

BLM Series  
BlueLynx Wireless Modules  
Operating Guide

PRELIMINARY MANUAL -- UNRELEASSED COPY

PRELIMINARY MANUAL -- UNRELEASSED COPY

*Caution: This manual should be read carefully before installation.*

W i l c o x o n

For product information or technical assistance, contact:

**Wilcoxon Research, Inc.**  
21 Firstfield Road, Gaithersburg, MD 20878 USA  
1-800-WILCOXON  
301-330-8811  
Fax: 301-330-8873  
Email: [techasst@wilcoxon.com](mailto:techasst@wilcoxon.com)  
Internet: <http://www.wilcoxon.com>

# Safety and License-free Operation

The Blue Lynx modules can be safely operated when the instructions in this manual are carefully followed. This section summarizes the safety considerations. Reminders, in the form described below, will appear in the detailed instructions to assure operator awareness of these safety considerations. Qualified personnel should install and maintain the Blue Lynx modules only after becoming thoroughly familiar with this manual.



**WARNING:** This symbol is used in the instruction manual where the safety of the operator must be considered. The instruction manual should be consulted and read carefully.



**CAUTION:** This symbol is used when caution is needed to prevent damage to equipment. It is used where careful attention to certain procedures described in the instruction manual is needed. This symbol is also used to emphasize procedures other than normal operating procedures.

## SAFETY SUMMARY



**WARNING: TO PREVENT FIRE OR SHOCK HAZARD, DO NOT EXPOSE THIS EQUIPMENT TO RAIN OR MOISTURE.**

1. Make sure that the BLM-series module is securely mounted to the DIN rail.
2. Disconnect the power to the module before connecting or disconnecting sensor or system wiring.
3. To reduce the risk of electric shock, do not attempt repairs to module. No user-serviceable parts are inside. Refer all servicing issues to Wilcoxon Research, Inc.
4. Do not attempt to operate a module without the protective case secured.
5. All wiring must be connected to the module before electrical power is connected. Inspect for frayed or cut cables prior to operation.
6. Do not expose this equipment to rain or moisture.
7. All wiring and connections must follow the National Electric Code and local electrical codes.
7. **Use common sense and avoid haste!**

## LICENSE-FREE OPERATION



**CAUTION:** The user has the privilege of operating this equipment without obtaining a license from the Federal Communication Commission (FCC) providing the user make no changes or modifications to the BLM-series modules. Changes to the modules not authorized by Wilcoxon Research, Inc. could void the user's authority to operate the BLM-series modules without a site-specific FCC license.

**NOTE:** This equipment has been tested and found to comply with the limits for a Class A digital device, pursuant to Part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference when the equipment is operated in a commercial environment. This equipment generates, uses, and can radiate radio frequency energy and, if not installed and used in accordance with the instruction manual, may cause harmful interference to radio communications. Operation of this equipment in a residential area is likely to cause harmful interference in which case the user will be required to correct the interference at his own expense.

# Contents

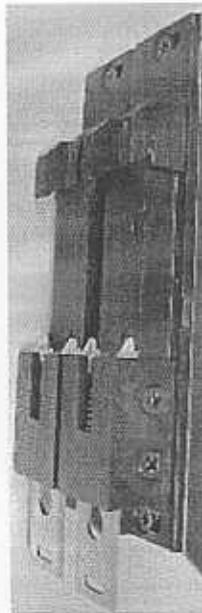
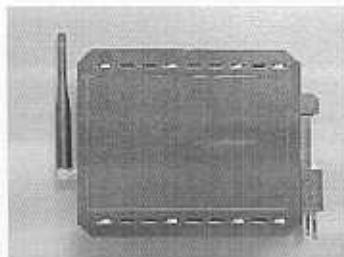
<b>Safety and License-free Operation.....</b>	<b>2</b>
SAFETY SUMMARY .....	2
LICENSE-FREE OPERATION .....	2
<b>1.0 Product Description .....</b>	<b>4</b>
<b>2.0 Installation .....</b>	<b>4</b>
2.1 Mounting .....	4
2.1.1 Installation and Removal .....	4
2.1.2 Location .....	4
2.2 Interface Connections .....	5
<b>3.0 Operation .....</b>	<b>7</b>
3.1 Setting the BLM-RM and BLM-TM addresses .....	7
3.2 Powering the BLM-RM and BLM-TM .....	7
3.3 Verifying operation .....	8
3.3 Establishing Communication .....	8
3.4 Resetting the Module .....	8
<b>4.0 Maintenance .....</b>	<b>8</b>
<b>5.0 Warranty .....</b>	<b>9</b>
<b>6.0 Technical Assistance .....</b>	<b>9</b>
6.1 Technical Assistance .....	9
6.2 Customer Service .....	9
<b>Appendix: .....</b>	<b>10</b>
BLM-TM Module Terminal Definitions .....	11
BLM-RM Module Terminal Definitions .....	11
BLM-RM Module Terminal Definitions and Wiring .....	12
BLM-TM Module Terminal Definitions and Wiring .....	12

## 1.0 Product Description

The Blue Lynx BLM-series of modules are designed to allow extending process control loop instrumentation using a Radio Frequency link. The wireless receiver and transmitter modules use the Bluetooth™ wireless technology operating in the 2.4 GigaHertz (GHz) license-free band. Bluetooth™ allows wireless data communication up to 100 meters within typical factory environments. The transmitter and receiver modules communicate using frequency hopping spread spectrum communication.

Transmitter and receiver modules are available with four (4) channels of 4-20 mA, 0 to 5 Volt process loop data. The data transmission is unidirectional, i.e. - a transmitter/received pair sends all data in one direction only. Consequently, the transmitter module is the data input module, connecting to the 4-20 mA loop sensors, and the receiver module is the data output module, connecting to the process control loop instrumentation equipment input channels. The transmitter module samples each channel 10 times per second.

The modules have sixteen (17) terminals arranged in three terminal blocks. Each data channel has three (3) connections. The input and output channels are unipolar. The signal range is from zero (0) volts to positive 5 volts, full scale, on the transmitter module and 4 milliamperes to 20 milliamperes on the receiver module. Each module has an RF connector for the antenna and three Light Emitting Diode (LED) indicators.



## 2.0 Installation

### 2.1 Mounting

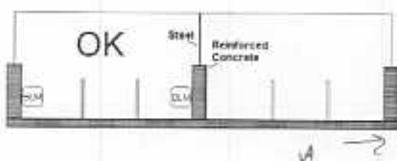
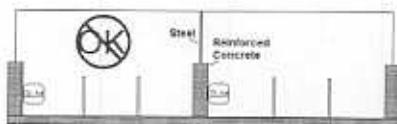
#### 2.1.1 Installation and Removal

The BLM-series Blue Lynx modules mount to standard 35 mm DIN rail mounts. The module base has a spring-loaded snap-in mount. To mount the module place the fixed end of the mounting over the DIN rail and, using a screwdriver blade, gently pull the spring-loaded clip of the module down until it locks into place. Since the module has two clips, each must be locked into place.

To remove the module, simply use a screwdriver blade to release the spring-loaded clip of each mount of the module.

#### 2.1.2 Location

The BLM-series Blue Lynx modules will not function correctly when mounted within steel, aluminum, or other electrically conductive boxes. The modules are radio transmitters and receivers and, as such, the antenna must be located where the radio signals can propagate to other modules. This can be accomplished through using electrically non-conductive boxes or locating the antenna at a distance from the module. When two or more modules are located in near proximity to one another, the antennas of the module must be spaced at least 8 inches (20 cm) apart.



Ideally, the transmitter and receiver modules should be located within a direct line-of-sight view of each other. However, they can function well as long as there are no reinforced concrete or solid metal walls between the modules. The modules will be able communicate even if there are machines located between the modules so long as there are no solid conductive walls between the modules. If the modules are separated by walls of reinforced concrete or steel, data transmission cannot be guaranteed.

The BLM-TM and BLM-RM must be located no more than 100 meters from each other. The ground connections for each module are not required to be common. Each module may have its own grounding path independent of the other module, so long as each is ground.

**CAUTION:** To avoid human exposure to potentially harmful levels of radio frequencies, the module antenna should be located at least seven (7) feet above floor level.

## 2.2 Interface Connections

The terminal definitions for the BLM-TM and the BLM-RM are the same. Each module has sixteen (17) terminal connections. Each channel has three (3) terminal connections, the reset uses two (2) terminal connections, and the power uses three (3) terminal connections. The appendix to this manual provides a detailed description of the terminal definitions.

All wiring for 4-20 mA loops are uni-polar, that is, all voltages are entirely positive. The negative termination serves as the circuit common (or low side) of the circuit. The shield terminal is coupled to the module ground reference (-24 VDC). The shield of the system wiring, whether for the transmitter or received, should always be connected at the module shield terminal to minimize spurious Radio Frequency signal radiation.

**CAUTION:** Precautions must be taken to avoid generating a ground loop in the receiver wiring since the internal module connection of the shield outputs in the receiver module is coupled to the module negative power (-24 VDC) connection. Failure to avoid ground loops will result in erroneous or noisy signals.

8) →

The modules require a 24 Volt DC, nominal, power connection. The connection between the power source and the module must not exceed 10 feet (3 meters). Module power is applied through the (+) and (-) terminals of the power connection on J3.

The two (2) terminals identified as "reset" provide for an external switch closure contact to reset the module software. Manual section 3.4, Resetting the Module, contains further guidance on this topic.

### 2.2.1 Transmitter Module BLM-TM

The BLM-TM connects to the field sensor wiring. This module allows up to four (4) 4-20 mA sensors or 0 to 5 Volt sensors to connect to the module. Whether a particular channel is set for 4-20 mA loop sensors or 0-5 Volt sensors is determined by a user-accessible jumper. Each channel operates independently and can be individually wired for either 4-20 mA loop or 0 to

5 Volt sensor wiring. The jumper inserts the 250-ohm resistor when the input will be defined as a 4-20 mA loop current. If the input will be a 0 to 5 Volt signal, the jumper must be removed. Accessing the jumpers is explained in the appendix to this manual.

The input to the transmitter module is actually a 0 to 5 Volt signal. The resistor operates to convert the loop current of 4 to 20 mA into 1 to 5 Volts by the operation of Ohm's Law. That is also why 0 to 5 Volt sensors can be directly connected to the input terminals when the jumper is not installed.

**CAUTION:** The module is shipped from Wilcoxon with all jumpers installed (4-20 mA loop operation). If 0-5 Volt operation is desired, the jumpers must be removed.

The jumpers are defined as: JP6 - Channel 1, JP7 - Channel 2, JP8 - Channel 3, and JP9 - Channel 4.

The module antenna should be adjusted so as to be in a vertical position and no more than 4 foot-pounds of torque should be used to tighten the non-standard FCC compliant SMA antenna connector on the front panel of the BLM module.

### 2.2.2 Receiver Module BLM-RM

The BLM-RM connects to the Programmable Logic Controller (PLC) or Distributed Control System (DCS) wiring. This module allows the four (4) outputs to connect to the PLC or DCS. Each channel operates independently and is wired for 4-20 mA loop current output.

Each channel jumper bypasses the coupling capacitor used for RF bypass operation and makes the shield output connection connect directly to the chassis ground of the BLM-RM module. Removing the jumpers allows the shield to be AC coupled for an RF path, but not have a low frequency DC ground loop.

The jumpers are defined as: JP4 - Channel 1, JP5 - Channel 2, JP6 - Channel 3, and JP7 - Channel 4.

The output of the receiver module is a 4 to 20 mA signal referenced to the 24 VDC power supply “-” (minus) input. If power is obtained from the DCS/PLC system, care must be taken to provide a short low-ohmic path between the module negative supply terminal and the ground terminal of the DCS/PLC system. Failure to do so will likely result in noise in the 4-20 mA input of the DCS/PLC.

The module antenna should be adjusted so as to be in a vertical position and no more than 4 foot-pounds of torque should be used to tighten the non-standard FCC compliant SMA antenna connector on the front panel of the BLM module.

## 3.0 Operation

The BLM-TM and BLM-RM modules are shipped with a "default" address by Wilcoxon Research, Inc. to enable communication with each other. The Bluetooth™ communication protocol uses a frequency hopping spread spectrum technique operating in the 2.4 GigaHertz ISM band. The spread spectrum technique used by the Blue Lynx modules requires the BLM-RM and BLM-TM to hop frequencies at the same time and in the same sequence to maintain communication. Any module pair must use the same address setting, otherwise no communication between them will occur. The appendix to this manual shows drawings that identify the location of the eight (8) address jumpers. The least significant address jumper is illustrated with "LSB" and is located toward the front of the module.

The BLM-TM and BLM-RM in a pair must be set to the same address and that address must be unique. That is, no two module sets must have the same address jumper settings.

**CAUTION:** Failing to observe the precaution of setting module addresses to different values in the same facility, will result in erroneous data.

The modules are certified by the Federal Communication Commission for operation in the 2.4 GHz band without the need for an operator license.

### 3.1 Setting the BLM-RM and BLM-TM addresses

The BLM-RM receiver and BLM-TM transmitter modules are shipped from Wilcoxon with "default" addresses set in the modules. It is necessary for the BLM-RM receiver and BLM-TM transmitter module pair to have the same address setting. It is also important that no other BLM-RM receiver and BLM-TM transmitter module pairs have the same address. The cover panel can be removed by the user to access the jumpers used to set the module address. See the Appendix for instructions regarding accessing the interior of the modules.

**WARNING:** Do not make changes to the jumper settings while power is connected to the module. Disconnect all power before attempting jumper setting changes.

The address jumper area has eight (8) sets of jumper pins allowing up to 256 possible address settings. Both modules in a pair must have their jumpers set exactly the same for proper data communication. Any setting may be used provided it is not the same as any other module pair installed within 1,000 meters.

**CAUTION:** No module pairs may have the same address setting as any other module pairs installed within 1,000 meters. Setting other nearby pairs to the same address can result in communication of data to the wrong module receiver.

### 3.2 Powering the BLM-RM and BLM-TM

The BLM-RM receiver and BLM-TM transmitter modules will power up immediately upon application of 24 Volt DC power to the "24 VDC" power input terminals of the modules. The green LED on the panel will illuminate whenever the 24 VDC power is connected. The powering voltage must be between 18 and 27.5 Volts DC.

### 3.3 Verifying operation

After power is applied to the module the internal digital processor will verify proper module operation and illuminate the red LED. If the red LED extinguishes it means the processor has detected a fault condition. In case of a fault condition, check the module power and RF connection to the antenna. For additional assistance, contact Wilcoxon Research Customer Service.

### 3.3 Establishing Communication

Once power is applied and the module is operating correctly, it will transmit a signal to attempt synchronization with its counterpart unit using the jumper-programmed address. Anytime the module is transmitting the blue LED will illuminate and be flashing. During the time when the module is attempting to synchronize with its counterpart, the blue LED will flash rapidly. Once synchronization is achieved, the blue LED flash rate will decrease.

Establishing communication correctly may require resetting the module to force a processor re-boot.

### 3.4 Resetting the Module

If the module is unable to obtain synchronization with its counterpart module, the user may close a contact across the terminals designated "reset" to force the module processor to perform a "warm boot" of the module. The module will then cycle through the same procedure used during initial power-up.

## 4.0 Maintenance

The BL-series modules contain no user serviceable or operator replaceable parts. No maintenance should be attempted by the user. Opening the module and attempting any maintenance will void the user warranty and the Federal Communication Commission (FCC) certification.

Access to the BL-series of modules is limited to the jumper plugs for setting channel configurations and module addresses.

There are no cleaning, cooling, or ventilation requirements for the BL-series modules.

## 5.0 Warranty

- 1. Lifetime Replacement of Our Sensors.** Wilcoxon Research, Inc. will repair or replace any Wilcoxon vibration sensor (including the sensor element within our wireless transmitters) that fails to operate properly under its normally specified conditions, even if the failure is due to ordinary wear and tear. This policy applies to the "lifetime" of the original equipment on which the sensor product is installed, and applies as long as Wilcoxon continues to produce or market the same or any similar substitute sensor product. Failures due to external damage to the sensor or use outside specifications are excluded.
- 2. Total Satisfaction Guarantee.** Write to Wilcoxon within one year of purchase, and Wilcoxon will repair, replace or exchange any product in the Wilcoxon catalogue if you are not satisfied with the performance of the product for any reason. Alternatively, if within 30 days of purchase you write to Wilcoxon and return the product, Wilcoxon will refund the full purchase price.
- 3. Additional Limited Warranty on All Products.** In addition to any coverage provided above, for a period of two years from purchase, Wilcoxon will repair or replace any product manufactured or sold by Wilcoxon that has any defect in design, materials or workmanship.
- 4. How to Make a Warranty Claim.** Warranty claims are made by requesting a products return authorization from Wilcoxon's Customer Sales & Service Department. On receipt of the authorization, the customer is to ship the product to Wilcoxon's facility in Gaithersburg, Maryland. Wilcoxon will repair or replace covered products at its discretion.
- 5. THERE ARE NO WARRANTIES, EITHER EXPRESS OR IMPLIED, INCLUDING THE WARRANTY OF MERCHANTABILITY OR FITNESS FOR A PARTICULAR PURPOSE, EXCEPT AS SPECIFICALLY SET FORTH ABOVE.** Wilcoxon will not be liable for any loss, injury or damages to persons or property, or products furnished by it, or for any delay in delivery, nor will Wilcoxon be liable for indirect, incidental, special or consequential damages of any kind sustained from any cause, including without limitation defect of any kind, installation or service problem, or delay in delivery. In no event may Wilcoxon's liability exceed the cost of the product. This warranty is governed and shall be construed under Maryland law. If any particular limitation of liability or restriction on warranty coverage contained herein is adjudicated to be invalid, the remainder of such limitations and restrictions continue in full force and effect, in order that these such provisions be interpreted to be effective to the fullest extent possible under applicable law. Wilcoxon reserves the right to modify warranty terms applicable to products sold in the future. Wilcoxon's entire warranty obligations for products sold herewith are embodied in this writing.

## 6.0 Technical Assistance

### 6.1 Technical Assistance

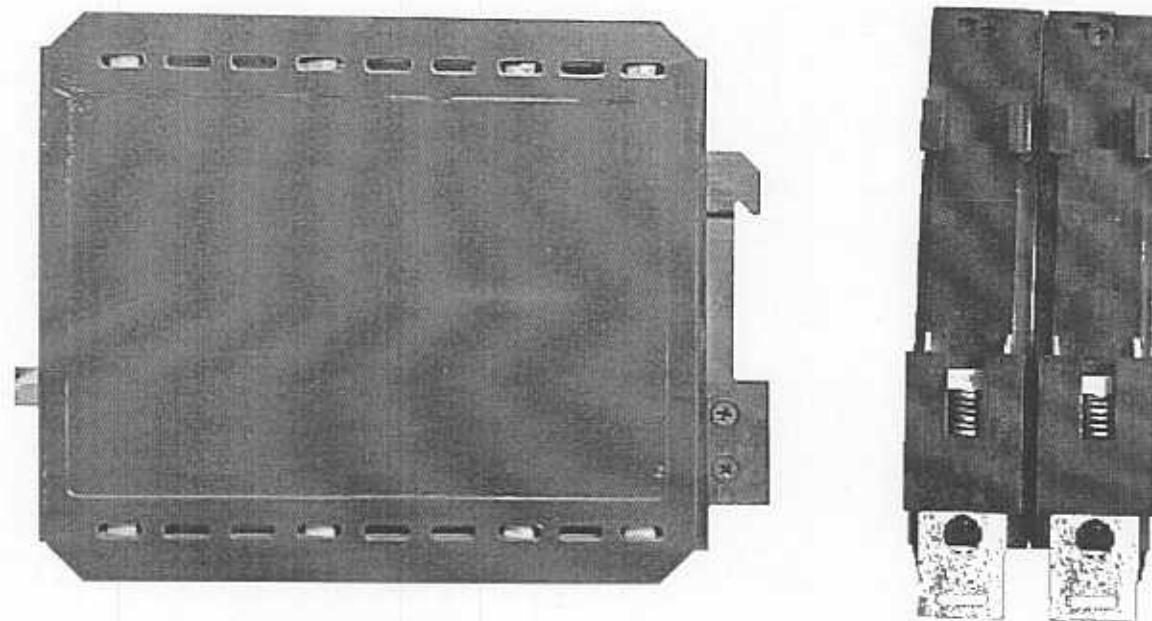
For technical assistance, please contact Wilcoxon's Product Manager at 301-330-8811, fax to 301-330-8873, or email to [techasst@wilcoxon.com](mailto:techasst@wilcoxon.com).

### 6.2 Customer Service

To obtain a Return Goods Authorization (RGA) number, please contact customer service at 301-330-8811, or fax to 301-330-8873.

## Appendix:

Accessing the BLM internal jumper positions

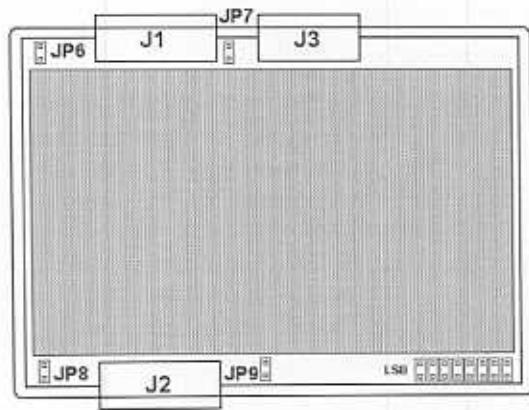


Lay the module on a clean surface with the right side of the module facing up, as shown above.

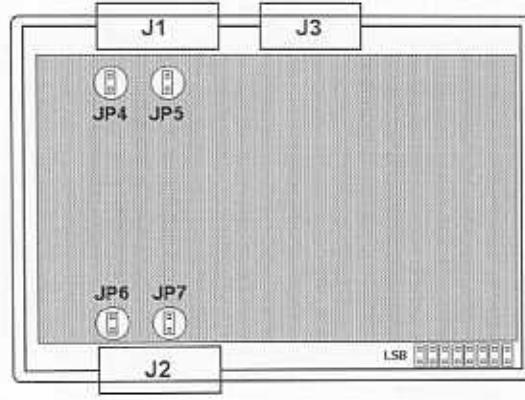
Using a Philips-Head screwdriver, remove the screw holding the mounting base to the case. The spring-loaded tabs have round holes in them to allow accessing the lower attachment screws.

When the mounting bases have been removed, the right side cover can be removed by sliding it to the rear of the case.

The Transmitter Module (BLM-TM) has internal jumpers located in different positions than the Receiver Module (BLM-RM).



*BLM-TM Transmitter Module*

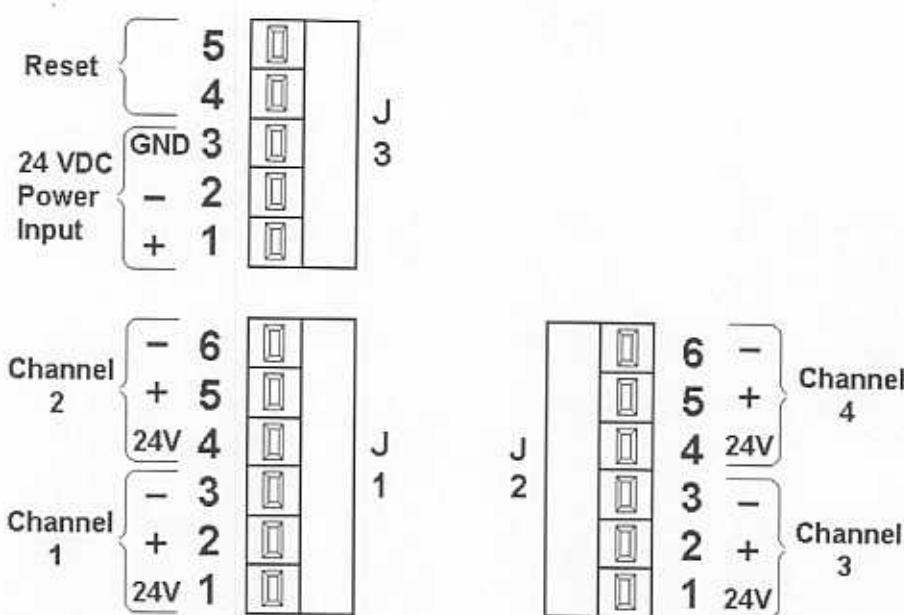


*BLM-RM Receiver Module*

The transmitter module jumpers determine whether any particular channel is defined as a 4-20 mA input or a 0 to 5 Volt input. When the jumpers are installed, that channel will be a 4-20 mA input.

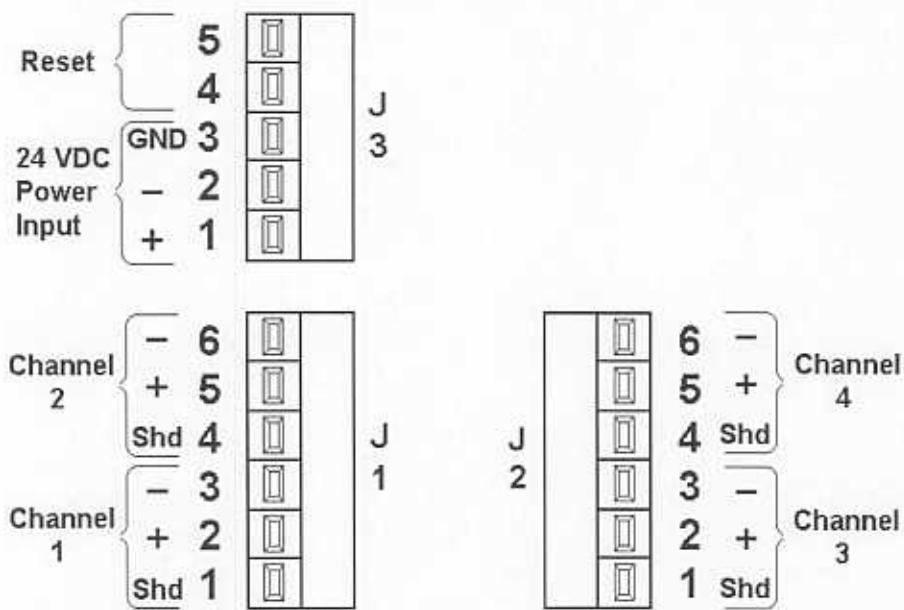
The receiver module jumpers determine whether a particular channel shield connection will be AC coupled to ground or DC coupled to ground. The AC coupling is through a 0.01 microFarad capacitor for RF coupling. When the jumpers are installed, that channel will be DC coupled.

## BLM-TM Module Terminal Definitions



J1 and J3 are on the top of the BLM modules, while J2 is on the bottom of the module. For each of the BLM-TM transmitter channels, a 24 VDC connection is available for powering the 4-20 mA loop sensors.

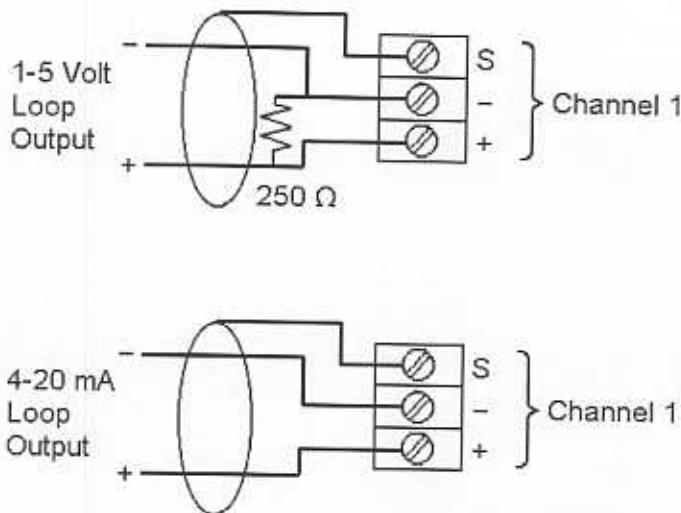
## BLM-RM Module Terminal Definitions



J1 and J3 are on the top of the BLM modules, while J2 is on the bottom of the module. For each of the BLM-RM receiver channels, a ground connection is available for the shield of the loop wiring.

### BLM-RM Module Terminal Definitions and Wiring

The output of the BLM-RM can be configured for either a 4-20 mA current loop or a 1-5 volt voltage output. To convert the 4-20 mA loop current to a 1-5 volt signal, a 250 ohm resistor must be placed across the wiring of the output loop current. This resistor may be placed across either the module output terminals or the input terminals of the measurement system.



### BLM-TM Module Terminal Definitions and Wiring

The transmitter module will be wired differently depending on whether the sensor is a 4-20 mA unit or 0-5 volt unit. The diagram below illustrates the wiring for each type of sensor.

