OleumTech™

Analog Input Module

Model:

WM3000-002

Controlled Copy

CONTENTS

PREFACE

The Analog Input Module is part of the Wireless System family of industrial wireless automation products by OleumTech. The module is equipped with four analog inputs for monitoring various process conditions such as pressure and can be connected to any Modbus master device via RS485 (RJ-45).

This document describes the Analog Input Module hardware and how to install the module. This document also describes how to maintain and troubleshoot the Analog Input Module.

Document Revision Level

This section provides a history of the revision changes to this document.

Revision	ECO Number	Date	Description
D	001316	02/27/2012	Corrected power input specs in "Features" section
E	001803	05/08/2013	Revised NEMA Enclosure Installation, added providing power warnings
F	002961	10/15/2015	Removed WIO, added counts

Changes in this Revision

Revised NEMA Enclosure Installation pg 15.

Added providing power warning information on pg 16.

Related Documents

In addition to this user guide, you may find the following additional documents helpful.

- I/O Expansion Modules Video

- Wireless Gateway User Guide (80-7004-001)

- BreeZ® Configuration Software User Guide (80-1004-001)

Document Conventions

This document uses the following additional conventions to draw your attention to certain information.

Safety and Warnings

This document uses the following symbols to draw your attention to certain information.

Symbol	Meaning	Description
	Note	Notes emphasize or supplement important points of the main text.
	Tip	Tips provide helpful information, guidelines, or suggestions for performing tasks more effectively.
	Warning	Warnings indicate that failure to take a specified action could result in damage to the device, or could result in serious bodily injury.
	Electric Shock Hazard	This symbol warns users of electric shock hazard. Failure to take appropriate precautions such as not opening or touching hazardous areas of the equipment could result in injury or death.

Typographic Conventions

This document also uses the following typographic conventions.

Convention	Description
Bold	Indicates text on a window, other than the window title, including menus, menu options, buttons, fields, and labels.
Italic	Indicates a variable, which is a placeholder for actual text provided by the user or system. Angled brackets (< >) are also used to indicate variables.
`screen/code`	Indicates text that is displayed on screen or entered by the user.
< > angled brackets	Indicates a variable, which is a placeholder for actual text provided by the user or system. Italic font is also used to indicate variables.
[ ] square brackets	Indicates optional values.
{ } braces	Indicates required or expected values.
| vertical bar	Indicates that you have a choice between two or more options or arguments.

1. PRODUCT OVERVIEW

Analog Input Module

The Analog Input Module is a member of the Monitoring System, an integral assembly that includes a Base Unit. Within this system, the Analog Input Module uses proprietary data-monitoring firmware to collect and transmit status data of field equipment.

Figure 1-1. Analog Input Module

Features

The following list summarizes the key features of the Analog Input Module.

- Expands analog input capabilities to Gateways (Base Unit, DH2, DH3)

- 4x Analog Inputs

- 0-5V, 0-10V, 4-20 mA selectable modes

- 24-bit ADC

- 6-24 VDC (12 VDC Recommended) power input

- Add multiple modules to Base Unit via RS485 (RJ45)

- Simple plug-and-play connection to Modbus master

- Compact, low-profile design with low power consumption

- Easy to install, configure, and use

- Scalable solution

Base Unit (WM2000-002)

The Base Unit is a multi-input unit that receives data from transmitters such as the Analog Input Module. The Base Unit accepts four analog inputs (0-5V), two discrete inputs, and two discrete outputs for various monitoring and control applications. For more information, refer to the *Wireless Gateway User Guide*.

Figure 1-2. Base Unit

BreeZ® Configuration Software

BreeZ® is a Microsoft Windows-based software tool for configuring OleumTech Industrial Wireless Automation Control Modules and Transmitter family of products. For more information, refer to the *BreeZ® Configuration Software User Guide*.

2. HARDWARE DESCRIPTION

Front

Figure 2-1 and Table 2-1 describe the components on the front of the Analog Input Module.

Figure 2-1. Front Components on the Analog Input Module

Table 2-1. Front Components on the Analog Input Module

Legend	Description
❶	Reset Button
❷	Green Indicator LED
❸	Jumpers (under front cover)
❹	P2 Terminal Block with AN3 and AN4 Analog Input and Power Pins
❺	P1 Terminal Block with AN1 and AN2 Analog Input Pins

The front of the Analog Input Module has a green indicator LED and a reset button.

- The LED flashes five times when, the Analog Input Module powers on, is being configured, or is having its firmware updated.

- The reset button reinitializes the Analog Input Module. To reset the Analog Input Module, press the reset button for at least 10 seconds. The LED flashes five times after the Analog Input Module is reset.

> **Note:** The reset button is recessed to prevent accidental resets. To access It, use a paperclip or small screwdriver.

Below the LED and reset button are two terminal blocks. Facing the front of the Analog Input Module:

- The left terminal block (**P1**) contains 6 pins, three for analog input AN1 and three for analog input AN2. For a definition of these pins, see Table 2-2.

- The right terminal block (**P2**) contains 8 pins. The six left pins are for analog inputs AN3 and AN4. The two right pins, labeled **V+** and **GND**, connect to the power source for the Analog Input Module. For a definition of these pins, see Table 2-3.

Table 2-2. P1 Terminal Block Pin Definitions (From Left to Right)

Pin Number	Pin Name	Description
1	AVCC1	Analog Input 1 Supply Voltage
2	AIN1	Analog Input 1
3	AGND	Ground
4	AVCC2	Analog Input 2 Supply Voltage
5	AIN2	Analog Input 2
6	AGND	Ground

Table 2-3. P2 Terminal Block Pin Definitions (From Left to Right)

Pin Number	Pin Name	Description
1	AVCC3	Analog Input 3 Supply Voltage
2	AIN3	Analog Input 3
3	AGND	Ground
4	AVCC4	Analog Input 4 Supply Voltage
5	AIN4	Analog Input 4
6	AGND	Ground
7	V+	Signal (6-24 VDC) (12 VDC Recommended)
8	GND	Ground

Top

The top of the Analog Input Module has two RJ45 ports labeled **RS485**. Both ports provide an RS485 interface that accommodates a Modbus device for performing Modbus read and write operations. You can also use these ports to daisy chain Analog Input Modules. In addition, the right port can accept a Category 5E patch cable assembly connected to a Base Unit for downloading configuration settings from the Base Unit. Table 2-4 lists the pin assignments for these ports.

Figure 2-2. RJ-45 Ports on the Top of the Analog Input Module

Table 2-4. Pin Assignments for RS485 Ports on Top Panel

Pin	Analog Receiver	Generic Modbus Master Device
1 (first pin from the left)	GND	GND
2	—	Reserved
3	TX+	RX+
4	TX−	RX−
5	RX−	TX−
6	RX+	TX+
7	—	Reserved
8	GND	Ground

Back

The back of the Analog Input Module has serial number, model name, power and temperature specifications, and hazard information.

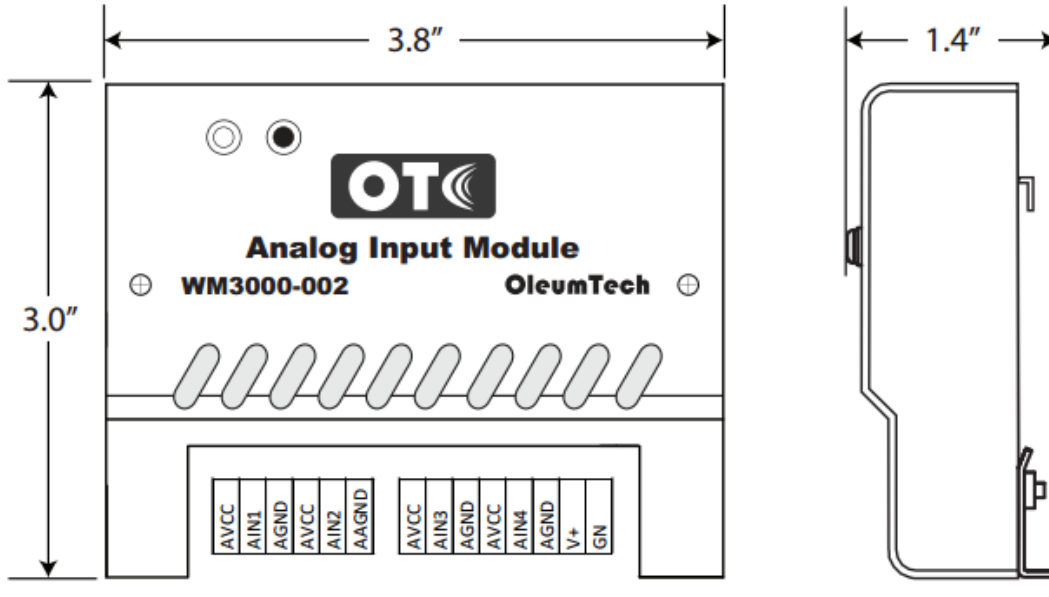**OleumTech** Analog Input Module User Guide

Dimensions

Figure 2-3. Analog Input Module Dimensions

3. INSTALLING THE ANALOG INPUT MODULE

This chapter describes how to install the Analog Input Module.

Selecting a Site

When selecting a site for the Analog Input Module, choose a location that places the Analog Input Module close enough to the Base Unit, so the two devices can be connected using the 1-foot Category 5E patch cable assembly.

Setting the Jumpers

The Analog Input Module PCBA provides a set of jumpers for selecting an input power range and for terminating the last module in a daisy-chain configuration. All other jumpers must be left in their default settings.

To access the jumpers, remove the top cover of the Analog Input Module.

Input Power Jumper Setting

The default input power setting for the Analog Input Module is 0-5 V. To change this setting, set the jumpers in Figure 3-1 and Table 2-2 on the next page to 0-10 V or 4-20 mA.

Daisy Chain Jumper Setting

If you connect multiple Analog Input Modules in a daisy-chain configuration, strap pin 3 on jumper **JP1** on the last module in the chain to terminate the module internally (see Figure 3-1 on the next page).
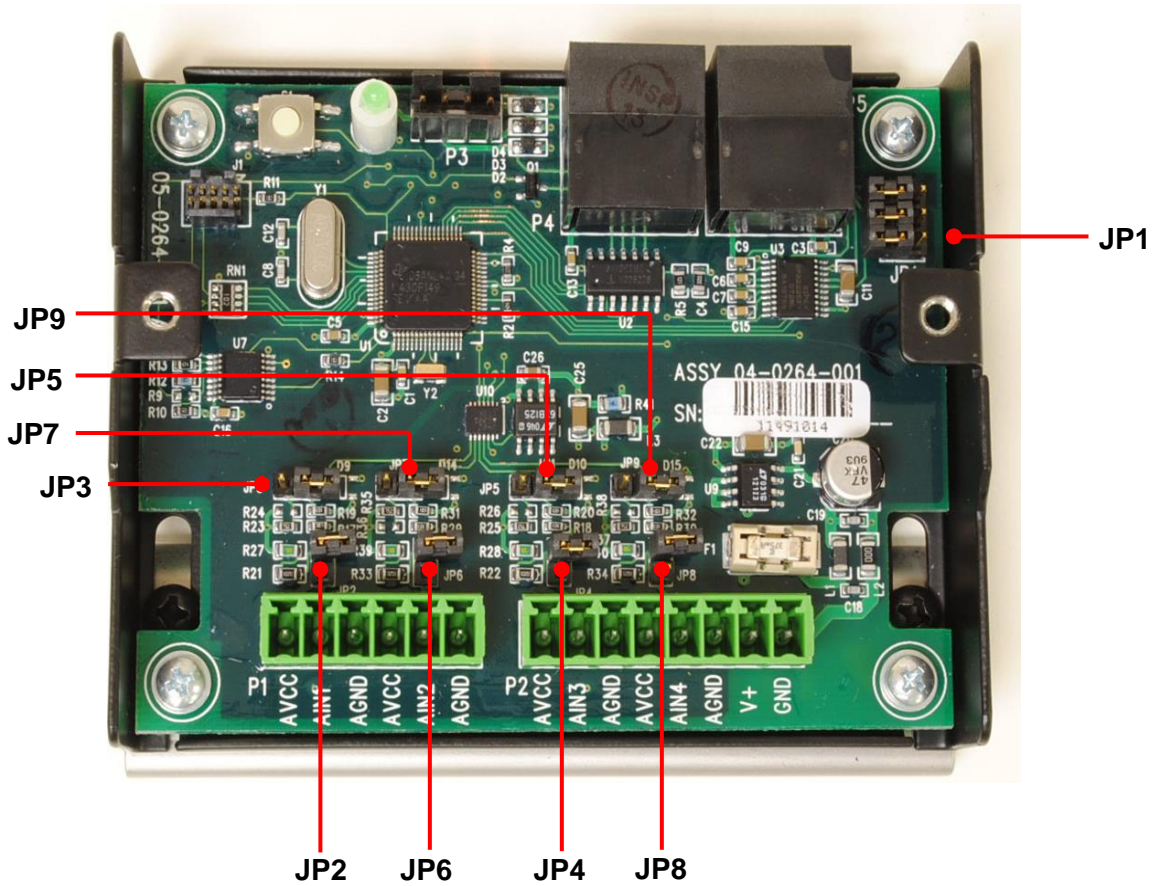
Figure 3-1. Jumpers on the Analog Input Module PCBA

Table 3-1. Using Jumpers to Select Input Range

To Select This Input Range	Set The Jumpers As Shown Below	
	JP3, JP7, JP5, JP9	JP2, JP6, JP4, JP8
0-5 V (*default*)	OFF	OFF
0-10 V	ON	OFF
4-20 mA	OFF	ON

Performing a Bench Test

Before you install the Analog Input Module in the field, we recommend you perform a bench test to ensure that the unit is working properly. During the bench test, some modules require you to use the BreeZ Configuration Software to configure the module. For more information, refer to the *BreeZ® Configuration Software User Guide*.

Field Installation

Field-installation procedures involve the following steps:

1. Mount the Analog Input Module in a NEMA enclosure (or an enclosure with a minimum IP 54 rating and that complies with IEC 60079-0 and IEC60079-15). See "Mounting in a NEMA Enclosure," below.

2. Provide power to the Analog Input Module. See page 16.

3. Install one or more Base Units. See page 18.

4. Confirm your installation. See page 18.

Mounting in a NEMA Enclosure

Before you install the Analog Input Module inside a NEMA 4X-type enclosure (or an enclosure with a minimum IP 54 rating and that complies with IEC 60079-0 and IEC60079-15), be sure the module meets applicable grounding requirements in the NEMA 4 enclosure.

CAUTION. Installation of the Analog Input Module should only be installed by a factory representative or a qualified installer.

CAUTION. The Analog Input Module must be installed within an enclosure that requires a tool to access. This is to prevent inadvertent disconnection of any of the power wiring, signal wiring or communication cables.

Note: This equipment is suitable for use in Class I, Division 2 Groups A, B, C, and D or non-hazardous locations only.

For ATEX/IECEx applications, the Base Unit or DH2 shall be installed in an enclosure providing a degree of protection of at least IP 54 that complies with IEC 60079-0 and IEC60079-15.
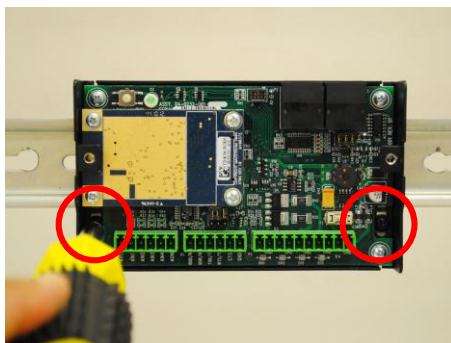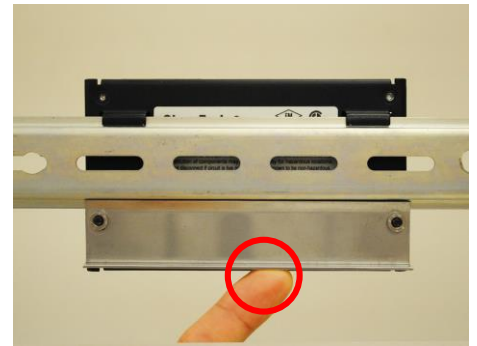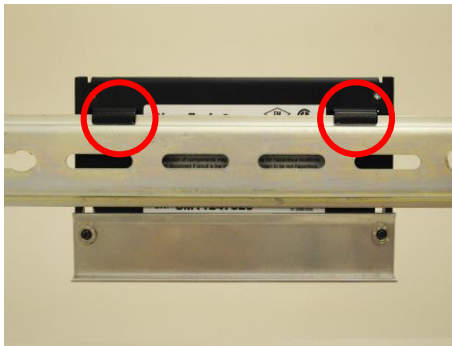
To mount the Analog Input Module in a NEMA 4X-type enclosure (or an enclosure with a minimum IP 54 rating and that complies with IEC 60079-0 and IEC60079-15): *Base Unit depicted for demonstration.

1. Remove the two screws in the Analog Input Module top plate and carefully remove the cover from the Module. Then loosen the two mounting screws for the DIN rail clamp.
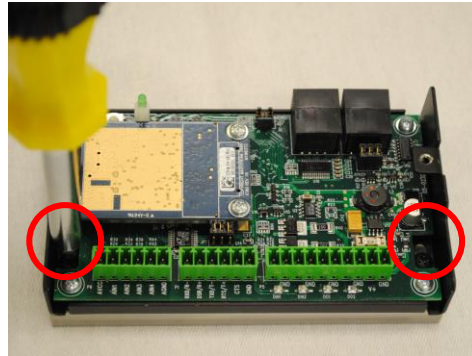
2. Loop the connector ends through the opening in the bottom of the NEMA 4 enclosure (or an enclosure with a minimum IP 54 rating and that complies with IEC 60079-0 and IEC60079-15) including compression fittings, before mounting devices in the enclosure.

3. Mount each Analog Input Module on a 32 mm (1.26 inch) DIN 1 or 35 mm (1.38 inch) DIN 3 rail inside the NEMA 4X enclosure. The location in the enclosure must allow access to the connectors for easy installation and service.

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4. If daisy-chaining Analog Input Modules, connect them using the **RS485** port on the top of the modules and the 1-foot Category 5E patch cable assembly. Strap pin 3 on jumper **JP1** on the last module in the chain (see "Daisy Chain Jumper Setting" on page 12).

5. Use 18-to-24 gauge wires to make I/O connections (see Figure 3-2).

6. Use conduit clamps approved for NEMA 4X enclosures (or an enclosure with a minimum IP 54 rating and that complies with IEC 60079-0 and IEC60079-15) to deliver I/O, power wiring and antenna cabling. Install conduit clamps as required. Tighten the threaded conduit sufficiently to prevent the entry of moisture or dirt.
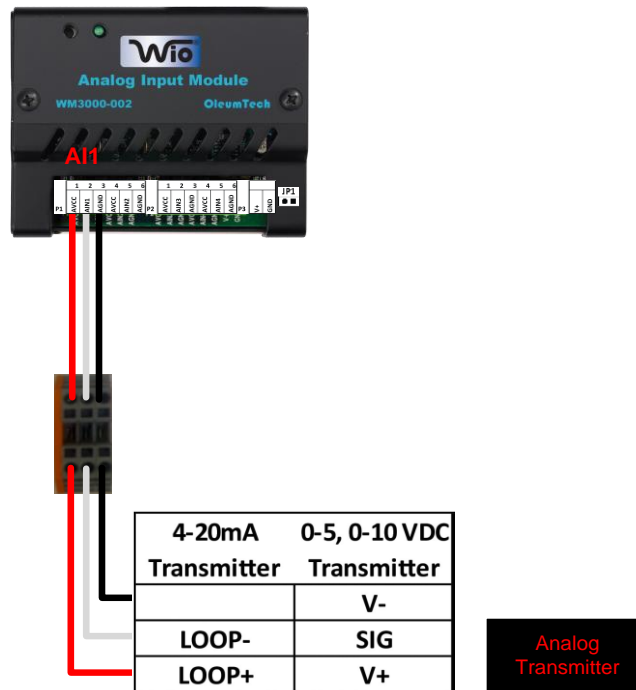

Figure 3-2. Wiring Diagram

Providing Power

The Analog Input Module operates on a minimum of 6 VDC and a maximum of 24 VDC power (12 VDC recommended). Power is provided using the Power Input (**V+**) and Ground (**GND**) pins on the Analog Input Module (see Figure 3-3). Use 18-to-24 gauge wires to make I/O and power source connections. The Power LED on the Analog Input Module flashes five times when the module powers up.

WARNING. EXPLOSION HAZARD. Substitution of components may impair intrinsic safety.

⚡ **WARNING. EXPLOSION HAZARD.** Do not disconnect equipment unless power has been switched off or the area is known to be nonhazardous.

⚡ **WARNING**. **EXPLOSION HAZARD.** Do not remove or replace fuse when energized.

Before you provide power to the Analog Input Module, review the following guidelines.

- Always provide a good-quality DC power supply (regulated or battery) to the Analog Input Module. Properly fuse the source DC voltage to the Analog Input Module with a fast blow minimum 500 mA fuse.

- Do not daisy chain Analog Input Module power lines with other devices.

- If the power supply is shared between high-current load devices, such as solenoids and motors, and a Analog Input Module, wire the high-current load devices directly to the power supply.

- Use twisted-pair wiring to reduce the noise for high-current loads.

- Keep all power, I/O, and antenna wires away from high-current load lines.

- If the solenoid or relay device does not contain a built-in protection diode, install one across the coil.

- Do not connect instrument ground (battery negative terminal) to earth ground.

V+ and GND Pins
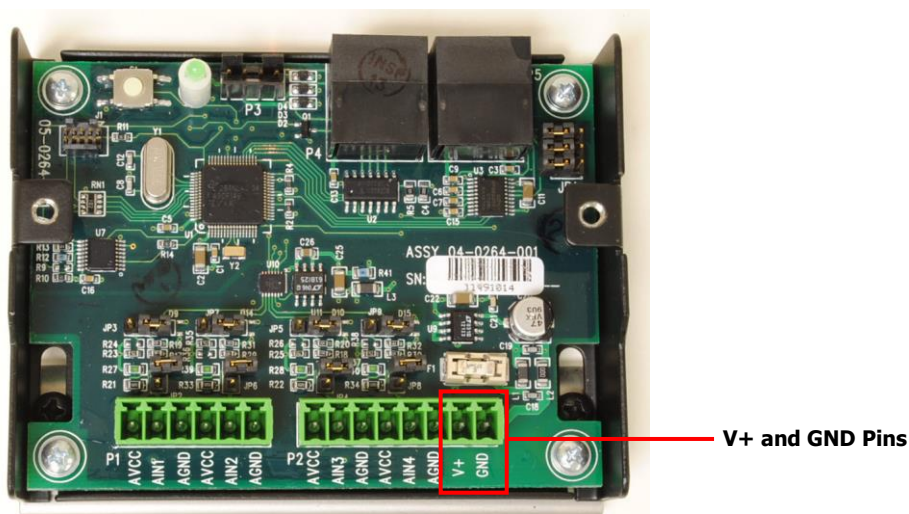
Figure 3-3. Power Input and Ground Pins on the Analog Input Module

Installing Base Units

To complete the Analog Input Module installation, install one or more Base Units (refer to the *Wireless Gateway User Guide*). Then use the Transmitter RJ-45 Configuration Cable to connect the Base Unit's RS485 port to the **RS485** port on the top of the Analog Input Module.

Confirming Your Installation

After you complete your installation, use the BreeZ® Configuration Software to create a project file and confirm Modbus communication between the Analog Input Module and Base Unit (refer to the *BreeZ® Configuration Software User Guide*).

4. MAINTAINING THE ANALOG INPUT MODULE

This chapter describes maintenance procedures for the Analog Input Module.

The topics covered in this chapter are:

- General Maintenance (page 20)

- Updating Firmware (page 20)

General Maintenance

The Analog Input Module is easy to maintain and does not require periodic system checks. It generally only needs a yearly visual inspection for the following:

- Is the Analog Input Module still securely fastened to the mounting location?

- Are there any visible signs of corrosion, cracks or residue build-up on the unit?

- Has anything about the intended use of the original application changed?

If the Analog Input Module is securely fastened, with no signs of corrosion, cracks, or residue build-up, or if nothing has changed about the location of its intended use, it should continue to operate within designed specification.

If the Analog Input Module is not securely fastened; if there are signs of corrosion, cracks, residue build-up; or if there has been a change to the location of its intended use resulting in undesirable performance, contact the manufacturer for service instructions.

⚠️ **WARNING:** TO PREVENT STATIC DISCHARGE, WIPE WITH DAMP CLOTH ONLY.

Updating Firmware

From time to time, OleumTech provides new firmware to offer new features, improve performance, and fix bugs. To take advantage of these benefits, we recommend you perform the following procedure periodically to check for new firmware versions and download them as they become available.

1. Remove the two screws in the Analog Input Module top plate and carefully remove the top cover from the module.

2. Attach the USB connector on the USB-to-RS232 Serial Adapter Cable to an available USB port on a PC running BreeZ. Connect the other end of the cable to the RS232 connector on the Transmitter RJ-45 Configuration Cable.

3. Connect the 4-pin connector on the other end of the Transmitter RJ-45 Configuration Cable to the 4-pin configuration connector labeled **P3** on the Analog Input Module (see Figure 4-1).
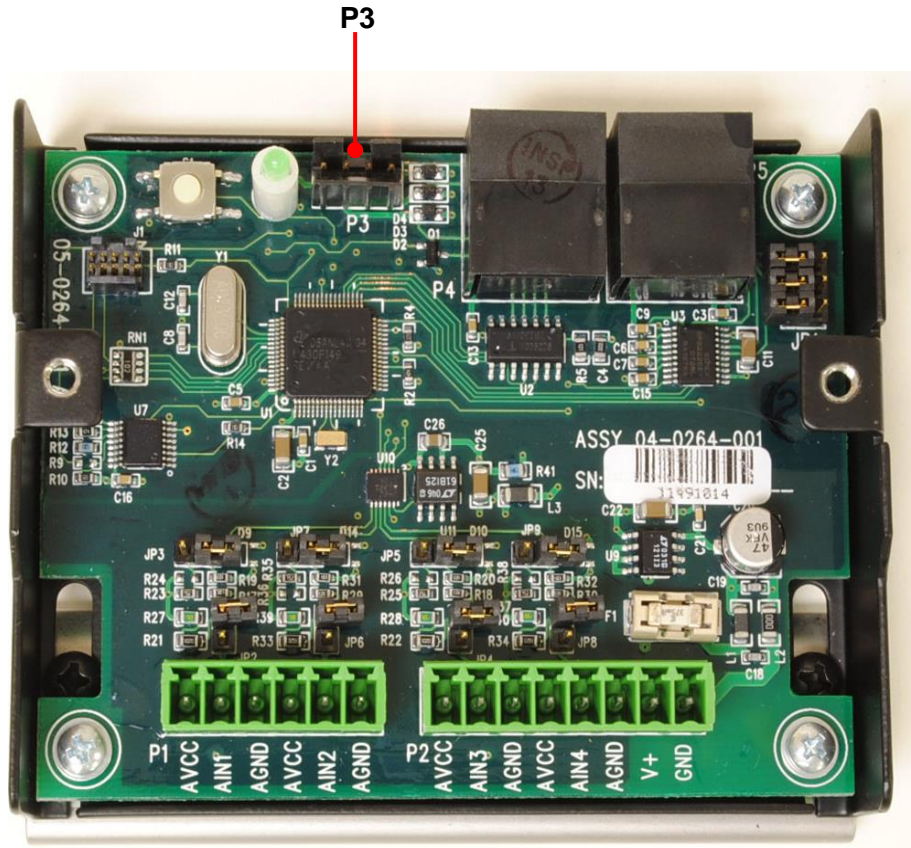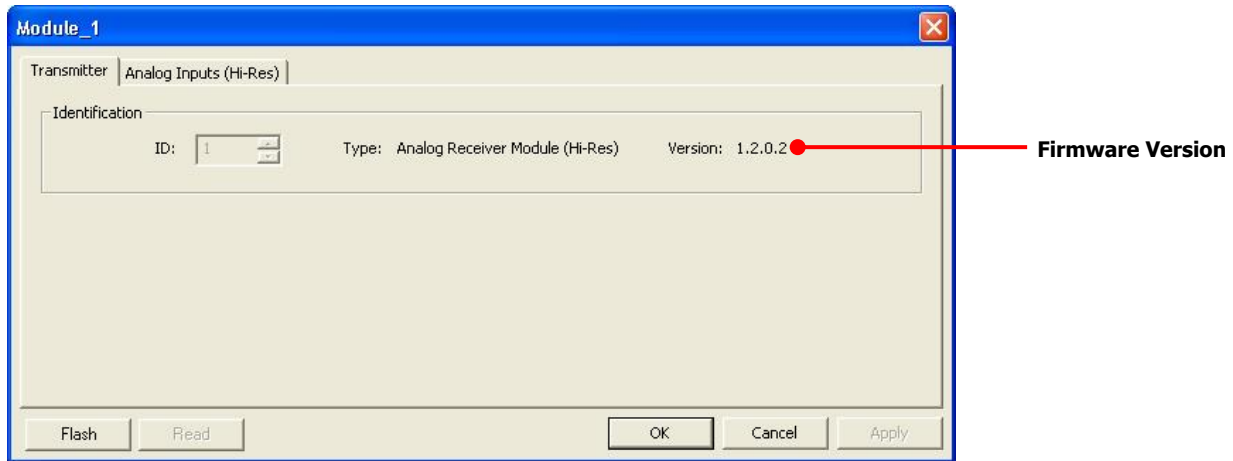
P3

Figure 4-1. P3 Connector on the Analog Input Module

4. Start BreeZ on a computer connected to the Analog Input Module and open the project file.

5. In the Project Explorer window, double-click the Analog Input Module.

6. Press the right mouse button and click **Connect**. A dialog box appears with the firmware version shown next to **Version**.

Firmware Version

7. Launch a browser on the PC and go to the appropriate support section on the OleumTech website: www.oleumtech.com.

8. Click the Analog Input Module and confirm that the firmware version shown is the same as the one shown in the dialog box. If the version shown on the website is higher than the one in the dialog box, follow the on-screen instructions to download the firmware from the website to the PC connected to the Analog Input Module.

9. With the Analog Input Module selected in the BreeZ Project Explorer window, press the right mouse button and click **Connect**.

10. Click the **Flash** button.

11. Go to the location where you downloaded the new firmware, then double-click the firmware file.

12. When the download message appears, click **OK**. A dialog box appears as the updated firmware writes to flash memory. A Flash in progress gauge shows the progress of the firmware upgrade.

13. At the end of the upgrade, click **OK** to close the dialog box. Then remove the cable attached to the Analog Input Module, reinstall the cover to the enclosure housing, and screw down the cover until it is securely in place.

5. TROUBLESHOOTING

In the unlikely event you encounter a problem using the Analog Input Module, refer to the troubleshooting suggestions in this chapter to identify and resolve the problem.

The topics covered in this chapter are:

- Analog Input Module Not Communicating with BreeZ® (page 24)

- Analog Input Module Not Communicating with the Base Unit (page 24)

- Analog Input Module Reports Wrong Measurements (page 24)

- Measurements are Always Zero (page 25)

- Resetting the Analog Input Module (page 25)

Analog Input Module Not Communicating with BreeZ®

If you are not able to communicate with the Analog Input Module using the BreeZ Configuration Software:

1. Check that the power connection to the Analog Input Module is secure.

2. Connect the PC running BreeZ configuration software to the Analog Input Module.

3. Confirm that PC's COM port and the COM port configured in the BreeZ Configuration Software are the same (refer to the *BreeZ® Configuration Software User Guide*). Also, verify that the COM port is not being used by another device, as this can block communications with the Analog Input Module.

4. Check that the appropriate device is selected in the BreeZ Configuration Software.

Analog Input Module Not Communicating with the Base Unit

If the Analog Input Module is not communicating with the Base Unit, perform the following procedure and refer to the *BreeZ® Configuration Software User Guide*.

1. Update all devices with the same project file.

2. Check that the Analog Input Module's slave ID setting match that of the project (refer to the *BreeZ® Configuration Software User Guide*).

3. Check that the Category 5E patch cable assembly is securely attached at both ends.

4. Confirm that the Interval setting for the Analog Input Module and Base Unit is correct (refer to the *BreeZ® Configuration Software User Guide*).

Analog Input Module Reports Wrong Measurements

If the Analog Input Module is reporting incorrect measurements:

1. Check the Analog Input Module for damage or malfunctions.

2. Perform a strap calibration (refer to the *BreeZ® Configuration Software User Guide*).

Measurements are Always Zero

If the measurements are always zero:

- Select the appropriate channel (refer to the *BreeZ® Configuration Software User Guide*).

- Confirm that the Base Unit or Analog Input Module has been reset.

Resetting the Analog Input Module

The top of the Analog Input Module has a reset button for reinitializing the unit.

To reset the Analog Input Module:

1. Remove the two screws in the Analog Input Module top plate and carefully remove the top cover from the module

2. Find the reset button on the front of the Analog Input Module (see Figure 2-1 on page 8).

3. Using a small screwdriver, push in and hold the recessed reset button for at least 10 seconds, then release. The LED flashes five times after the device is reset.

APPENDIX A. SPECIFICATIONS

Hardware Specifications

Device Functionality:	Analog Input Expansion Module
User interface:	Standard RS232 serial interface
I/O Interface:	4 analog inputs
Resolution:	24-bit ADC
Accuracy:	0.1% of full scale, 0.2% of full scale over temperature range
Sensor/Receiver Voltage:	2-Wire: 4-20 mA 3-Wire: 0-5 or 0-10 V (jumper selectable)
Input Impedance:	250 ohm (4-20 mA), 57K (0-5 V), 133K (0-10 V)
RS485/Serial:	RS485 (2-wire and 4-wire), 9,600/19,200 baud, Modbus/RTU protocol
Multi-dropped Units:	247 maximum
Self-Diagnostics:	Contains comprehensive self-checking software and hardware for continuous monitoring of operation

Approvals and Certifications

Over Voltage Rating:	Transient voltage suppressor on each port
Short Circuit Protection:	Fuse protection (375 mA)
FCC: FC	FCC Part 15
Industry Canada (IC):	ICES-003
Safety:	Class I; Division 2 (Certification Pending)

Mechanical Specifications

Dimensions:	Width: 3.8 inches (97 mm) Height: 1.4 inches (36 mm) Depth: 3 inches (76 mm)
Mounting Hardware:	DIN rail or direct mount / custom enclosures available

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Electrical Specifications

DC Power Input:	24 VDC maximum; 12 VDC normal; 6 VDC minimum
Power Consumption:	60 mW @ 12 VDC (does not include sensors)
Wiring:	18- 24 AWG

Operating Conditions

Temperature:	-40° F to 185° F (-40° to 85° C)
Humidity:	0% to 99%, non-condensing

APPENDIX B. COUNT CHART

The following table shows the counts for 4-20mA and 1-5V.

Voltage	Amps	Counts
1	0.004	819
1.47	0.005	1024
1.71	0.006	1229
1.94	0.007	1433
2.18	0.008	1638
2.41	0.009	1843
2.65	0.010	2048
2.88	0.011	2252
3.12	0.012	2457
3.35	0.013	2662
3.59	0.014	2867
3.82	0.015	3071
4.06	0.016	3276
4.29	0.017	3481
4.53	0.018	3686
4.76	0.019	3890
5	0.020	4095

APPENDIX C. GLOSSARY

Term	Definition
Baud rate	A data transmission rate (bits/second) for communications devices, such as the Analog Input Module, Analog Input Module, and Wireless Gateway.
COM port	A communications channel or pathway over which data is transferred between computing devices, such as the Analog Input Module, Analog Input Module, and Wireless Gateway.
Modbus	A high-level serial communications protocol for industrial networks. Modbus protocol is defined as a master/slave protocol, where a device operating as a master polls one or more devices operating as a slave. A slave device cannot volunteer information; it must wait to be asked for it. The master writes data to a slave device's registers and reads data from a slave device's registers. A register address or register reference is always in the context of the slave's registers.
USB	Universal Serial Bus. A port for connecting computing devices, such as a PC and Wireless Gateway.

APPENDIX D. LIMITED WARRANTY

a. OleumTech warrants that goods described herein and manufactured by OleumTech are free from defects in material and workmanship for two (2) years from the date of shipment.

b. OleumTech warrants that goods repaired by it pursuant to the warranty are free from defects in material and workmanship for a period to the end of the original warranty or ninety (90) days from the date of delivery of repaired goods, whichever is longer.

c. Warranties on goods not manufactured by OleumTech are expressly limited to the terms of the warranties given by the manufacturer of such goods.

d. All warranties are void in the event that the goods or systems or any part thereof are (i) misused, abused or otherwise damaged, (ii) repaired, altered or modified without OleumTech's consent, (iii) not installed, maintained and operated in strict compliance with instructions furnished by OleumTech, (iv) worn, injured or damaged from abnormal or abusive use in service time, (v) subjected to acts of God, or extreme weather phenomenon including, but not limited to, flood, lightning, tornado or hurricane, or (vi) intentional acts including, but not limited to vandalism, sabotage, explosion or acts of terrorism.

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APPENDIX E. COMPLIANCES

Important Information to the User

- This device MUST be professionally installed only by a factory representative or a trained authorized technician.

- Changes or modifications not expressly approved by the manufacturer may void the user's authority to operate the equipment.

- This device complies with Part 15 of the FCC Rules. Operation is subject to the following two conditions: 1) this device may not cause harmful interference, and 2) this device must accept any interference received, including interference that may cause undesired operation.

FCC Interference Statement

This equipment has been tested and found to comply with the limits for a class B digital device, pursuant to Part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference in a residential installation. This equipment generates, uses and can radiate radio frequency energy and if not installed and used in accordance with the instructions, may cause harmful communications to radio communications. However, there is no guarantee that interference will not occur in a particular installation. If this equipment does cause harmful interference to radio or television reception, which can be determined by turning the equipment off and on, the user is encouraged to try to correct the interference by one of the following measures:

- Reorient or relocate the antenna.

- Increase the separation between the equipment and receiver.

- Consult the manufacturer for technical help.

This equipment has been certified to comply with the limits for a class B computing device, pursuant to FCC Rules. In order to maintain compliance with FCC regulations, shielded cables must be used with this equipment. Operation with non-approved equipment or use of unshielded cables is likely to result in interference to radio and television reception. The user is cautioned that changes or modifications made to the equipment without the approval of the manufacturer could void the user's authority to operate this equipment.

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