P2-8AD4DA-1
Analog Input/Output

The P2-8AD4DA-1 Current Analog Input/Output Module provides eight channels of 0–20 mA inputs and four channels of 4–20 mA outputs for use with the Productivity2000 System.

General Specifications

<table>
<thead>
<tr>
<th>Specification</th>
<th>Details</th>
</tr>
</thead>
<tbody>
<tr>
<td>Operating Temperature</td>
<td>0º to 60ºC (32º to 140ºF)</td>
</tr>
<tr>
<td>Storage Temperature</td>
<td>-20º to 70ºC (-4º to 158ºF)</td>
</tr>
<tr>
<td>Humidity</td>
<td>5 to 95% (non-condensing)</td>
</tr>
<tr>
<td>Environmental Air</td>
<td>No corrosive gases permitted</td>
</tr>
<tr>
<td>Vibration</td>
<td>IEC60068-2-6 (Test Fc)</td>
</tr>
<tr>
<td>Shock</td>
<td>IEC60068-2-27 (Test Ea)</td>
</tr>
<tr>
<td>Field to Logic Side Isolation</td>
<td>1800VAC applied for 1 second</td>
</tr>
<tr>
<td>Insulation Resistance</td>
<td>&gt; 10MΩ @ 500VDC</td>
</tr>
<tr>
<td>Heat Dissipation</td>
<td>2.47 W</td>
</tr>
<tr>
<td>Enclosure Type</td>
<td>Open Equipment</td>
</tr>
<tr>
<td>Agency Approvals</td>
<td>UL 61010-1 and UL 61010-2-201 File E139594, Canada &amp; USA CE (EN 61131-2 EMC, EN 61010-1 and EN 61010-2-201 Safety)*</td>
</tr>
<tr>
<td>Module Keying to Backplane</td>
<td>Electronic</td>
</tr>
<tr>
<td>Module Location</td>
<td>Any I/O slot in a Productivity2000 System</td>
</tr>
<tr>
<td>Field Wiring</td>
<td>Use ZIPLink Wiring System or removable terminal block (not included). See “Wiring Options” on page 5.</td>
</tr>
<tr>
<td>EU Directive</td>
<td>See the “EU Directive” topic in the Productivity2000 Help File. Information can also be obtained at: <a href="http://www.productivity2000.com">www.productivity2000.com</a></td>
</tr>
<tr>
<td>Connector Type (not included)</td>
<td>18-Position Removable Terminal Block</td>
</tr>
<tr>
<td>Weight</td>
<td>90g (3.2 oz)</td>
</tr>
</tbody>
</table>

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

Terminal Block sold separately, (see wiring options on page 3).

### Input Specifications

<table>
<thead>
<tr>
<th>Specification</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Input Channels</strong></td>
<td>8 (1 common)</td>
</tr>
<tr>
<td><strong>Module Signal Input Range</strong></td>
<td>0–20 mA</td>
</tr>
<tr>
<td><strong>Signal Resolution</strong></td>
<td>12–16 bit, depending on input resolution</td>
</tr>
<tr>
<td><strong>Input Resolution &amp; Update Rate</strong></td>
<td>Fine: 8ms, 0.305 μA, 16 bit; Medium: 2ms, 1.22 μA, 14 bit; Coarse: 700μs, 4.88 μA, 12 bit</td>
</tr>
<tr>
<td><strong>Data Range</strong></td>
<td>0–65535 counts</td>
</tr>
<tr>
<td><strong>Input Type</strong></td>
<td>Single Ended (1 common)</td>
</tr>
<tr>
<td><strong>Maximum Continuous Overload</strong></td>
<td>±31mA</td>
</tr>
<tr>
<td><strong>Input Impedance</strong></td>
<td>250Ω ±0.1%, 1/4W</td>
</tr>
<tr>
<td><strong>Hardware Filter Characteristics</strong></td>
<td>Low pass 1st order, -3dB @ 48Hz</td>
</tr>
<tr>
<td><strong>All Channel Update Rate</strong></td>
<td>Fine 57ms; Medium: 17ms; Coarse: 7ms</td>
</tr>
<tr>
<td><strong>Open Circuit Detection Time</strong></td>
<td>Zero reading within 1s</td>
</tr>
<tr>
<td><strong>Conversion Method</strong></td>
<td>Successive approximation</td>
</tr>
<tr>
<td><strong>Accuracy vs. Temperature</strong></td>
<td>±15ppm/°C maximum</td>
</tr>
<tr>
<td><strong>Maximum Inaccuracy</strong></td>
<td>0.1% of range</td>
</tr>
<tr>
<td><strong>Linearity Error (end to end)</strong></td>
<td>0.015% of range maximum; Monotonic with no missing codes</td>
</tr>
<tr>
<td><strong>Input Stability and Repeatability</strong></td>
<td>±0.015% of range (after 10 minute warm-up)</td>
</tr>
<tr>
<td><strong>Full Scale Calibration Error</strong></td>
<td>±0.05% of range maximum</td>
</tr>
<tr>
<td><strong>Offset Calibration Error</strong></td>
<td>±0.05% of range maximum</td>
</tr>
<tr>
<td><strong>Maximum Crosstalk</strong></td>
<td>-96dB ±1 -0.015% of full scale maximum</td>
</tr>
<tr>
<td><strong>Recommended Fuse (external)</strong></td>
<td>Edison S500-32-R, 0.032 A fuse</td>
</tr>
<tr>
<td><strong>External DC Power Required</strong></td>
<td>24VDC (-20% / +25%), 145mA</td>
</tr>
</tbody>
</table>

**Note 1:** The Input Resolution of Fine returns 16 bit resolution. Medium and Coarse are 14 and 12 bit respectively. The 12 and 14 bit input values are scaled to 0-65535.

**Note 2:** Valid when all channels are set for the same Input Resolution.

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### Output Specifications

<table>
<thead>
<tr>
<th>Specification</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Output Channels</strong></td>
<td>4 (1 common)</td>
</tr>
<tr>
<td><strong>Module Signal Output Range</strong></td>
<td>4–20 mA</td>
</tr>
<tr>
<td><strong>Output Signal Resolution</strong></td>
<td>16-bit</td>
</tr>
<tr>
<td><strong>Resolution Value of LSB</strong></td>
<td>0.244 μA / count, 1 LSB = 1 count</td>
</tr>
<tr>
<td><strong>Data Range</strong></td>
<td>0–65535 counts</td>
</tr>
<tr>
<td><strong>Output Type</strong></td>
<td>Current sourcing: 20mA max</td>
</tr>
<tr>
<td><strong>Output Value in Fault Mode</strong></td>
<td>≤ 4mA</td>
</tr>
<tr>
<td><strong>Load Impedance</strong></td>
<td>Minimum External Power Supply</td>
</tr>
<tr>
<td></td>
<td>0–480 Ω (19.2 VDC)</td>
</tr>
<tr>
<td></td>
<td>0–600 Ω (21.6 VDC)</td>
</tr>
<tr>
<td></td>
<td>0–715 Ω (24VDC)</td>
</tr>
<tr>
<td></td>
<td>0–840 Ω (26.4 VDC)</td>
</tr>
<tr>
<td></td>
<td>0–1010 Ω (30VDC)</td>
</tr>
<tr>
<td><strong>Maximum Inductive Load</strong></td>
<td>1mH</td>
</tr>
<tr>
<td><strong>Allowed Load Type</strong></td>
<td>Grounded</td>
</tr>
<tr>
<td><strong>Maximum Inaccuracy</strong></td>
<td>0.1% of range</td>
</tr>
<tr>
<td><strong>Maximum Full Scale Calibration Error</strong></td>
<td>±0.065% of full scale</td>
</tr>
<tr>
<td><strong>Maximum Offset Calibration Error</strong></td>
<td>±0.065% of full scale</td>
</tr>
<tr>
<td><strong>Accuracy vs. Temperature</strong></td>
<td>±15ppm/°C max full scale calibration change (-0.0025% of range/°C)</td>
</tr>
<tr>
<td><strong>Max Crosstalk</strong></td>
<td>-96dB, 1 LSB</td>
</tr>
<tr>
<td><strong>Linearity Error (End to End)</strong></td>
<td>±0.015% of range maximum; Monotonic with no missing codes</td>
</tr>
<tr>
<td><strong>Output Stability and Repeatability</strong></td>
<td>±0.015% after 10 minute warm-up typical</td>
</tr>
<tr>
<td><strong>Output Ripple</strong></td>
<td>0.01% of full scale at 50/60 Hz</td>
</tr>
<tr>
<td><strong>Output Setting Time</strong></td>
<td>Rising Time 200μs; Falling Time 135μs (full scale change)</td>
</tr>
<tr>
<td><strong>All Channel Update Rate</strong></td>
<td>3.55 ms</td>
</tr>
<tr>
<td><strong>Maximum Continuous Overload</strong></td>
<td>Outputs open circuit protected</td>
</tr>
<tr>
<td><strong>Type of Output Protection</strong></td>
<td>Electronically current limited to 20mA or less</td>
</tr>
<tr>
<td><strong>Output Signal (power-up, -down)</strong></td>
<td>≤ 4mA</td>
</tr>
</tbody>
</table>
Using the Hardware Configuration tool in the Productivity Suite programming software, drag and drop the P2-8AD4DA-1 module into the base configuration. Select Automatic Module Verification or No Verification and Enable Hot Swap. Also specify Input Resolution for inputs and Stop Mode Value for outputs. If desired, assign a User Tagname to each input and output point (channel) selected and to each Status Bit Item.

### Wiring Options

1. **ZIPLink Feed Through Modules and Cables¹**
   - ZL-RB20
   - ZL-RB20-1
   - ZL-P2-CBL18
   - ZL-P2-CBL18-1
   - ZL-P2-CBL18-2
   - 0.5 m (1.6 ft) cable
   - 1.0 m (3.3 ft) cable
   - 2.0 m (6.6 ft) cable

2. **Terminal Block with pigtail cable**
   - ZL-P2-CBL18-1P
   - ZL-P2-CBL18-2P
   - 1.0 m (3.3 ft) cable
   - 2.0 m (6.6 ft) cable

3. **Screw Terminal Block only**
   - P2-RTB (Quantity 1)

4. **Spring Clamp Terminal Block only**
   - P2-RTB-1 (Quantity 1)

5. **Accessories²**
   - ZL-RB-COM
   - TW-SD-SL-1
   - TW-SD-MSL-1

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¹ ZIPLink Module = Complete System
² ZL-RB-COM provides a common connection point for power or ground

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Sales 800-633-0405  www.productivity2000.com
The Scale (Linear) function can be used to:

- Convert analog field input signals from the range which is native to the analog input module to an application specific range.
- Convert an application specific range to a range which is native to the analog output module.
- Make other linear conversions in ranges appropriate to the application.

The Scale (Non-Linear) function can be used for Non-Linear applications.
OLED Panel Display

Power On

- **PASSED SELF TEST**
  - Appears initially
  - These screens will then auto cycle

- **P2-8AD4DA-1**
  - Fw. Rev. 1.00

- **In:** 0-20mA
- **Out:** 4-20mA

- **Channels Enabled:** 7

Hold SEL button down to cycle through primary screens. Release button to select screen.

- **DISPLAY SETUP INFO**
- **DISPLAY STATUS INFO**
- **DISPLAY UNITS DECIMAL COUNTS**
- **DISPLAY UNITS HEX COUNTS**
- **DISPLAY UNITS mA**

This screen will auto cycle with status information

Momentarily Press SEL button to toggle through secondary displays

- **1H 00000**
- **2H 00000**
- **3H 00000**
- **4H 00000**
- **5H 00000**
- **6H 00000**
- **7H 00000**
- **8H SPARE**

Error Messages – An existing error will be inserted into the cycling Status Info screen

- **MISSING EXTERNAL 24VDC**
- **SELFTEST FAIL REPLACE MODULE**
- **End of Status Menu List**

- **5H 00000**
- **6H 00000**
- **7H 00000**
- **8H SPARE**
- **5H 00000**
- **6H 00000**
- **7H 00000**
- **8H SPARE**

Fault Messages – Appear in place of data during a fault condition.

- **1H OVER**
- **2H UNDER**
- **3H**
- **4H**

- **In:** OVER
- **Out:** UNDER
- **3H**
- **4H**

- **In:** greater than or equal to 20 mA.
- **Out:** less than or equal to 0 mA.

End of Status Menu List

- **1I 00000**
- **2I 00000**
- **3I 00000**
- **4I 00000**
- **5I 00000**
- **6I 00000**
- **7I 00000**
- **8I SPARE**

- **1I 00000**
- **2I 00000**
- **3I 00000**
- **4I 00000**
- **5I 00000**
- **6I 00000**
- **7I 00000**
- **8I SPARE**

- **1I 0000H**
- **2I 0000H**
- **3I 0000H**
- **4I 0000H**
- **5I 0000H**
- **6I 0000H**
- **7I 0000H**
- **8I SPARE**

- **1I 0000H**
- **2I 0000H**
- **3I 0000H**
- **4I 0000H**
- **5I 0000H**
- **6I 0000H**
- **7I 0000H**
- **8I SPARE**

- **1I 0000H**
- **2I 0000H**
- **3I 0000H**
- **4I 0000H**
- **5I 0000H**
- **6I 0000H**
- **7I 0000H**
- **8I SPARE**

- **1I 0000H**
- **2I 0000H**
- **3I 0000H**
- **4I 0000H**
- **5I 0000H**
- **6I 0000H**
- **7I 0000H**
- **8I SPARE**

- **1I 0000H**
- **2I 0000H**
- **3I 0000H**
- **4I 0000H**
- **5I 0000H**
- **6I 0000H**
- **7I 0000H**
- **8I SPARE**

- **1I 0000H**
- **2I 0000H**
- **3I 0000H**
- **4I 0000H**
- **5I 0000H**
- **6I 0000H**
- **7I 0000H**
- **8I SPARE**

- **1I 0000H**
- **2I 0000H**
- **3I 0000H**
- **4I 0000H**
- **5I 0000H**
- **6I 0000H**
- **7I 0000H**
- **8I SPARE**

- **1I 0000H**
- **2I 0000H**
- **3I 0000H**
- **4I 0000H**
- **5I 0000H**
- **6I 0000H**
- **7I 0000H**
- **8I SPARE**

Note: SPARE denotes deselected channel
Module Installation

WARNING: Do not apply field power until the following steps are completed. See hot-swapping procedure for exceptions.

Step One: Align module catch with base slot and rotate module into connector.

Step Two: Pull top locking tab toward module face. Click indicates lock is engaged.

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

Important Hot-Swap Information

The Productivity2000 System supports hot-swap! Individual modules can be taken offline, removed, and replaced while the rest of the system continues controlling your process. Before attempting to use the hot-swap feature, be sure to read the hot-swap topic in the programming software’s help file or our online documentation at AutomationDirect.com for details on how to plan your installation for use of this powerful feature.
Current Input Circuits

2-Wire 4-20 mA Transmitter

- 2-Wire Transmitter

- 3-Wire Current Transmitter

- 4-Wire 4-20 mA Transmitter

- AC or DC

Note: Do not connect both ends of shield.

Current Output Circuits

- 4 - 20mA Load

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

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

Note: This module includes input and output channels. Before connecting field wiring, verify that you are connecting to the appropriate terminals.
**WARNING:** To minimize the risk of potential safety problems, you should follow all applicable local and national codes that regulate the installation and operation of your equipment. These codes vary from area to area and it is your responsibility to determine which codes should be followed, and to verify that the equipment, installation, and operation are in compliance with the latest revision of these codes. *Equipment damage or serious injury to personnel can result from the failure to follow all applicable codes and standards. We do not guarantee the products described in this publication are suitable for your particular application, nor do we assume any responsibility for your product design, installation, or operation.*

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

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### Removable Terminal Block Specifications

<table>
<thead>
<tr>
<th>Part Number</th>
<th>P2-RTB</th>
<th>P2-RTB-1</th>
</tr>
</thead>
<tbody>
<tr>
<td>Number of positions</td>
<td>18 Screw Terminals</td>
<td>18 Spring Clamp Terminals</td>
</tr>
<tr>
<td>Wire Range</td>
<td>30–16 AWG (0.051–1.31 mm²) solid / stranded conductor</td>
<td>28–16 AWG (0.081–1.31 mm²) solid / stranded conductor</td>
</tr>
<tr>
<td></td>
<td>3/64 in (1.2 mm) insulation maximum</td>
<td>3/64 in (1.2 mm) insulation maximum</td>
</tr>
<tr>
<td></td>
<td>1/4 in (6–7 mm) strip length</td>
<td>19/64 in (7–8 mm) strip length</td>
</tr>
<tr>
<td>Conductors</td>
<td>“USE COPPER CONDUCTORS, 75ºC” or equivalent.</td>
<td></td>
</tr>
<tr>
<td>Screw Driver Width</td>
<td>0.1 in (2.5 mm) maximum*</td>
<td></td>
</tr>
<tr>
<td>Screw Size</td>
<td>M2</td>
<td>N/A</td>
</tr>
<tr>
<td>Screw Torque</td>
<td>2.5 lb·in (0.28 N·m)</td>
<td>N/A</td>
</tr>
</tbody>
</table>

*Recommended Screwdriver TW-SD-MSL-1