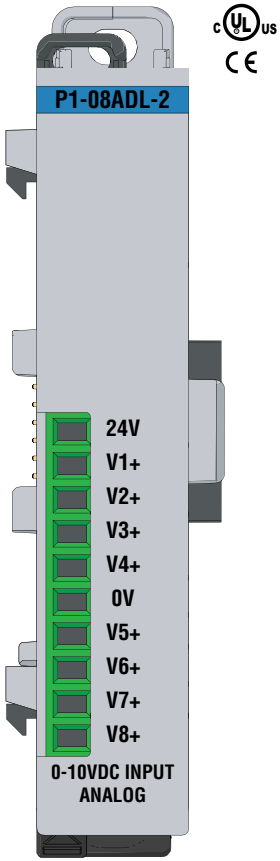
**Select *Automatic Module Verification* or No *Verification and Enable Hot Swap*. If desired, assign a *User Tagname* to each output point channel selected and to each *Status Bit Item*. A *Stop Mode Value* may also be assigned.**




The 'Under Range Error' bit for each channel activates below 0mA.
The 'Over Range Error' bit for each channel activates at a count of 8190 and above (above 19.999 mA).

# P1-08ADL-2 Analog Input

The P1-08ADL-2 Low Resolution Voltage Analog Input Module provides eight channels for converting 0–10 VDC analog signals to digital values of 0–8191 (13-bit) for use with the Productivity® 1000 system.




Terminal block sold separately.

## Input Specifications

| | |
|---|---|
| Input Channels | 8 |
| Input Range | 0–10 VDC |
| Signal Resolution | 13-bit |
| Resolution Value of LSB | 0–10 VDC = 1.22 mV per count<br>(1 LSB = 1 count) |
| Data Range | 0–8191 counts |
| Input Type | Single-ended (1 common) |
| Maximum Continuous Overload | ±100VDC |
| Input Impedance | >150kΩ |
| Hardware Filter Characteristics | Low Pass, -3dB @ 500Hz |
| Sample Duration Time | 2.5 ms per channel<br>(Does not include ladder scan time) |
| All Channel Update Rate | 25ms |
| Conversion Method | Successive approximation |
| Accuracy vs Temperature | ±75PPM / °C maximum |
| Maximum Inaccuracy | 0.5% of range<br>(Including temperature drift) |
| Linearity Error | ±0.036% of range<br>Monotonic with no missing codes |
| Input Stability and Repeatability | ±0.024% of range |
| Full Scale Calibration Error (including offset) | ±0.097% of range |
| Offset Calibration Error | ±0.097% of range |
| Max Crosstalk at DC, 50Hz and 60Hz | ±0.049% of range |
| External 24VDC Power Required | 24VDC (-20% / +25%), 30mA |

**We recommend using pre-wired ZIPLink cables and connection modules. See Chapter 5.**
**If you wish to hand-wire your module, removable terminal blocks are sold separately. Order part number P1-10RTB or P1-10RTB-1**

## Diagnosis/Status

| | |
|---|---|
| Under Range Error | 1 bit per channel |
| Over Range Error | 1 bit per channel |
| Module Failed | 1 bit per module |
| Missing 24V | 1 bit per module |

# P1-08ADL-2 Analog Input (continued)

| General Specifications | |
|---|---|
| Operating Temperature | 0°C– 60°C (32°F–140°F) |
| Storage Temperature | -20ºC–70ºC (-4ºF–158ºF) |
| Humidity | 5 to 95% (non-condensing) |
| Altitude | 2000 meters max. |
| Pollution Degree | 2 |
| Environmental Air | No corrosive gases permitted |
| Vibration | IEC60068-2-6 (Test Fc) |
| Shock | IEC60068-2-27 (Test Ea) |
| Field to Logic Side Isolation | 1800VAC applied for 1s |
| Insulation Resistance | >10MΩ @ 500VDC |
| Heat Dissipation | 1200mW |
| Overvoltage Category | II |
| Enclosure Type | Open equipment |
| Module Location | Any I/O position in a Productivity®1000 system |
| Field Wiring | Use ZIPLink wiring system or removable terminal block (not included). See “Wiring Options” in Chapter 5.. |
| Terminal Type (sold separately) | 10-position removable terminal block |
| Weight | 71g (2.5 oz) |
| Agency Approvals | UL 61010-1 and UL 61010-2-201 File E139594, Canada and USA<br>CE (EN 61131-2 EMC, EN 61010-1 and EN 61010-2-201 Safety)* |

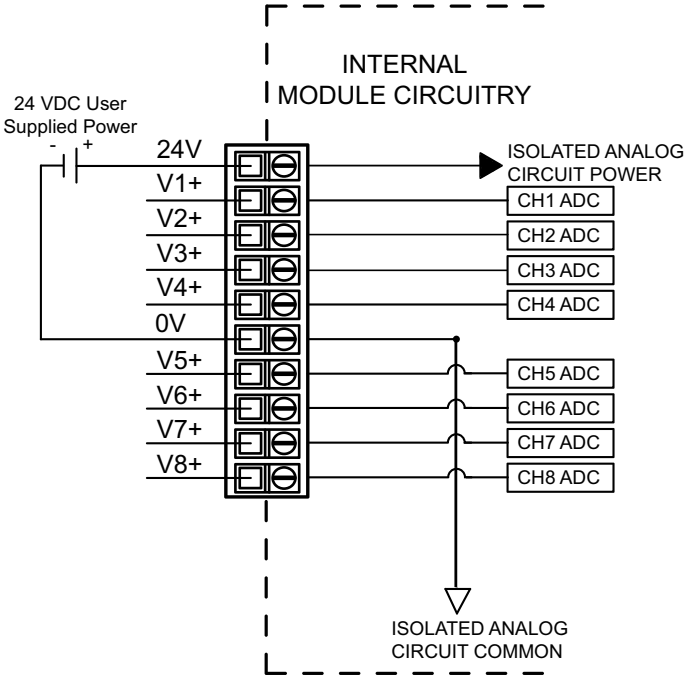
** See CE Declaration of Conformance for details.*

| Removable Terminal Block Specifications | | |
|---|---|---|
| Part Number | P1-10RTB | P1-10RTB-1 |
| Number of positions | 10 screw terminals | 10 spring clamp terminals |
| Wire Range | 30–16 AWG (0.051–1.31 mm²)<br>Solid/stranded conductor<br>3/64 in. (1.2 mm) insulation max.<br>1/4 in (6– 7 mm) strip length | 28–16 AWG (0.081–1.31 mm²)<br>Solid/stranded conductor<br>3/64 in (1.2 mm) insulation max.<br>19/64 in (7–8 mm) strip length |
| Conductors | USE COPPER CONDUCTORS, 75ºC 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 |

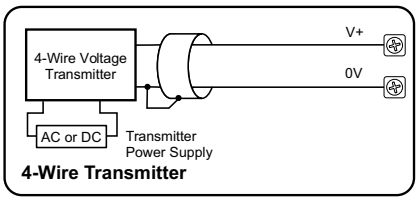
** Recommended screw driver P/N: TW-SD-MSL-1.*

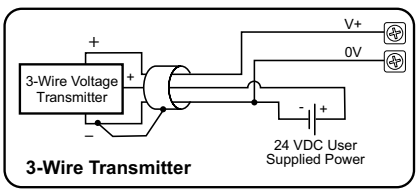
# P1-08ADL-2 Analog Input (continued)

## Wiring Diagrams



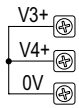

**Voltage Input Circuits**




Note: Do not connect both ends of shield.

Notes for maximum accuracy:
1. Jumper unused inputs to common.

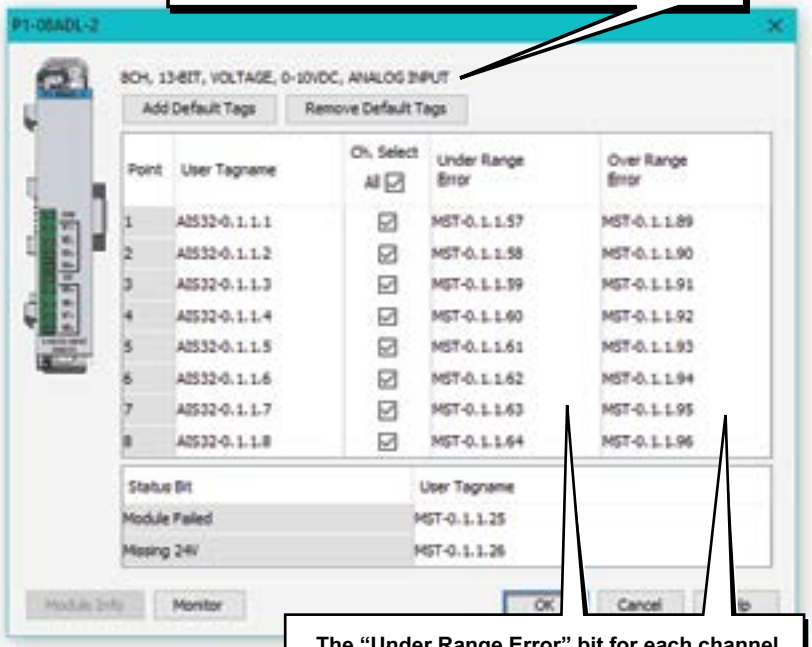


# P1-08ADL-2 Analog Input (continued)

## Module Configuration

Using the Hardware Configuration tool in the Productivity Suite programming software, drag and drop the P1-08ADL-2 module into the base configuration.

If desired, assign a *User Tagname* to each input point (channel) selected and to each *Status Bit Item*. A *Stop Mode Value* may be assigned.

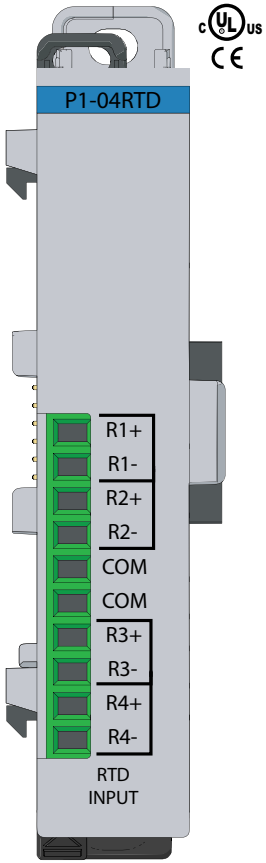



**The "Under Range Error" bit for each channel activates for a signal around 0V, ± offset error.**

**The "Over Range Error" bit for each channel activates for a signal around 10V, ± gain error.**

# P1-04RTD Analog Input

The P1-04RTD Input Module provides four differential channels for receiving RTD and resistance input signals for use with the Productivity® 1000 system.




**Terminal Block Included.**
**Not Compatible with *ZIP*Link.**

**Warranty: Thirty-day money-back guarantee. Two-year limited replacement. (See www.productivity1000.com for details).**

| RTD Input Specifications | | |
|---|---|---|
| Input Channels | 4 Differential | |
| Data Format | Floating Point | |
| Max. Common Mode Voltage | 5VDC | |
| Common Mode Rejection | -100dB min. @ DC, -100dB min. @ 50/60 Hz* | |
| Absolute Maximum Ratings | Fault protected input, ±50V | |
| Internal Resolution | 16-bit, ±0.1°C or °F | |
| Input Ranges (RTD Types) | Pt100<br>Pt1000<br>JPt100<br>10Ω Cu.<br>25Ω Cu.<br>120Ω Ni. | -200°C–850°C (-328°F–1562°F)<br>-200°C–595°C (-328°F–1103°F)<br>-100°C–450°C (-148°F–842°F)<br>-200°C–260°C (-328°F–500°F)<br>-200°C–260°C (-328°F–500°F)<br>-80°C–260°C (-112°F–500°F) |
| RTD Linearization | Automatic | |
| Excitation Current (all ranges) | 210µA | |
| Accuracy vs. Temperature | ±10ppm per °C (maximum) | |
| Warm-up Time | 2 minutes for ±0.2% repeatability | |
| Maximum Inaccuracy* | ±1°C maximum @ 16.7 Hz,<br>±3°C maximum @470Hz<br>±5°C maximum on Cu10 & Cu25 | |
| Sample Duration (Single channel update rate) | Dependent on digital filter settings –<br>200ms @ 16.7 Hz, 90ms @ 470Hz | |
| Filter Characteristics | Digital filter cutoff frequencies:<br>16.7 Hz, 470Hz | |
| All Channel Update Rate | Single channel update rate times the number of enabled channels | |
| Open Circuit Detection Time | Burnout detect within 2s | |
| Conversion Method | Sigma-Delta | |
| External DC Power Required | None | |

** Note: Excluding RTD error, including temperature drift.*

# P1-04RTD Analog Input (continued)

| General Specifications | |
|---|---|
| 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 | IEC60068-2-6 (Test Fc) |
| Shock | IEC60068-2-27 (Test Ea) |
| Field to Logic Side Isolation | 1800VAC applied for 1s |
| Heat Dissipation | 100mW |
| Enclosure Type | Open equipment |
| Module Location | Any I/O position in a Productivity®1000 system |
| Field Wiring | Removable terminal block (included). The P1-04RTD module is not compatible with the ZIPLink wiring system. |
| Connector Type (included) | 10-position removable terminal block |
| Weight | 60g (2.1 oz) |
| Agency Approvals | UL61010-2-201 File E139594, Canada & USA<br>CE (EN61131-2 EMC and EN61010-2-201 Safety)* |

** See the Declaration of Conformance for details.*

| Removable Terminal Block Specifications | | |
|---|---|---|
| Part Number | P1-10RTB | P1-10RTB-1 |
| Number of positions | 10 screw terminals | 10 spring clamp terminals |
| Wire Range | 30–16 AWG (0.051–1.31 mm²)<br>Solid/stranded conductor<br>3/64 in. (1.2 mm) insulation max.<br>1/4 in (6– 7 mm) strip length | 28–16 AWG (0.081–1.31 mm²)<br>Solid/stranded conductor<br>3/64 in (1.2 mm) insulation max.<br>19/64 in (7–8 mm) strip length |
| Conductors | USE COPPER CONDUCTORS, 75ºC 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 P/N: TW-SD-MSL-1.*

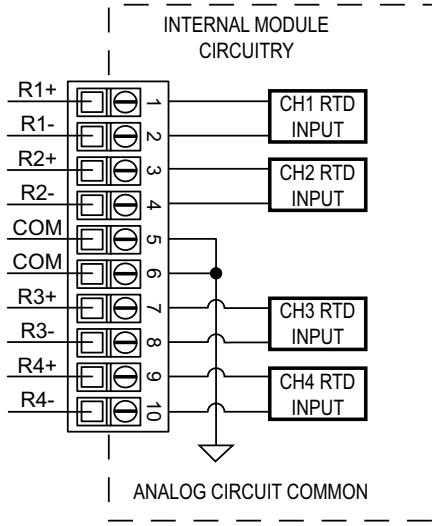
# P1-04RTD Analog Input (continued)

| Resistance Input Specifications | |
|---|---|
| Internal Resolution | 16 bit, 0.0015% of full scale range in ohms |
| Resistance Input Ranges and CPU Resolution | 0–10,000 V, Resolution 1V<br>0–6,250 V, Resolution 0.1 V<br>0–3,125 V, Resolution 0.1 V<br>0–1,562.5 V, Resolution 0.1 V<br>0–781.25 V, Resolution 0.1 V<br>0–390.625 V, Resolution 0.01 V<br>0–195.3125 V, Resolution 0.01 V |
| Accuracy vs. Temperature | ±25ppm per °C (maximum) |
| Linearity Error (end to end) | ± 0.03% @16.7 Hz, ±0.06% 470Hz of full scale range maximum at 25°C, Monotonic with no missing codes |
| Maximum Inaccuracy | ± 0.10% of full scale range |

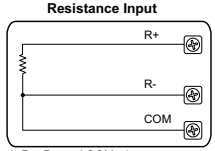
| Diagnostics | |
|---|---|
| Module Diagnostics Failure | 1 bit per module |
| Module Not Ready | 1 bit per module |
| Channel Burn-out (RTD only) | 1 bit per channel |
| Under-range (RTD only) | 1 bit per channel |
| Over-range | 1 bit per channel |

# P1-04RTD Analog Input (continued)

## Wiring Diagrams




**Resistance Input**

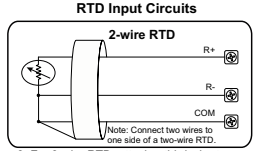



1. R+, R-, and COM wires to an RTD must be equal length and type. Refer to RTD manufacturers

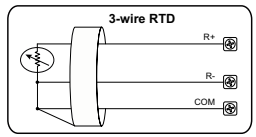
Notes for maximum accuracy:

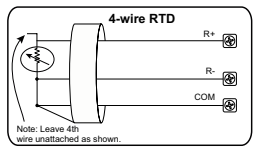
3. Do not use cable shield as a sensing wire.
4. When applicable, connect shield to RTD common only, otherwise connect to module common only. Do not connect shield to both ends.
5. Jumper unused inputs to common.

**RTD Input Circuits**




2. For 2-wire RTD, attach a third wire to module common.



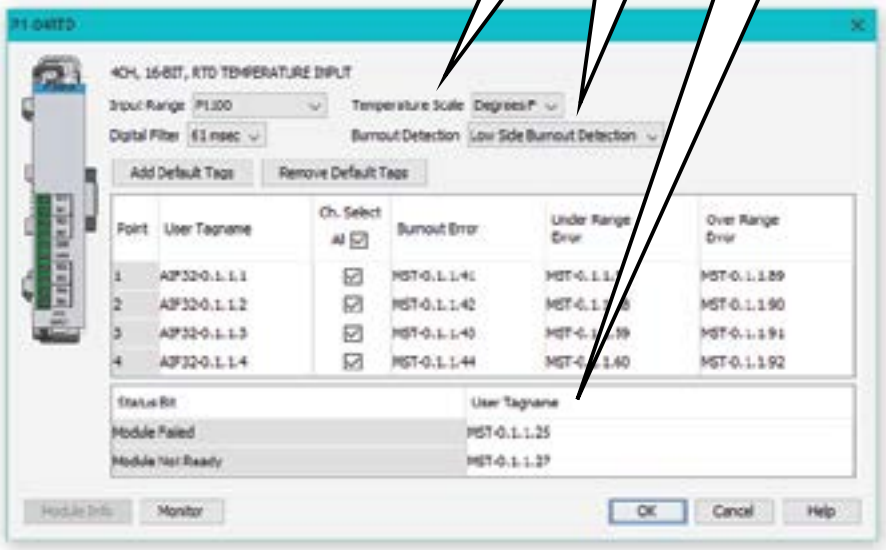



# P1-04RTD Analog Input (continued)

## Module Configuration

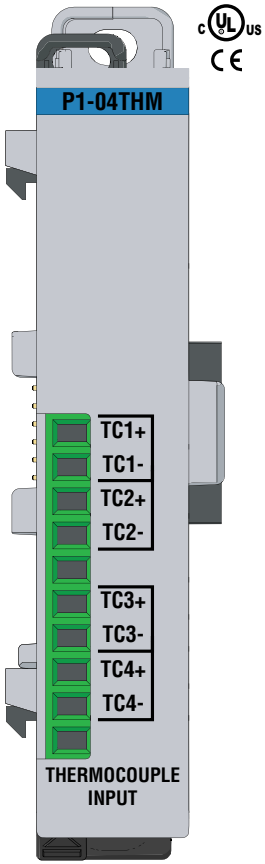
Using the Hardware Configuration tool in the Productivity Suite programming software, drag and drop the P1-04RTD module into the base configuration.

Specify *Temperature Scale* and *Burnout Detection*, and use the drop down menu to select module range and resolution. If desired, assign a *User Tagname* to each output point channel selected and to each *Status Bit*.



# P1-04THM Analog Input

The P1-04THM Thermocouple Input Module provides four differential channels for receiving thermocouple and voltage input signals for use with the Productivity® 1000 system.




**Terminal Block Included.**
**Not Compatible with *ZIP*Link.**

**Warranty: Thirty-day money-back guarantee. Two-year limited replacement. (See www.productivity1000.com for details).**

## Thermocouple Input Specifications

| | |
|---|---|
| Input Channels | 4 Differential |
| Data Format | Floating Point |
| Common Mode Range | ±0.5 V |
| Common Mode Rejection | 100dB @ DC |
| Input Impedance | >5MΩ |
| Maximum Ratings | Fault protected inputs to ±50V |
| Resolution | 16-bit, ±0.1°C or °F |
| Thermocouple Input Ranges | Type J - 190° to 760°C (-310° to 1400°F);<br>Type E - 210° to 1000°C (-346° to 1832°F);<br>Type K - 150° to 1372°C (-238° to 2502°F);<br>Type R - 65° to 1768°C (149° to 3214°F);<br>Type S - 65° to 1768°C (149° to 3214°F);<br>Type T - 230° to 400°C (-382° to 752°F);<br>Type B - 529° to 1820°C (984° to 3308°F);<br>Type N - 70° to 1300°C (-94° to 2372°F);<br>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 | ±50ppm per °C (maximum) |
| Maximum Inaccuracy | ±3°C maximum<br>(excluding thermocouple error). |
| Linearity Error | ±1°C maximum (±0.5°C typical)<br>Monotonic with no missing codes. |
| Warm-up Time | 30 minutes for ±1% repeatability<br>2 minutes to reach voltage specifications |
| External Power Supply Required | None |

## Voltage Input Specifications

| | |
|---|---|
| Linear mV Device Input Ranges | 0–39.0625 mVDC,<br>±39.0625 mVDC,<br>±78.125 mVDC,<br>0–156.25 mVDC,<br>±156.25 mVDC,<br>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 |

# P1-04THM Analog Input (continued)

| General Specifications | |
|---|---|
| Operating Temperature | 0°C– 60°C (32°F–140°F) |
| Storage Temperature | -20ºC–70ºC (-4ºF–158ºF) |
| Humidity | 5 to 95% (non-condensing) |
| Altitude | 2000 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 1s |
| Heat Dissipation | 100mW |
| Enclosure Type | Open equipment |
| Module Location | Any I/O position in a Productivity®1000 system |
| Field Wiring | Removable terminal block (included).<br>The P1-04THM module is not compatible with the *ZIP*Link wiring system. |
| Connector Type (Included) | 10-position removable terminal block |
| Weight | 58g (2.0 oz) |
| Agency Approvals | UL 61010-1 and UL 61010-2-201 File E139594, Canada and USA<br>CE (EN 61131-2 EMC, EN 61010-1 and EN 61010-2-201 Safety)* |

** See CE Declaration of Conformance for details.*

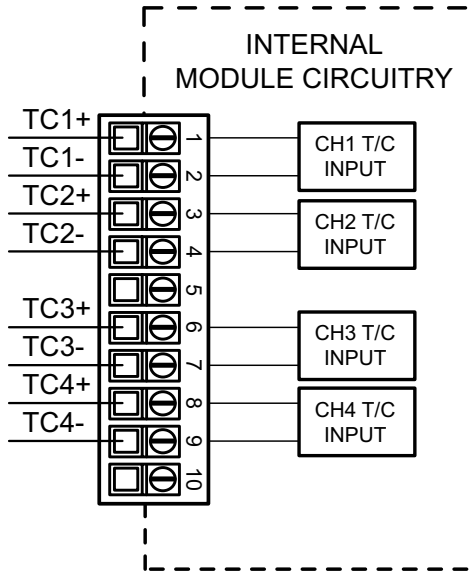
| Configuration/Diagnostics | |
|---|---|
| Burn-out Detection: High Side/Disable | 1 bit per module |
| °C/°F (T/C Only) | 1 bit per module |
| Module Diagnostics Failure | 1 bit per module |
| Burn-out (on if T/C input is open – no connection between TCn+ and TCn-) | 1 bit per channel |
| Channel Under-range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

# P1-04THM Analog Input (continued)

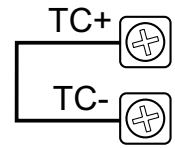
| Removable Terminal Block Specifications | | |
|---|---|---|
| Part Number | P1-10RTB | P1-10RTB-1 |
| Number of positions | 10 screw terminals | 10 spring clamp terminals |
| Wire Range | 30–16 AWG (0.051–1.31 mm²)<br>Solid/stranded conductor<br>3/64 in. (1.2 mm) insulation max.<br>1/4 in (6– 7 mm) strip length | 28–16 AWG (0.081–1.31 mm²)<br>Solid/stranded conductor<br>3/64 in (1.2 mm) insulation max.<br>19/64 in (7–8 mm) strip length |
| Conductors | USE COPPER CONDUCTORS, 75ºC 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 P/N: TW-SD-MSL-1.*

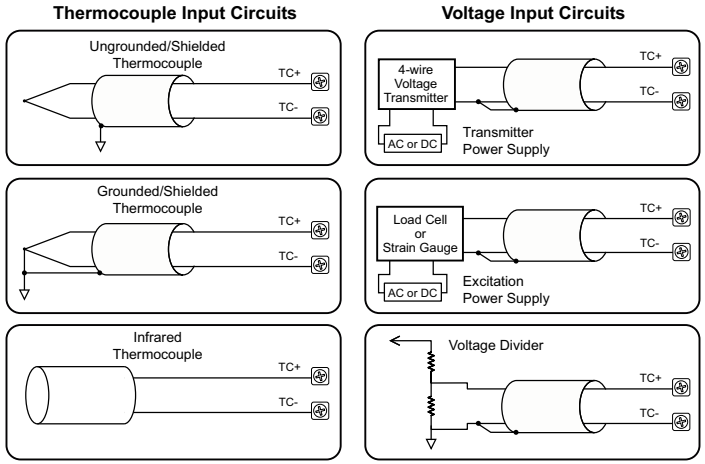
## Wiring Diagrams

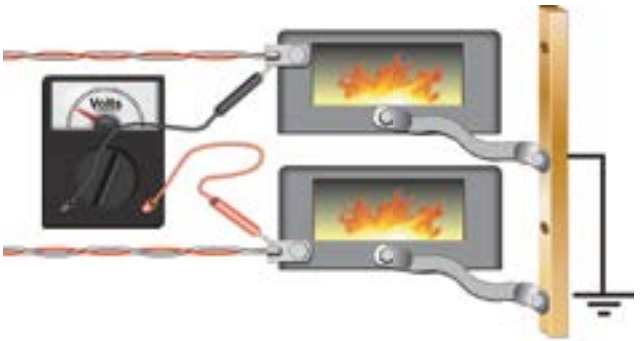



***NOTE:*** *Install jumper wire on each unused input; TC+ to TC-.*



# P1-04THM Analog Input (continued)




**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-.

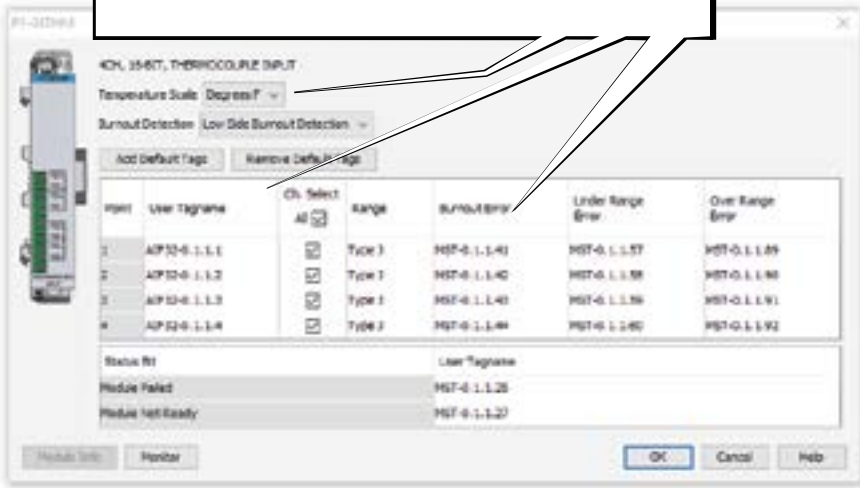
3. With grounded thermocouples, take precautions to prevent having a voltage potential between thermocouple tips. A voltage of 0.5V or greater between tips will skew measurements.
4. Use shielded, twisted thermocouple extension wire that matches the thermocouple type. Use thermocouple-compatible junction blocks.

# P1-04THM Analog Input (continued)

## Module Configuration

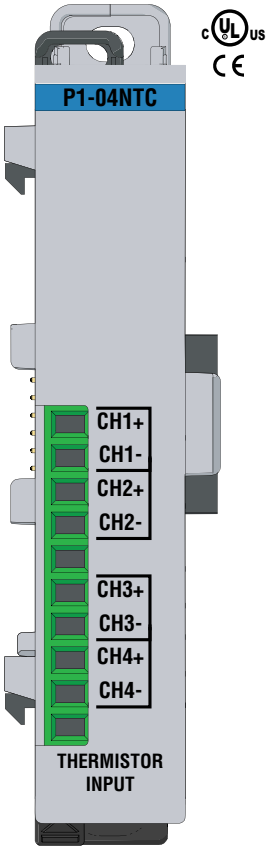
**Using the Hardware Configuration tool in the Productivity Suite programming software, drag and drop the P1-04THM module into the base configuration.**

**Select *Automatic Module Verification* or No *Verification*. Specify** *Temperature Scale* **and** *Burnout Detection*, **and use the drop down menu to select module range and resolution. If desired, assign a *User Tagname* to each output point channel selected and to each *Status Bit Item*.**



# P1-04NTC Thermistor

The P1-04NTC module provides four Thermistor input channels for use with the Productivity®1000 system.




**Terminal Block Included.**
**Not Compatible with *ZIP*Link.**

**Warranty: Thirty-day money-back guarantee. Two-year limited replacement. (See www.productivity1000.com for details).**

## NTC Input Specifications

| | | |
|---|---|---|
| Input Channels | 4 Single Ended (Temperature only) | |
| Data Format | Floating Point | |
| Common Mode Rejection | 100dB @ DC | |
| Input Impedance | >5MΩ | |
| Maximum Ratings | Fault protected inputs to ±50V | |
| Resolution | 16-bit, ±0.1°C or °F | |
| Thermistor Input Ranges | 2252<br>10K-AN Type 1<br>10K-CP Type 2<br>5K<br>3K<br>1.8K | -40° to 150°C (-40° to 300°F) |
| Thermistor Linearization | Automatic | |
| Sample Duration | Dependent on digital filter settings - 61ms @ 33Hz; 4ms @ 470Hz | |
| Sample Duration Time | Per channel: 61ms @ 33Hz, 4ms @ 470Hz | |
| All Channel Update Rate | 1.2 s @ 33Hz; 300ms @ 470Hz | |
| Open Circuit Detection Time | Within 5s @ 33Hz | |
| Conversion Method | Sigma-Delta | |
| Accuracy vs. Temperature | ±35PPM per °C (maximum) | |
| Maximum Inaccuracy | ±1°C maximum (33Hz)<br>±2.5°C maximum (470Hz)<br>(Excluding thermistor error; including temperature drift) | |
| Linearity Error | ±0.5°C maximum (±0.35°C typical)<br>Monotonic with no missing codes | |
| Filter Characteristics | Digital filter cutoff frequencies: 33Hz, 470Hz. | |
| External Power Supply Required | None | |

# P1-04NTC Thermistor (continued)

| General Specifications | |
|---|---|
| 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 | IEC60068-2-6 (Test Fc) |
| Shock | IEC60068-2-27 (Test Ea) |
| Field to Logic Side Isolation | 1800VAC applied for 1s |
| Heat Dissipation | 100mW |
| Enclosure Type | Open equipment |
| Module Location | Any I/O position in a Productivity®1000 system |
| Field Wiring | Removable terminal block (included).<br>The P1-04NTC module is not compatible with the ZIPLink wiring system. |
| Connector Type (included) | 10-position removable terminal block |
| Weight | 60g (2.1 oz) |
| Agency Approvals | UL 61010-1 and UL 61010-2-201 File E139594, Canada and USA<br>CE (EN 61131-2 EMC, EN 61010-1 and EN 61010-2-201 Safety)* |

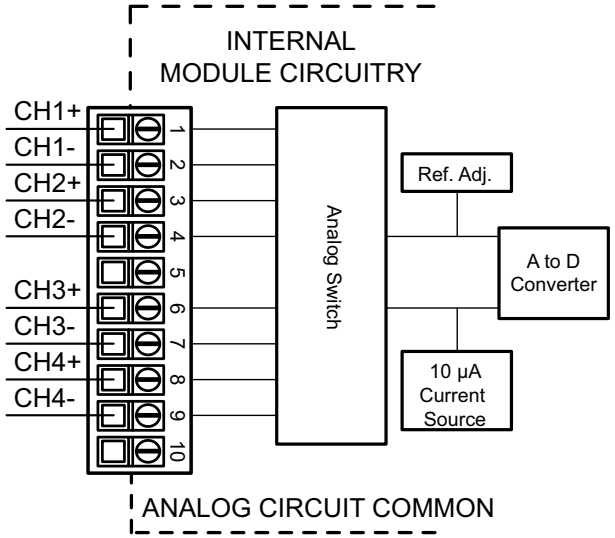
** See CE Declaration of Conformance for details.*

| Removable Terminal Block Specifications | | |
|---|---|---|
| Part Number | P1-10RTB | P1-10RTB-1 |
| Number of positions | 10 screw terminals | 10 spring clamp terminals |
| Wire Range | 30–16 AWG (0.051–1.31 mm²)<br>Solid/stranded conductor<br>3/64 in. (1.2 mm) insulation max.<br>1/4 in (6– 7 mm) strip length | 28–16 AWG (0.081–1.31 mm²)<br>Solid/stranded conductor<br>3/64 in (1.2 mm) insulation max.<br>19/64 in (7–8 mm) strip length |
| Conductors | USE COPPER CONDUCTORS, 75ºC 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 P/N: TW-SD-MSL-1.*

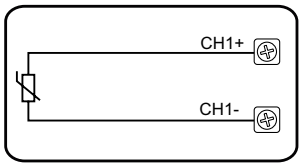
# P1-04NTC Thermistor (continued)

## Wiring Diagrams

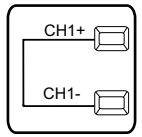



***NOTE:*** *Install jumper wire on each unused input; CH+ to CH-.*

**Thermistor Input**




**Jumpers**

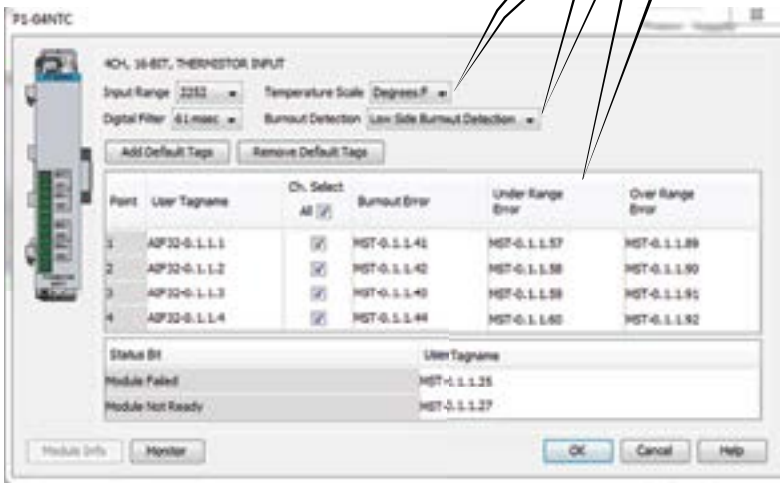


# P1-04NTC Thermistor (continued)

## Module Configuration

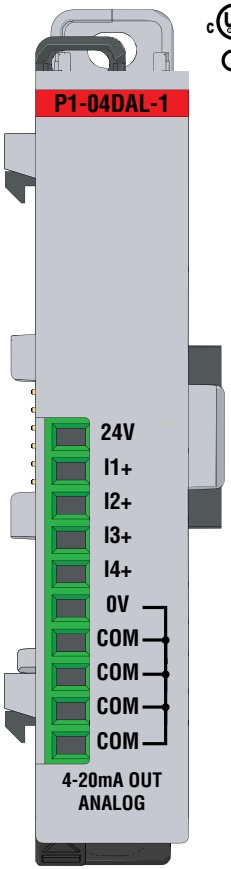
**Using the Hardware Configuration tool in the Productivity Suite programming software, drag and drop the P1-04NTC module into the base configuration.**

**Specify** *Temperature Scale* **and** *Burnout Detection*, **and use the drop down menu to select module range and resolution. If desired, assign a *User Tagname* to each output point channel selected and to each *Status Bit Item*.**



# P1-04DAL-1 Analog Output

The P1-04DAL-1 Low Resolution Analog Output Module provides four current sourcing channels for converting a digital value of 0–4095 (12-bit) to 4–20 mA analog signals for use with the Productivity® 1000 system.




**Terminal block sold separately.**

## Output Specifications

| | |
|---|---|
| Output Channels | 4 |
| Output Range | 4–20 mA |
| Signal Resolution | 12-bit |
| Resolution Value of LSB (least significant bit) | 4–20 mA = 3.9 µA / count<br>1 LSB = 1 count |
| Data Range | 0 to 4095 counts |
| Output Type (sourcing) | Current sourcing at 20mA max |
| Output Value in Fault Mode | Less than 4mA |
| Load Impedance | 0–570Ω (19.2 VDC),<br>0–690Ω (21.6 VDC),<br>0–810Ω (24VDC),<br>0–930Ω (26.4 VDC),<br>0–1100Ω (30.0 VDC),<br>Minimum Load: 0Ω @ 0–45°C<br>125Ω @ 45–60°C ambient temperature |
| Maximum Inductive Load | 1mH |
| Allowed Load Type | Grounded |
| Maximum Inaccuracy | 1% of range |
| Maximum Full Scale Calibration Error (Including Offset) | ±0.2% of range minimum |
| Maximum Offset Calibration Error | ±0.2% of range maximum |
| Accuracy vs. Temperature | ±75PPM / °C maximum full-scale calibration change (±0.005% of range / °C) |
| Max Crosstalk at DC, 50/60Hz | -72dB, 1 LSB |
| Linearity Error (End to End) | ±4 counts max., (±0.1% of full scale) |
| Output Stability and Repeatability | ±2 count after 10 min. warm up (typical) |
| Output Ripple | ±0.2% of full scale |
| Output Settling Time | 0.3 ms max., 5µs min. (full scale range) |
| All Channel Update Rate | 2ms (max) |
| Maximum Continuous Overload | Outputs open circuit protected |
| Type of Output Protection | Electronically current limited to 20mA or less |
| Output Signal at Power Up and Power Down | 4mA |
| External Power Supply Required | 24VDC (-20% / +25%),140mA (Loop power included) |

**We recommend using pre-wired ZIPLink cables and connection modules. See Chapter 5.**
**If you wish to hand-wire your module, removable terminal blocks are sold separately. Order part number P1-10RTB or P1-10RTB-1**

# P1-04DAL-1 Analog Output (continued)

| General Specifications | |
|---|---|
| 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 | IEC60068-2-6 (Test Fc) |
| Shock | IEC60068-2-27 (Test Ea) |
| Field to Logic Side Isolation | 1800VAC applied for 1s |
| Insulation Resistance | >10MΩ @ 500VDC |
| Heat Dissipation | 3000mW Maximum |
| Enclosure Type | Open equipment |
| Module Location | Any I/O position in a Productivity®1000 system |
| Field Wiring | Use ZIPLink wiring system or removable terminal block (not included). See “Wiring Options” in Chapter 5. |
| Terminal Type (sold separately) | 10-position removable terminal block |
| Weight | 85.1 g (3.0 oz) |
| Agency Approvals | UL 61010-1 and UL 61010-2-201 File E139594, Canada and USA<br>CE (EN 61131-2 EMC, EN 61010-1 and EN 61010-2-201 Safety)* |

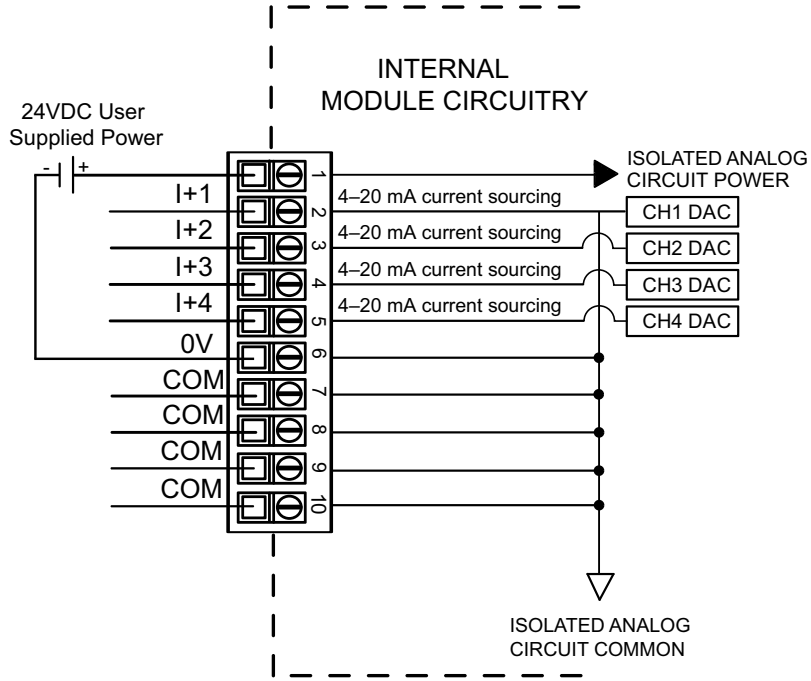
** See CE Declaration of Conformance for details.*

| Removable Terminal Block Specifications | | |
|---|---|---|
| Part Number | P1-10RTB | P1-10RTB-1 |
| Number of positions | 10 screw terminals | 10 spring clamp terminals |
| Wire Range | 30–16 AWG (0.051–1.31 mm²)<br>Solid/stranded conductor<br>3/64 in. (1.2 mm) insulation max.<br>1/4 in (6– 7 mm) strip length | 28–16 AWG (0.081–1.31 mm²)<br>Solid/stranded conductor<br>3/64 in (1.2 mm) insulation max.<br>19/64 in (7–8 mm) strip length |
| Conductors | USE COPPER CONDUCTORS, 75ºC 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 |

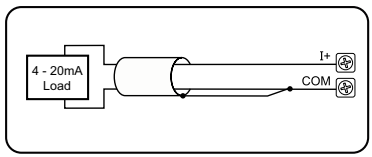
** Recommended screw driver P/N: TW-SD-MSL-1.*

# P1-04DAL-1 Analog Output (continued)

## Wiring Diagrams




**Current Source Output Circuit**



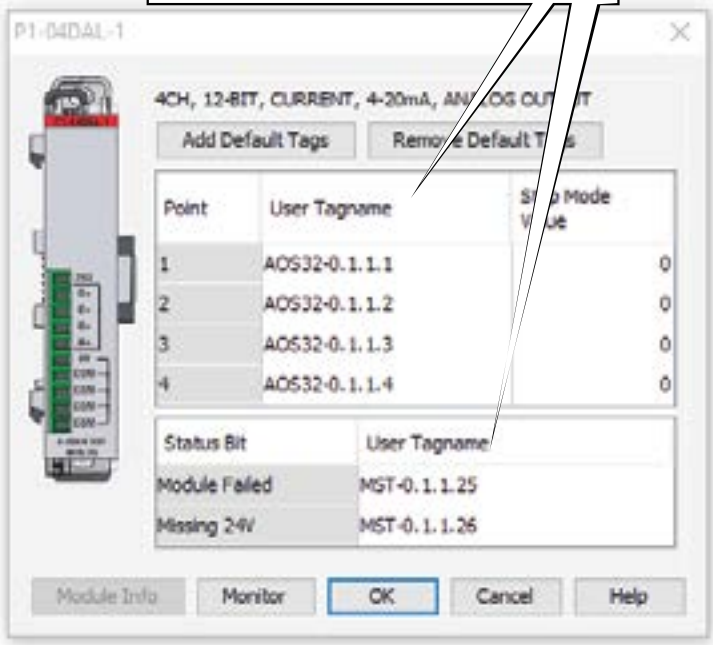

Note: Shield is connected to common at the source device.

# P1-04DAL-1 Analog Output (continued)

## Module Configuration

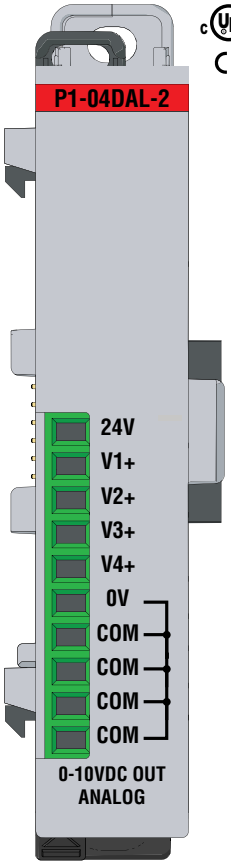
**Using the Hardware Configuration tool in the Productivity Suite programming software, drag and drop the P1-04DAL-1 module into the base configuration.**

**If desired, assign a *User Tagname* to each output point channel selected and to each *Status Bit Item*. A *Stop Mode Value* may also be assigned.**



# P1-04DAL-2 Analog Output

The P1-04DAL-2 Low Resolution Voltage Analog Output Module provides four outputs for converting digital values from 0–4095 (12-bit) to 0–10 VDC analog signals for use with the Productivity® 1000 system.




**Terminal block sold separately.**

| Output Specifications | |
|---|---|
| Output Channels | 4 |
| Module Signal Input Range | 0–10 V |
| Output Signal Resolution | 12-bit |
| Resolution Value of LSB (least significant bit) | 0–10 V = 2.44 mV per count<br>1 LSB = 1 count |
| Data Range | 0 to 4095 counts |
| Output Type | Voltage sourcing at 10mA |
| Output Value in Fault Mode | 0V |
| Load Impedance | ≥1000Ω |
| Maximum Capacitive Load | 0.01 µF |
| Allowed Load Type | Grounded |
| Maximum Inaccuracy | 0.5% of range |
| Maximum Full Scale Calibration Error (Not Including Offset) | ±0.2% of range |
| Maximum Offset Calibration Error | ±0.2% of range |
| Accuracy vs. Temperature | ±75PPM / °C maximum full-scale calibration change<br>(±0.0025% of range / °C) |
| Max Crosstalk | -72dB, 1 LSB |
| Linearity Error (End to End) | ±4 LSB maximum, (±0.1% of full scale)<br>Monotonic with no missing codes |
| Output Stability and Repeatability | ±2% LSB after 10 min. warm up (typical) |
| Output Ripple | ±0.2% of full scale |
| Output Settling Time | 0.3 ms max., 5µs min. (full scale range) |
| All Channel Update Rate (typical) | 2ms |
| Maximum Continuous Overload | Outputs current limited to 40mA typical<br>Continuous overloads on multiple outputs can damage the module. |
| Type of Output Protection | 0.1 µF Transient Suppressor |
| Output Signal at Power Up and Power Down | 0V |
| External Power Supply Required | 24VDC (-20% / +25%), 100mA |

**We recommend using pre-wired ZIPLink cables and connection modules. See Chapter 5. If you wish to hand-wire your module, removable terminal blocks are sold separately. Order part number P1-10RTB or P1-10RTB-1**

# P1-04DAL-2 Analog Output (continued)

| General Specifications | |
|---|---|
| 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 | IEC60068-2-6 (Test Fc) |
| Shock | IEC60068-2-27 (Test Ea) |
| Field to Logic Side Isolation | 1800VAC applied for 1s |
| Insulation Resistance | >10MΩ @ 500VDC |
| Heat Dissipation | 2000mW |
| Enclosure Type | Open equipment |
| Module Location | Any I/O position in a Productivity®1000 system |
| Field Wiring | Use ZIPLink wiring system or removable terminal block (not included). See “Wiring Options” in Chapter 5. |
| Connector Type (Not included) | 10-position removable terminal block |
| Weight | 62g (2.2 oz) |
| Agency Approvals | UL 61010-1 and UL 61010-2-201 File E139594, Canada and USA<br>CE (EN 61131-2 EMC, EN 61010-1 and EN 61010-2-201 Safety)* |

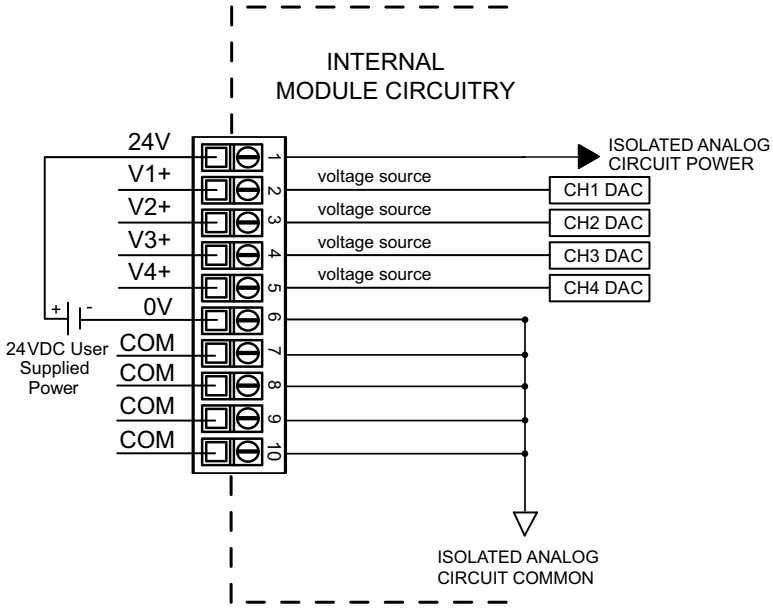
** See CE Declaration of Conformance for details.*

| Removable Terminal Block Specifications | | |
|---|---|---|
| Part Number | P1-10RTB | P1-10RTB-1 |
| Number of positions | 10 screw terminals | 10 spring clamp terminals |
| Wire Range | 30–16 AWG (0.051–1.31 mm²)<br>Solid/stranded conductor<br>3/64 in. (1.2 mm) insulation max.<br>1/4 in (6– 7 mm) strip length | 28–16 AWG (0.081–1.31 mm²)<br>Solid/stranded conductor<br>3/64 in (1.2 mm) insulation max.<br>19/64 in (7–8 mm) strip length |
| Conductors | USE COPPER CONDUCTORS, 75ºC 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 |

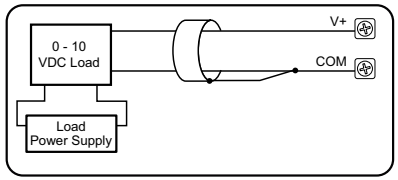
** Recommended screw driver P/N: TW-SD-MSL-1.*

# P1-04DAL-2 Analog Output (continued)

## Wiring Diagrams




**Voltage Output Circuits**

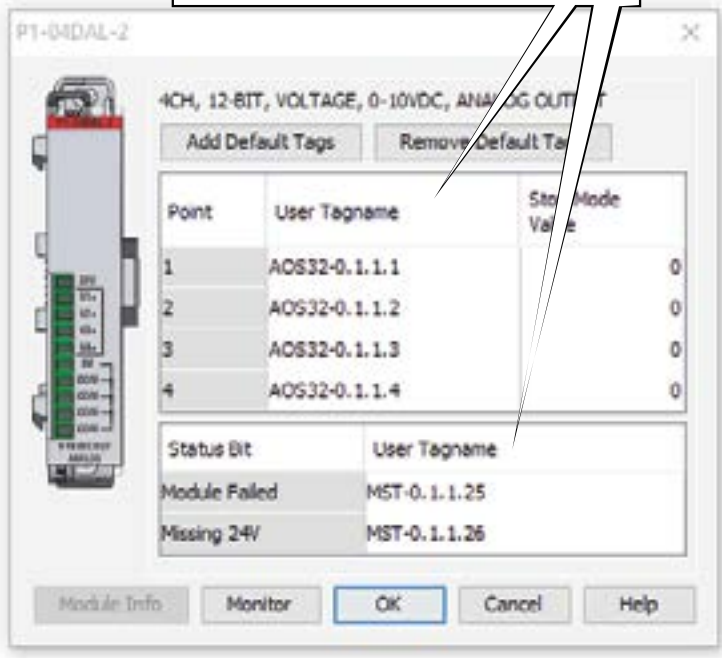


# P1-04DAL-2 Analog Output (continued)

## Module Configuration

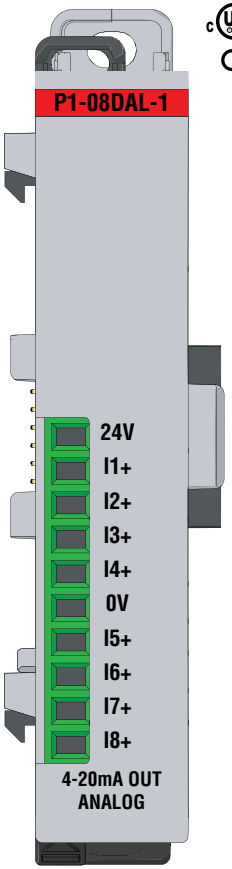
**Using the Hardware Configuration tool in the Productivity Suite programming software, drag and drop the P1-04DAL-2 module into the base configuration.**

**If desired, assign a *User Tagname* to each output point channel selected and to each *Status Bit Item*. A *Stop Mode Value* may also be assigned.**



# P1-08DAL-1 Analog Output

The P1-08DAL-1 Current Analog Output Module provides eight (12-bit) to 4–20 mA analog signals for use with the Productivity® 1000 system.




**Terminal block sold separately.**

## Output Specifications

| | |
|---|---|
| Output Channels | 8 |
| Output Type (sourcing) | Current sourcing at 20mA max |
| Output Range | 4–20 mA |
| Signal Resolution | 12-bit |
| Resolution Value of LSB (least significant bit) | 4–20 mA = 3.9 µA / count<br>1 LSB = 1 count |
| Data Range | 0 to 4095 counts |
| Output Value in Fault Mode | Less than 4mA |
| Load Impedance | 0–570Ω (19.2 VDC),<br>0–690Ω (21.6 VDC),<br>0–810Ω (24VDC),<br>0–930Ω (26.4 VDC),<br>0–1100Ω (30.0 VDC),<br>Minimum Load: 0Ω @ 0–45°C<br>125Ω @ 45–60°C ambient temperature |
| Maximum Inductive Load | 1mH |
| Allowed Load Type | Grounded |
| Maximum Inaccuracy | 1% of range |
| Maximum Full Scale Calibration Error (Including Offset) | ±0.2% of range minimum |
| Maximum Offset Calibration Error | ±0.2% of range maximum |
| Accuracy vs. Temperature | ±75PPM / °C maximum full-scale calibration change (±0.005% of range / °C) |
| Max Crosstalk at DC, 50/60Hz | -72dB, 1 LSB |
| Linearity Error (End to End) | ±4 LSB max., (±0.1% of full scale) |
| Output Stability and Repeatability | ±2% LSB after 10 min. warm up (typical) |
| Output Ripple | ±0.1% of full scale |
| Output Settling Time | 0.3 ms max., 5µs min. (full scale range) |
| All Channel Update Rate | 10ms (max) |
| Maximum Continuous Overload | Outputs open circuit protected |
| Type of Output Protection | Electronically current limited to 20mA or less |
| Output Signal at Power Up and Power Down | 4mA |
| External Power Supply Required | 24VDC @ 160mA |

**We recommend using pre-wired ZIPLink cables and connection modules. See Chapter 5.**
**If you wish to hand-wire your module, removable terminal blocks are sold separately. Order part number P1-10RTB or P1-10RTB-1**

# P1-08DAL-1 Analog Output (continued)

| General Specifications | |
|---|---|
| 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 | IEC60068-2-6 (Test Fc) |
| Shock | IEC60068-2-27 (Test Ea) |
| Field to Logic Side Isolation | 1800VAC applied for 1s |
| Insulation Resistance | >10MΩ @ 500VDC |
| Heat Dissipation | 6000mW |
| Enclosure Type | Open equipment |
| Module Location | Any I/O position in a Productivity®1000 system |
| Field Wiring | Use ZIPLink wiring system or removable terminal block (not included). See “Wiring Options” in Chapter 5. |
| Terminal Type (sold separately) | 10-position removable terminal block |
| Weight | 70g (2.3 oz) |
| Agency Approvals | UL 61010-1 and UL 61010-2-201 File E139594, Canada and USA<br>CE (EN 61131-2 EMC, EN 61010-1 and EN 61010-2-201 Safety)* |

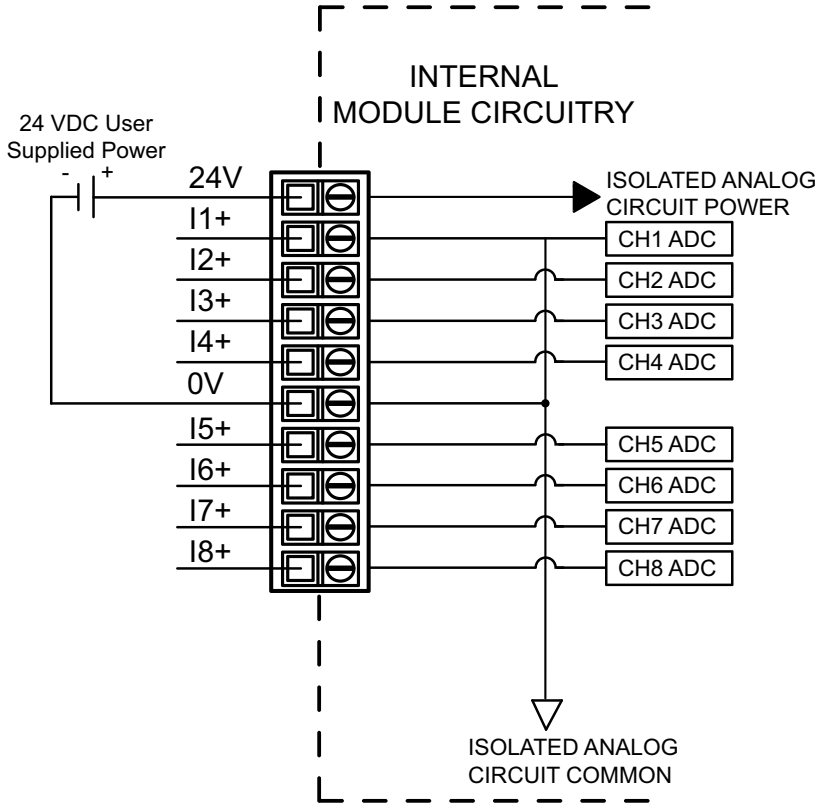
** See CE Declaration of Conformance for details.*

| Removable Terminal Block Specifications | | |
|---|---|---|
| Part Number | P1-10RTB | P1-10RTB-1 |
| Number of positions | 10 screw terminals | 10 spring clamp terminals |
| Wire Range | 30–16 AWG (0.051–1.31 mm²)<br>Solid/stranded conductor<br>3/64 in. (1.2 mm) insulation max.<br>1/4 in (6– 7 mm) strip length | 28–16 AWG (0.081–1.31 mm²)<br>Solid/stranded conductor<br>3/64 in (1.2 mm) insulation max.<br>19/64 in (7–8 mm) strip length |
| Conductors | USE COPPER CONDUCTORS, 75ºC 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 |

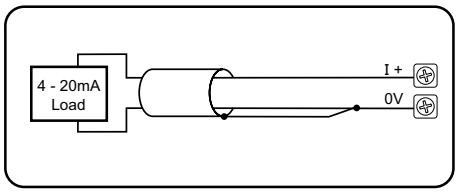
** Recommended screw driver P/N: TW-SD-MSL-1.*

# P1-08DAL-1 Analog Output (continued)

## Wiring Diagrams




**Current Source Output Circuit**



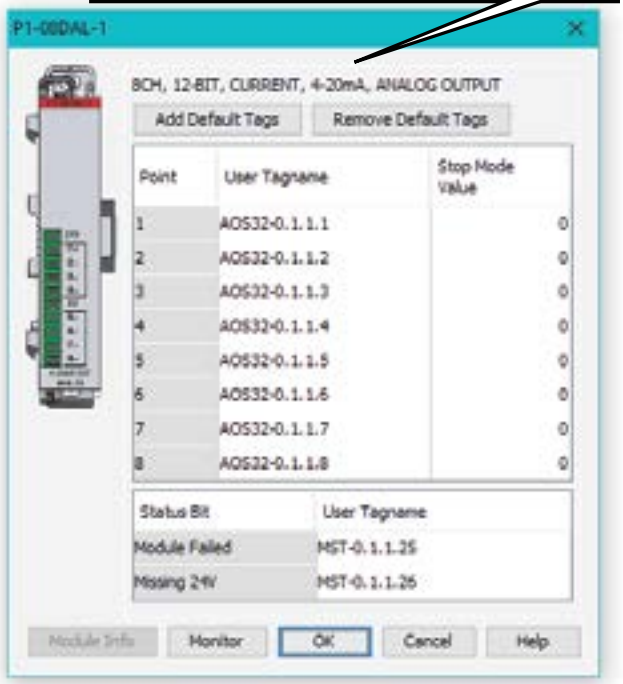

Note: Shield is connected to common at the source device.

# P1-08DAL-1 Analog Output (continued)

## Module Configuration

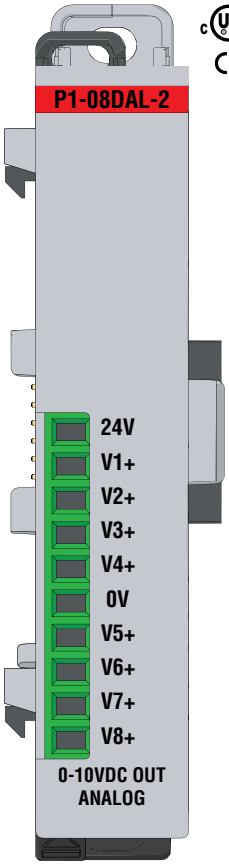
Using the Hardware Configuration tool in the Productivity Suite programming software, drag and drop the P1-08DAL-1 module into the base configuration.

If desired, assign a *User Tagname* to each input point (channel) selected and to each *Status Bit Item*. A *Stop Mode Value* may be assigned.



# P1-08DAL-2 Analog Output

The P1-08DAL-2 Current Analog Output Module provides eight 12-bit channels of 0–10 VDC analog signals for use with the Productivity®1000 system.




**Terminal block sold separately.**

| Output Specifications | |
|---|---|
| Output Channels | 8 |
| Output Type | Sinking/sourcing, 10mA max. |
| Module Signal Input Range | 0–10 V |
| Output Signal Resolution | 12-bit |
| Resolution Value of LSB (least significant bit) | 0–10 V = 2.44 mV per count<br>1 LSB = 1 count |
| Data Range | 0 to 4095 counts |
| Output Value in Fault Mode | 0V |
| Load Impedance | ≥1000Ω |
| Maximum Capacitive Load | 0.01 µF |
| Allowed Load Type | Grounded |
| Maximum Inaccuracy | 0.5% of range (Including temperature drift) |
| Maximum Full Scale Calibration Error (Including Offset) | ±0.2% of range minimum |
| Maximum Offset Calibration Error | ±0.2% of range maximum |
| Accuracy vs. Temperature | ±75PPM / °C maximum full-scale calibration change<br>(±0.0025% of range / °C) |
| Max Crosstalk | -72dB, 1 LSB |
| Linearity Error (End to End) | ±4 LSB maximum, (±0.1% of full scale)<br>Monotonic with no missing codes |
| Output Stability and Repeatability | ±2% LSB after 10 min. warm up (typical) |
| Output Ripple | ±0.1% of full scale |
| Output Settling Time | 300µs max., 5µs min. (full scale range) |
| All Channel Update Rate (typical) | 1ms |
| Maximum Continuous Overload | Outputs current limited to 40mA typical<br>Continuous overloads on multiple outputs can damage the module. |
| Type of Output Protection | 0.1 µF Transient Suppressor |
| Output Signal at Power Up and Power Down | 0V |
| External Power Supply Required | 24VDC (-20% / +25%), 100mA |

**We recommend using pre-wired ZIPLink cables and connection modules. See Chapter 5. If you wish to hand-wire your module, removable terminal blocks are sold separately. Order part number P1-10RTB or P1-10RTB-1**

# P1-08DAL-2 Analog Output (continued)

| General Specifications | |
|---|---|
| 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 | IEC60068-2-6 (Test Fc) |
| Shock | IEC60068-2-27 (Test Ea) |
| Field to Logic Side Isolation | 1800VAC applied for 1s |
| Insulation Resistance | >10MΩ @ 500VDC |
| Heat Dissipation | 3250mW |
| Enclosure Type | Open equipment |
| Module Location | Any I/O position in a Productivity®1000 system |
| Field Wiring | Use ZIPLink wiring system or removable terminal block (not included). See “Wiring Options” in Chapter 5. |
| Connector Type (Not included) | 10-position removable terminal block |
| Weight | 72g (2.5 oz) |
| Agency Approvals | UL 61010-1 and UL 61010-2-201 File E139594, Canada and USA<br>CE (EN 61131-2 EMC, EN 61010-1 and EN 61010-2-201 Safety)* |

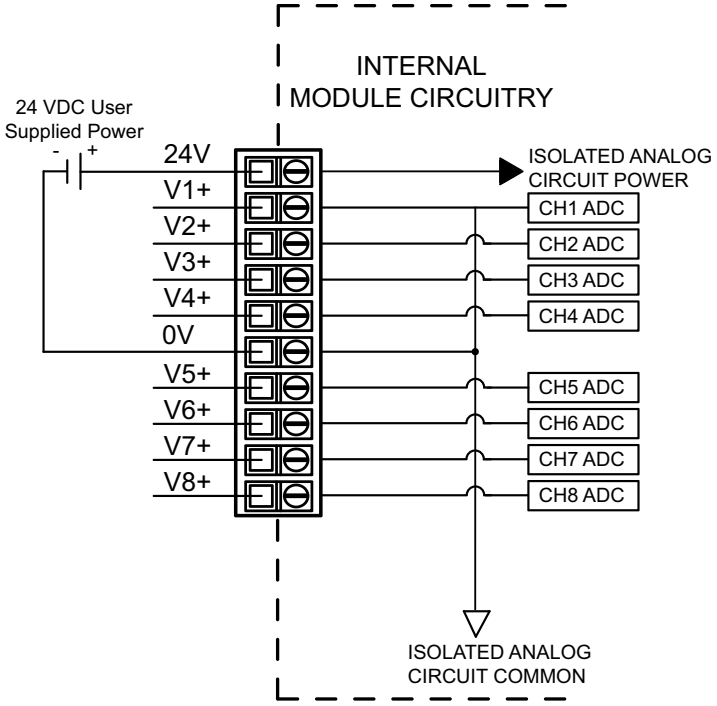
** See CE Declaration of Conformance for details.*

| Removable Terminal Block Specifications | | |
|---|---|---|
| Part Number | P1-10RTB | P1-10RTB-1 |
| Number of positions | 10 screw terminals | 10 spring clamp terminals |
| Wire Range | 30–16 AWG (0.051–1.31 mm²)<br>Solid/stranded conductor<br>3/64 in. (1.2 mm) insulation max.<br>1/4 in (6– 7 mm) strip length | 28–16 AWG (0.081–1.31 mm²)<br>Solid/stranded conductor<br>3/64 in (1.2 mm) insulation max.<br>19/64 in (7–8 mm) strip length |
| Conductors | USE COPPER CONDUCTORS, 75ºC 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 |

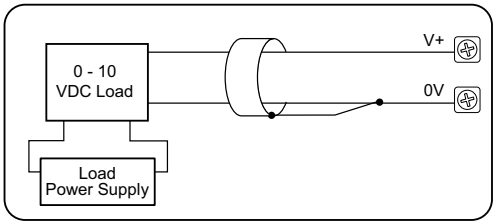
** Recommended screw driver P/N: TW-SD-MSL-1.*

# P1-08DAL-2 Analog Output (continued)

## Wiring Diagrams




**Voltage Output Circuits**

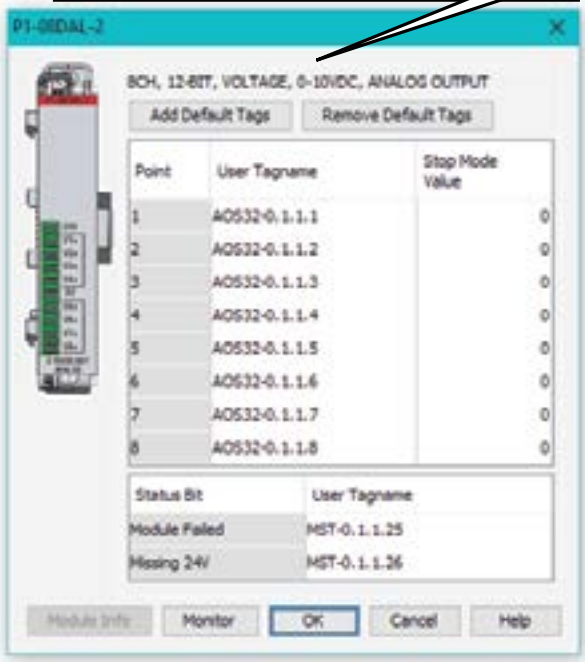


# P1-08DAL-2 Analog Output (continued)

## Module Configuration

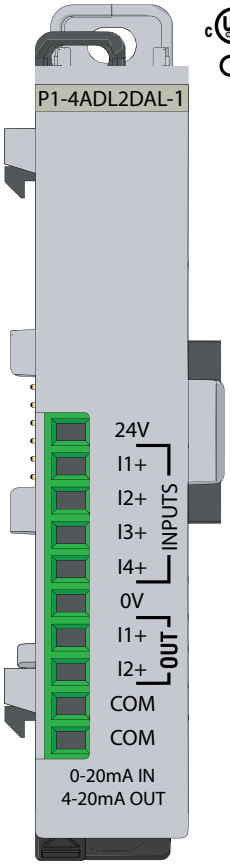
Using the Hardware Configuration tool in the Productivity Suite programming software, drag and drop the P1-08DAL-2 module into the base configuration.

If desired, assign a *User Tagname* to each input point (channel) selected and to each *Status Bit Item*. A *Stop Mode Value* may be assigned.



# P1-4ADL2DAL-1 Current Analog Input/Output

The P1-4ADL2DAL-1 Current Analog Input/Output Module provides four 13-bit input channels of 0–20 mA inputs and two 12-bit output channels at 4–20 mA for use with the Productivity® 1000 system.




**Terminal block sold separately.**

| Input Specifications | |
|---|---|
| Inputs per Module | 4 |
| Module Signal Input Range | 0–20 mA |
| Signal Resolution | 13-bit |
| Resolution Value of LSB (least significant bit) | 0–20 mA = 2.44 µA per count (1 LSB = 1 count) |
| Data Range | 0–8191 counts |
| Input Type | Sinking, single ended (1 common) |
| Maximum Continuous Overload | ±31mA |
| Input Impedance | 247Ω ±0.5%, 1/4 W current input |
| Filter Characteristics | Low pass, -3dB @ 120Hz |
| Sample Duration Time | 4ms per channel (does not include ladder scan time) |
| All Channel Update Rate | 20ms |
| Open Circuit Detection Time | Zero reading within 100ms |
| Conversion Method | Successive approximation |
| Accuracy vs. Temperature | ±75PPM/°C maximum |
| Maximum Inaccuracy | 0.5% of range (including temperature drift) |
| Linearity Error (end to end) | 0.037% of range Monotonic with no missing codes |
| Input Stability and Repeatability | ±0.024% of range (after 10 minute warm-up) |
| Maximum Full Scale Calibration Error | ±0.098% of range |
| Offset Calibration Error | ±0.098% of range |
| Maximum Crosstalk at DC, 50Hz and 60Hz | 0.049% of range |
| Recommended Fuse (external) | Edison S500-32-R, 0.032 A fuse |
| External Power Supply Required | 24VDC (-20% / +25%), 140mA (Loop power included) |

**We recommend using pre-wired ZIPLink cables and connection modules. See Chapter 5. If you wish to hand-wire your module, removable terminal blocks are sold separately. Order part number P1-10RTB or P1-10RTB-1**

# P1-4ADL2DAL-1 Current Analog Input/Output (cont'd)

| Output Specifications | |
|---|---|
| Output Channels | 2 |
| Module Signal Output Range | 4–20 mA |
| Output Signal Resolution | 12-bit |
| Resolution Value of LSB (least significant bit) | 4–20 mA = 3.9 µA / count; 1 LSB = 1 count |
| Data Range | 0–4095 counts |
| Output Type | Current sourcing at 20mA max |
| Output Value in Fault Mode | Less than 4mA |
| Load Impedance (Minimum External Power Supply) | 0–570 Ω (19.2 VDC)<br>0–690 Ω (21.6 VDC)<br>0–810 Ω (24.0 VDC)<br>0–930 Ω (26.4 VDC)<br>0–1100 Ω (30VDC); Minimum load: 0Ω @ 0-45ºC, 125Ω@45–60ºC ambient temperature |
| Maximum Inductive Load | 1mH |
| Allowed Load Type | Grounded |
| Maximum Inaccuracy | 1% of range |
| Full Scale Calibration Error | ±0.2% of range minimum |
| Offset Calibration Error | ±0.2% of range minimum |
| Accuracy vs. Temperature | ±75 PPM/°C max full scale calibration change (±0.005% of range/°C) |
| Max Crosstalk | -72dB, 1 LSB |
| Linearity Error (End to End) | ±4 counts max. (±0.1% of full scale) |
| Output Stability and Repeatability | ±2% counts max. after 10 minute warm-up (typical) |
| Output Ripple | 0.2% of full scale |
| Output Settling Time | 0.3 ms max., 5µs min. (full scale range) |
| All Channel Update Rate | 4ms (max) |
| Maximum Continuous Overload | Outputs open circuit protected |
| Type of Output Protection | Electronically current limited to 20mA or less |
| Output Signal (power-up, -down) | 4mA |

| Removable Terminal Block Specifications | | |
|---|---|---|
| Part Number | P1-10RTB | P1-10RTB-1 |
| Number of positions | 10 screw terminals | 10 spring clamp terminals |
| Wire Range | 30–16 AWG (0.051–1.31 mm²)<br>Solid/stranded conductor<br>3/64 in. (1.2 mm) insulation max.<br>1/4 in (6– 7 mm) strip length | 28–16 AWG (0.081–1.31 mm²)<br>Solid/stranded conductor<br>3/64 in (1.2 mm) insulation max.<br>19/64 in (7–8 mm) strip length |
| Conductors | USE COPPER CONDUCTORS, 75ºC 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 P/N: TW-SD-MSL-1.*

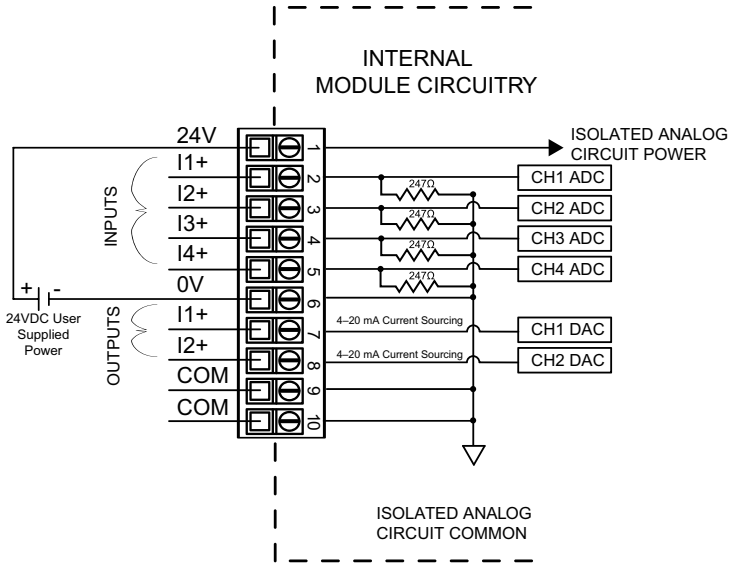
# P1-4ADL2DAL-1 Current Analog Input/Output (cont'd)

| General Specifications | |
|---|---|
| Operating Temperature | 0°C– 60°C (32°F–140°F) |
| Storage Temperature | -20ºC–70ºC (-4ºF–158ºF) |
| 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) |
| Field to Logic Side Isolation | 1800VAC applied for 1s |
| Insulation Resistance | > 10MΩ @ 500VDC |
| Heat Dissipation | 2470mW |
| Overvoltage Category | II |
| Enclosure Type | Open equipment |
| Module Location | Any I/O position in a Productivity®1000 system |
| Field Wiring | Removable terminal block (sold separately). Use ZIPLink wiring system, optional<br>See "Wiring Options" in Chapter 5. |
| Terminal Type (sold separately) | 10-position removable terminal block |
| Weight | 60g (2.1 oz) |
| Agency Approvals | UL 61010-1 and UL 61010-2-201 File E139594, Canada and USA<br>CE (EN 61131-2 EMC, EN 61010-1 and EN 61010-2-201 Safety)* |

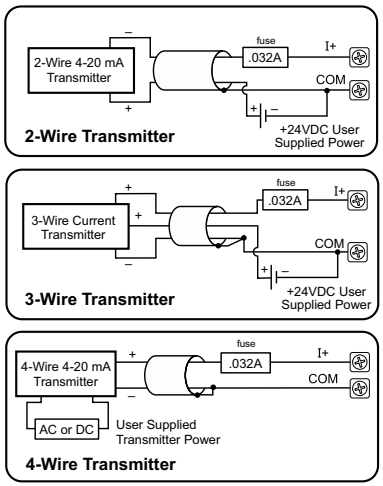
** See CE Declaration of Conformance for details.*

# P1-4ADL2DAL-1 Current Analog Input/Output (cont'd)

## Wiring Diagrams



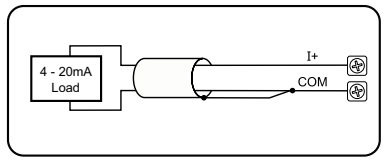

**Current Input Circuits**




An Edison S500-32-R 0.032A fast-acting fuse is recommended for all 4-20 mA current loops.

Note: Do not connect both ends of shield.

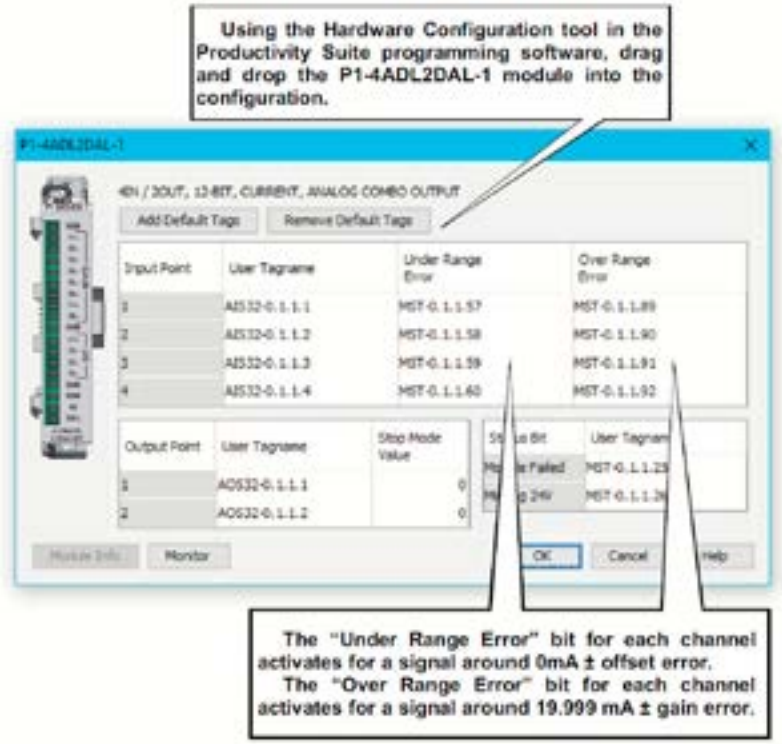
**Current Output Circuits**




Note: Shield is connected to common at the source device.

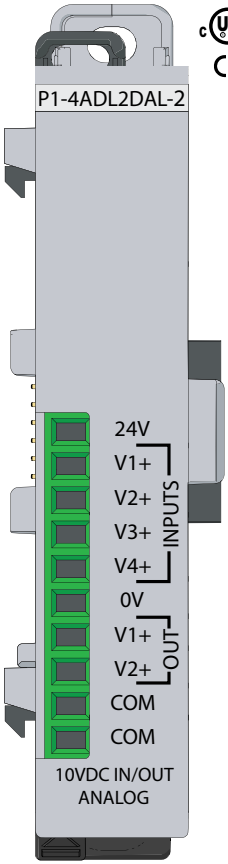
# P1-4ADL2DAL-1 Current Analog Input/Output (cont'd)

## Module Configuration



# P1-4ADL2DAL-2 Voltage Analog Input/Output

The P1-4ADL2DAL-2 Voltage Analog Input/Output Module provides four 13-bit input channels at 0–10 VDC and two 12-bit output channels at 0–10 VDC for use with Productivity® 1000 system.




## Input Specifications

| | |
|---|---|
| Input Channels | 4 |
| Module Signal Input Range | 0–10 VDC |
| Signal Resolution | 13-bit |
| Resolution Value of LSB (least significant bit) | 0–10 VDC = 1.22 mV per count (1 LSB = 1 count) |
| Data Range | 0–8191 counts |
| Input Type | Single Ended (1 common) |
| Maximum Continuous Overload | ±100VDC |
| Input Impedance | 200kΩ |
| Filter Characteristics | Low pass, -3dB @ 100Hz |
| Signal Duration Time | 4ms per channel (does not include ladder scan time) |
| All Channel Update Rate | 20ms |
| Conversion Method | Successive approximation |
| Accuracy vs. Temperature | ±75PPM/°C maximum |
| Maximum Inaccuracy | 0.5% of range (including temperature drift) |
| Linearity Error | ±0.036% of range Monotonic with no missing codes |
| Input Stability and Repeatability | ±0.03% of range |
| Full Scale Calibration Error (not including offset) | ±0.097% of range |
| Offset Calibration Error | ±0.097% of range |
| Maximum Crosstalk at DC, 50Hz and 60Hz | ±0.049% of range |
| External Power Supply Required | 24VDC (-20% / +25%), 100mA |

**Terminal blocks sold separately.**

**We recommend using pre-wired ZIPLink cables and connection modules. See Chapter 5. If you wish to hand-wire your module, removable terminal blocks are sold separately. Order part number P1-10RTB or P1-10RTB-1**

## Diagnosis/Status

| | |
|---|---|
| Under Range Error | 1 bit per channel |
| Over Range Error | 1 bit per channel |
| Module Failed | 1 bit per module |
| Missing 24V | 1 bit per module |

# P1-4ADL2DAL-2 Voltage Analog Input/Output (cont'd)

| Output Specifications | |
|---|---|
| Output Channels | 2 |
| Module Signal Output Range | 0–10 VDC |
| Output Signal Resolution | 12-bit |
| Resolution Value of LSB (least significant bit) | 0–10 VDC = 2.44 mV / count; 1 LSB= 1 count |
| Data Range | 0–4095 counts |
| Output Type | Voltage @10mA |
| Output Value in Fault Mode | 0V |
| Load Impedance | ≥1000Ω |
| Maximum Inductive Load | 0.01 µF |
| Allowed Load Type | Grounded |
| Maximum Inaccuracy | 0.5% of range |
| Full Scale Calibration Error | ±0.2% of range |
| Offset Calibration Error | ±0.2% of range |
| Accuracy vs. Temperature | ±75PPM/°C max full-scale calibration change (±0.0025% of range/°C) |
| Max Crosstalk | -72dB, 1 LSB |
| Linearity Error (End to End) | ±4 LSB max. (±0.1% of full scale)<br>Monotonic with not missing codes |
| Output Stability and Repeatability | ±2% LSB after 10 minute warm-up (typical) |
| Output Ripple | ±0.2% of full scale |
| Output Settling Time | 0.3 ms max., 5µs min. (full scale range) |
| All Channel Update Rate | 4ms |
| Maximum Continuous Overload | Outputs open circuit limited to 40mA typical Continuous overloads on multiple outputs can damage the module |
| Type of Output Protection | 0.1 µs Transient Suppressor |
| Output Signal at Power-up and Power-down | 0V |

| Removable Terminal Block Specifications | | |
|---|---|---|
| Part Number | P1-10RTB | P1-10RTB-1 |
| Number of positions | 10 screw terminals | 10 spring clamp terminals |
| Wire Range | 30–16 AWG (0.051–1.31 mm²)<br>Solid/stranded conductor<br>3/64 in. (1.2 mm) insulation max.<br>1/4 in (6– 7 mm) strip length | 28–16 AWG (0.081–1.31 mm²)<br>Solid/stranded conductor<br>3/64 in (1.2 mm) insulation max.<br>19/64 in (7–8 mm) strip length |
| Conductors | USE COPPER CONDUCTORS, 75ºC 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 P/N: TW-SD-MSL-1.*

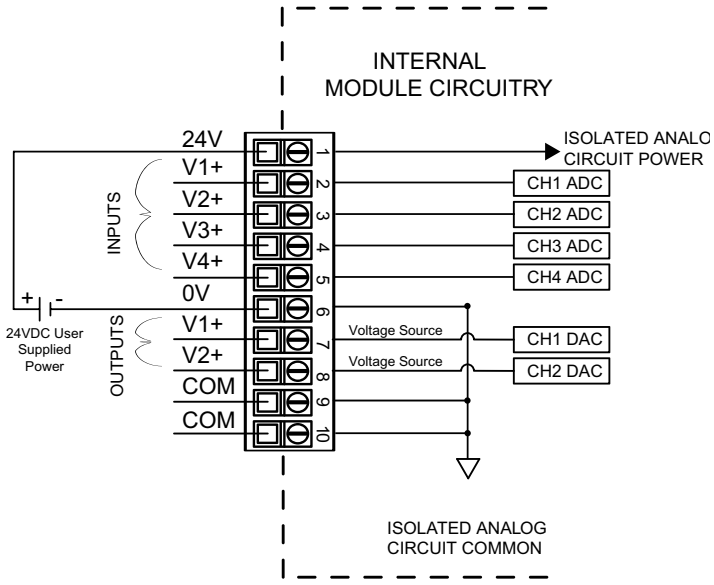
# P1-4ADL2DAL-2 Voltage Analog Input/Output (cont'd)

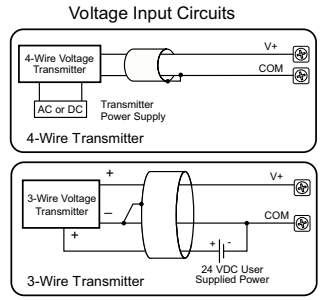
| General Specifications | |
|---|---|
| Operating Temperature | 0°C– 60°C (32°F–140°F) |
| Storage Temperature | -20ºC–70ºC (-4ºF–158ºF) |
| Humidity | 5 to 95% (non-condensing) |
| Altitude | 2000 meter max. |
| Pollution Degree | 2 |
| Environmental Air | No corrosive gases permitted |
| Vibration | IEC60068-2-6 (Test Fc) |
| Shock | IEC60068-2-27 (Test Ea) |
| Field to Logic Side Isolation | 1800VAC applied for 1s |
| Insulation Resistance | > 10MΩ @ 500VDC |
| Heat Dissipation | 1950mW |
| Overvoltage Category | II |
| Enclosure Type | Open equipment |
| Module Location | Any I/O slot in a Productivity®1000 system |
| Field Wiring | Use ZIPLink wiring system or removable terminal block (not included). See "Wiring Options" in Chapter 5. |
| Connector Type (Not included) | 10-position removable terminal block |
| Weight | 60g (2.1 oz) |
| Agency Approvals | UL61010-2-201 File E139594, Canada & USA<br>CE (EN61131-2 EMC and EN61010-2-201 Safety)* |

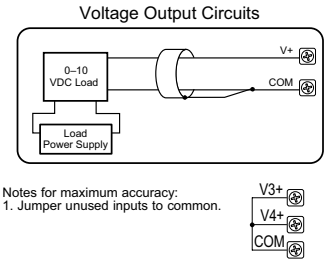
** See CE Declaration of Conformance for details.*

# P1-4ADL2DAL-2 Voltage Analog Input/Output (cont'd)

## Wiring Diagrams



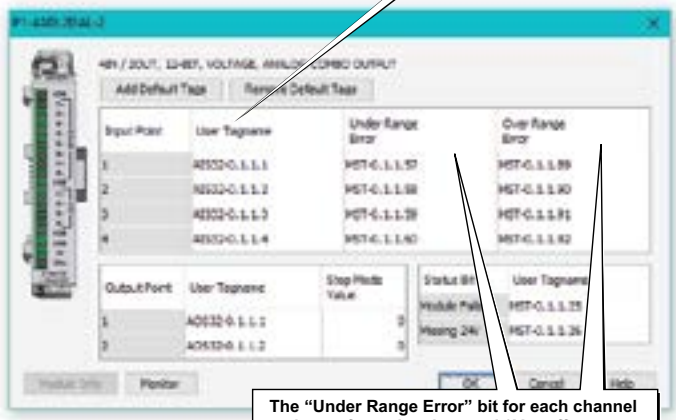

Notes for maximum accuracy:
1. Jumper unused inputs to common.

# P1-4ADL2DAL-2 Voltage Analog Input/Output (cont'd)

## Module Configuration

**Using the Hardware Configuration tool in the Productivity Suite programming software, drag and drop the P1-4ADL2DAL-2 module into the configuration.**

**If desired, assign a *User Tagname* to each input point (channel) selected and to each *Status Bit Item*.**




**The "Under Range Error" bit for each channel activates for a signal around 0V, ± offset error.**

**THe "Over Raqnge Error" bit for each channel activates for a signal aroungd 10V, ± gain error.**