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Module Overview

The B875-111 is an 8 point differential or 16 point single-ended analog input module that accepts one of five voltage or three current ranges and converts them to binary logic level input signals used by Modicon Programmable Logic Controllers which are compatible with 800-Series I/O.

Module Features and "Life Value" Benefits

- Compatible with all 800-Series Interfaces, Power Supplies, and Housings
- Can be used in any available 800-Series I/O Slot
- Compatible with previous Modicon analog input modes of operation

Performance and Quality

- Module auto-calibrates for simple, reliable installation and maintenance
- High resolution A/D converter for greater accuracy
- High speed analog conversion for maximum throughput
- User configurable for flexible application
- Meets ANSI and IEEE surge withstand requirements as applied to non-hazardous (user supply) connections
- Inputs electrically isolated from logic circuitry
- Continually monitors communications with controller

System Investment

- Flexible configuration eliminates the need for multiple types of analog input modules
- Single-ended input mode reduces input costs for non-critical applications
## Current Settings for Single-Ended Inputs

3-4-Position Dip Switches and 1 S-Position Dip Switch

<table>
<thead>
<tr>
<th>Top of Module</th>
<th>Switch to Channel Relationship</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>( SW_1 = CH_1 )</td>
</tr>
<tr>
<td>2</td>
<td>( SW_2 = CH_2 )</td>
</tr>
<tr>
<td>3</td>
<td>( SW_3 = CH_3 )</td>
</tr>
<tr>
<td>4</td>
<td>( SW_4 = CH_4 )</td>
</tr>
</tbody>
</table>

**Switch Bank 1**

<table>
<thead>
<tr>
<th>Top of Module</th>
<th>Switch to Channel Relationship</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>( SW_1 = CH_5 )</td>
</tr>
<tr>
<td>2</td>
<td>( SW_2 = CH_6 )</td>
</tr>
<tr>
<td>3</td>
<td>( SW_3 = CH_7 )</td>
</tr>
<tr>
<td>4</td>
<td>( SW_4 = CH_8 )</td>
</tr>
</tbody>
</table>

**Switch Bank 2**

<table>
<thead>
<tr>
<th>Top of Module</th>
<th>Switch to Channel Relationship</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>( SW_1 = CH_9 )</td>
</tr>
<tr>
<td>2</td>
<td>( SW_2 = CH_{10} )</td>
</tr>
<tr>
<td>3</td>
<td>( SW_3 = CH_{11} )</td>
</tr>
<tr>
<td>4</td>
<td>( SW_4 = CH_{12} )</td>
</tr>
</tbody>
</table>

**Switch Bank 3**

<table>
<thead>
<tr>
<th>Top of Module</th>
<th>Switch to Channel Relationship</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>( SW_1 = CH_{13} )</td>
</tr>
<tr>
<td>2</td>
<td>( SW_2 = CH_{14} )</td>
</tr>
<tr>
<td>3</td>
<td>( SW_3 = CH_{15} )</td>
</tr>
<tr>
<td>4</td>
<td>( SW_4 = CH_{16} )</td>
</tr>
<tr>
<td>5</td>
<td>( SW_5 = 10\text{V/5V} )</td>
</tr>
</tbody>
</table>

**Switch Bank 4**

<table>
<thead>
<tr>
<th>Top of Module</th>
<th>Left Right Functions</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>[ 0 ]</td>
</tr>
</tbody>
</table>

### DIP-Switch Settings

#### Module Configuration Switch
6-Position Dip-Switch

<table>
<thead>
<tr>
<th>Top of Module</th>
<th>Switch to Function Relationship</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>( SW_1 = \text{Bipolar/Unipolar} )</td>
</tr>
<tr>
<td>2</td>
<td>( SW_2 = \text{All Other Ranges} / 1.5 \text{V} &amp; 4-20 \text{mA} )</td>
</tr>
<tr>
<td>3</td>
<td>( SW_3 = \text{Output Format} )</td>
</tr>
<tr>
<td>4</td>
<td>( SW_4 = \text{Output Format} )</td>
</tr>
<tr>
<td>5</td>
<td>( SW_5 = \text{No. of Samples Averaged} )</td>
</tr>
<tr>
<td>6</td>
<td>( SW_6 = \text{No. of Samples Averaged} )</td>
</tr>
<tr>
<td>7</td>
<td>( SW_7 = \text{No. of Channels} )</td>
</tr>
<tr>
<td>8</td>
<td>( SW_8 = \text{10V/5V} )</td>
</tr>
</tbody>
</table>

#### Switches Functions

**SW1**
- **Input Range**
  - For Bipolar (+/- 10V, +/- 5V, +/- 20mA): \( SW_1 = \text{L} \)
  - For Unipolar (0-10V, 0-5V, 0-20mA, 1-5V, 4-20mA): \( SW_1 = \text{R} \)

**SW2**
- **Input Range**
  - For Offset (1.5V OR 4-20mA): \( SW_2 = \text{R} \)
  - For No Offset (All Other Ranges): \( SW_2 = \text{L} \)

**SW3 & SW4**
- **Output Format** *See Table 1 for Resolutions*
  - For Standard (0000-4095):
    - \( SW_3 = \text{R AND} \)
    - \( SW_4 = \text{L AND} \)
  - For Expanded (4096-16384):
    - \( SW_3 = \text{L AND} \)
    - \( SW_4 = \text{R AND} \)

**SW5 & SW6**
- **Samples to Averaged**
  - For 1 Sample: \( SW_5 = \text{R AND} \)
  - \( SW_6 = \text{L AND} \)
  - For 8 Samples: \( SW_5 = \text{L AND} \)
  - \( SW_6 = \text{R AND} \)
  - For 16 Samples: \( SW_5 = \text{R AND} \)
  - \( SW_6 = \text{L} \)
  - For 32 Samples: \( SW_5 = \text{L AND} \)
  - \( SW_6 = \text{L} \)

**SW7**
- **Input Types**
  - For Differential: \( SW_7 = \text{R} \)
  - For Single-Ended: \( SW_7 = \text{L} \)

**SW8**
- **Input Ranges**
  - For 10V (+/- 10V OR 0-10V): \( SW_8 = \text{R} \)
  - For 5V (All Others): \( SW_8 = \text{R} \)
Module Specific Information:

Module Topology
- Number of Inputs: 8 differential or 16 single-ended (user selectable)
- Number of Groups: 8 for differential mode
- Points per Group: 1 for single-ended mode

Electrical Information - General
- Working Voltage Ranges:
  - -10 to +10 VDC
  - -5 to +5 VDC
  - 0 to +5 VDC
  - 0 to +10 VDC
  - +1.1 to +5 VDC
- Working Current Ranges:
  - -20 to +20 ma
  - 0 to +20 ma
  - +4 to +20 ma

(One Range Selectable Per Module)

Electrical Information – Inputs
- Impedance:
  - Current Mode: 250 Ohms (+/- 0.5%)
  - Voltage Mode: >10 MOhm (within operating range)
  - Input Filter: 5000 Ohms (outside operating range)
- Input Protection (voltage mode):
  - Normal Mode: 120 V RMS differential input
  - Common Mode: 120 V RMS
- Over Current Protection:
  - (current mode) Up to 30 mA

Data Format and Resolution – User Selectable (Per Module)
- A) Standard Input Data Format
  - For All Ranges: Full Range = 1 to 4095
  - Under Range = 0
  - Over Range = 4096
- B) Elevated Input Data Format
  - For All Ranges: Full Range = 4096 to 8191
  - Under Range = 4095
  - Over Range = 8192
- C) Full Resolution Input Data Format
  - For 0 to 5 VDC, 0 to 10 VDC, 0 to 20 ma Ranges:
    - Full Range = 1 to 7499
  - For 1 to 5 VDC, 4 to 20 ma Ranges:
    - Full Range = 1 to 6000
  - For -10 to +10 VDC, -5 to +5 VDC, -20 to +20 ma Ranges:
    - Full Range = 1 to 9999

(One Range Selectable Per Module)

Under Range: Two most significant bits set high. Register contains absolute value of under range condition.

D) Decimal Input Data Format*
- For All Ranges: Full Range = 1 to 9999
- Out of Range (<2.4%) As Follows:
  - Over Range: Most significant bit set high. Register contains absolute value of over range condition.
  - Under Range: Two most significant bits set high. Register contains absolute value of under range condition.

*Note: actual resolution will not exceed resolution format C.

Linearity: +/- 0.05% of full scale over rated temperature range

Repeatability: 0.055% RMS for constant input voltage and temperature over a 24-hour period

Accuracy: +/- 0.1% of full scale over rated temperature range

Isolation:
- Channel to Channel: 3000 VAC
- Channel to Case: 1500 VAC for 1 minute
- Channel to Controller: 1500 VAC for 1 minute

Common Mode
- Range:
  - -5 to +5 VDC, 0 to 5 VDC, 1 to 5 VDC, -20 to +20 ma, 0 to 20 ma.
  - 4 to 20 ma Ranges: +/- 0 V
  - -10 to +10 VDC, 0 to 10 VDC
- Ranges: +/- 4V

Rejection:
- -40 dB typical, DC to 60 Hz

Performance Information
- 8 inputs - all inputs updated every 10 ms (without averaging)
- 16 inputs - all inputs updated every 20 ms (without averaging)

Averaging: User may select 1, 8, 16, or 32 samples to be averaged as input to the controller

Power Supply Requirements
- +5 VDC: 500 ma
- -4.3 VDC: 900 ma
- -5 VDC: 0 ma

Required Addressing
- Discrete I/O (bits): 0 in / 0 out
- Register I/O (registers): Differential Mode: 8 in / 0 out (8875)
  - Single-Ended Mode: 16 in / 0 out (8877)

Module Indicators
- Communications ACTIVE Indicator LED, flashes with out-of-range condition
**B875-111 and B877-111**

**Field Side**
- Case Ground
- Input 1 + (B875)
  - Input 1 (B877)
- Current Input (B875 Only - Tie to #3)
- Input 1 - (B875)
  - Input 2 (B877)
- Shield (B875)
  - Input 18 & RTN (B877)

**Module Side**
- Chassis Gnd
- 10 K ohm
- Current Input Select B877 (16 Chan Single Ended)
- Trans 20RB
- Field Side Common
- 10 K ohm
- Field Side Common

**Analog Multiplexer I/O**
- Approx 1 KΩ
- Amplifier

---

**800-Series I/O – Family Information**

**Environmental**
- Operating Temperature: 0 to 60 Degrees C
- Storage Temperature: -40 to +85 Degrees C
- Humidity: 0 to 95% (Non-Condensing)
- Shock (Half Sine Wave): 15 G Peak for 11 ms
- Vibration (Displacement): 0.0005 in (5-50 Hz)
- Vibration (G-Force): 0.625 G (50-500 Hz Sine Wave)

**Electrical – AC Line Surge**
- 150 VAC RMS for 10 seconds maximum or 200 VAC RMS for 1 cycle maximum, repeated at a rate of no greater than once every 3 minutes.

**Physical**
- Dimensions: 2.0 x 0.5 x 0.6 in (W x H x D)
- (50.8 x 12.7 x 15.2 mm)
- Approximate Weight: 2 lbs.

**800-Series I/O Features – General**
- Module handle for easy installation and removal
- Module removal without disturbing field wiring
- Designed to operate in industrial environments

**Electrical – Isolation Voltage**
- Between inputs and I/O bus, and between input groups: 1500 VAC at 47 to 63 Hz for 60 seconds without breakdown. 2500 VDC for 60 seconds without breakdown. Leakage current shall not exceed 1.5 mA.
Typical Field Connections, 8 Differential Inputs

<table>
<thead>
<tr>
<th>Signal</th>
<th>Terminal No.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Case Ground</td>
<td>1</td>
</tr>
<tr>
<td>Current Input 1</td>
<td>2</td>
</tr>
<tr>
<td>Input 1 -</td>
<td>3</td>
</tr>
<tr>
<td>Shield 1 -</td>
<td>4</td>
</tr>
<tr>
<td>Current Input 2</td>
<td>5</td>
</tr>
<tr>
<td>Input 2 -</td>
<td>6</td>
</tr>
<tr>
<td>Shield 2 -</td>
<td>7</td>
</tr>
<tr>
<td>Current Input 3</td>
<td>8</td>
</tr>
<tr>
<td>Input 3 -</td>
<td>9</td>
</tr>
<tr>
<td>Shield 3 -</td>
<td>10</td>
</tr>
<tr>
<td>Current Input 4</td>
<td>11</td>
</tr>
<tr>
<td>Input 4 -</td>
<td>12</td>
</tr>
<tr>
<td>Shield 4 -</td>
<td>13</td>
</tr>
<tr>
<td>N.C.</td>
<td>14</td>
</tr>
<tr>
<td>N.C.</td>
<td>15</td>
</tr>
<tr>
<td>N.C.</td>
<td>16</td>
</tr>
<tr>
<td>N.C.</td>
<td>17</td>
</tr>
<tr>
<td>N.C.</td>
<td>18</td>
</tr>
<tr>
<td>N.C.</td>
<td>19</td>
</tr>
<tr>
<td>N.C.</td>
<td>20</td>
</tr>
</tbody>
</table>

N.C. Current Input 5 21
Input 5 - 22
Shield 5 23
Current Input 6 24
Input 6 - 25
Shield 6 26
Current Input 7 27
Input 7 - 28
Shield 7 29
Current Input 8 30
Input 8 - 31
Shield 8 32
Voltage Reference 33
Case Ground 34
EARTH GROUND

*For reference only. Do not attach field wiring.
1. Inputs 1-6 are common and tied to field side ground.
2. Jumper unused channels to their shields, to avoid ground loops.
3. When using shielded field circuit wires, ground shield at one end only to avoid ground loops.

Typical Field Circuit Connections, Single Ended Inputs

<table>
<thead>
<tr>
<th>Signal</th>
<th>Terminal No.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Case Ground</td>
<td>1</td>
</tr>
<tr>
<td>N.C.</td>
<td>2</td>
</tr>
<tr>
<td>Input 1 -</td>
<td>3</td>
</tr>
<tr>
<td>Input 2 -</td>
<td>4</td>
</tr>
<tr>
<td>Input 1, 2 Return N.C.</td>
<td>5</td>
</tr>
<tr>
<td>Input 3 -</td>
<td>6</td>
</tr>
<tr>
<td>Input 4 -</td>
<td>7</td>
</tr>
<tr>
<td>Input 3, 4 Return N.C.</td>
<td>8</td>
</tr>
<tr>
<td>Input 5 -</td>
<td>9</td>
</tr>
<tr>
<td>Input 6 -</td>
<td>10</td>
</tr>
<tr>
<td>Input 5, 6 Return N.C.</td>
<td>11</td>
</tr>
<tr>
<td>Input 7 -</td>
<td>12</td>
</tr>
<tr>
<td>Input 6 -</td>
<td>13</td>
</tr>
<tr>
<td>Input 7, 8 Return N.C.</td>
<td>14</td>
</tr>
<tr>
<td>N.C.</td>
<td>15</td>
</tr>
<tr>
<td>N.C.</td>
<td>16</td>
</tr>
<tr>
<td>N.C.</td>
<td>17</td>
</tr>
<tr>
<td>N.C.</td>
<td>18</td>
</tr>
<tr>
<td>N.C.</td>
<td>19</td>
</tr>
<tr>
<td>N.C.</td>
<td>20</td>
</tr>
</tbody>
</table>

N.C. Current Input 5 21
Input 5 - 22
Input 9 23
Input 10 24
Input 9, 10 Return N.C. | 25        |
Input 11 26
Input 12 27
Input 11, 12 Return N.C. | 28        |
Input 13 29
Input 14 30
Input 13, 14 N.C. | 31        |
Input 15 32
Input 16 33
Input 15, 16 Return N.C. | 34        |
Voltage Reference 35
Voltage Reference - Case Ground 36
EARTH GROUND

*For reference only. Do not attach field wiring.
1. All returns are electrically tied together inside the module.
2. Jumper all unused channels to their respective returns, to avoid ground loops.
3. When using shielded field circuit wires, ground shield at one end only.
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