



## ***MDR221A Wireless V.90 RS232 Modem***

### **User's Manual Version 1.0**



***1000 Park Drive – Lawrence, PA 15055-1018 – (724)746-5500***  
***Web site: [www.blackbox.com](http://www.blackbox.com) E-mail: [info@blackbox.com](mailto:info@blackbox.com)***

Order Toll Free in the US: Call 877-877-BBOX ( Outside the US call 724-746-5500)

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### FCC Notice

**Warning:** 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.

### RF Exposure/Installation Instructions

**Warning:** To satisfy FCC RF exposure requirements for mobile transmitting devices, this equipment must be professionally installed such that the end user is prevented from replacing the antenna with a nonapproved antenna. The end user should also be prevented from being within 20cm of the antenna during normal use with the exception of hands, feet and ankles.

**Caution:** Any change or modification not expressly approved by Black Box could void the user's authority to operate the equipment.

The preceding statement must be included as a CAUTION statement in manuals for OEM products to alert users on FCC RF Exposure compliance.

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## 1) Overview

The MDR221A product provides a wireless RS232 connection between different devices. Each MDR221A unit can be programmed as a Server or a Client, allowing for the creation of a two device or multiple device wireless network. In addition, multiple networks can be created by programming each network of MDR221A units with unique Channel Number and System ID combinations. See Figure 1 below. To create a wireless network, simply program one of the units as a Server and the other units as Clients.

Figure 1 - Multiple Networks Of MDR221A Units



Example: Channel Number = 13  
System ID = 001002003004005006007008

Example: Channel Number = 25  
System ID = 012023034045056067078089

## 2) Flow Control

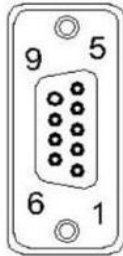
For optimal performance, Hardware Flow Control is strongly recommended. If the Clear To Send (CTS) line is not used, there is a chance that the transmit buffer will fill up to its maximum limit and data will be lost. Whenever CTS is High, the MDR221A is not ready to receive additional data from its host. When CTS is Low, the ConnexLink is ready to receive data.

## 3) MDR221A Definitions

- 1) **Pwr**: Red LED indicates power is connected to the unit.
- 2) **Link**: Green LED indicates the units are in range of one another.
- 3) **Rx**: Red LED indicates a unit is receiving data.
- 4) **Tx**: Green LED indicates a unit is sending data.

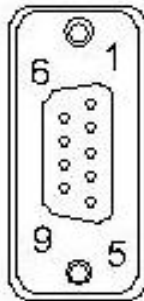
### 3.1 Cable Pinout Definitions

Standard RS232 DB9 Female Connector  
(Black DB9 Female/Female Cable)



Pin	Description
1	DCD
2	RxD
3	TxD
4	DTR
5	GND
6	DSR
7	RTS
8	CTS
9	RI

Null Modem RS232 DB9 Male Connector  
(Gray DB9 Female/Male Cable)



Pin	Description
NC	DCD
2	TxD
3	RxD
4	DSR
5	GND
6	DTR
7	CTS
8	RTS
NC	RI

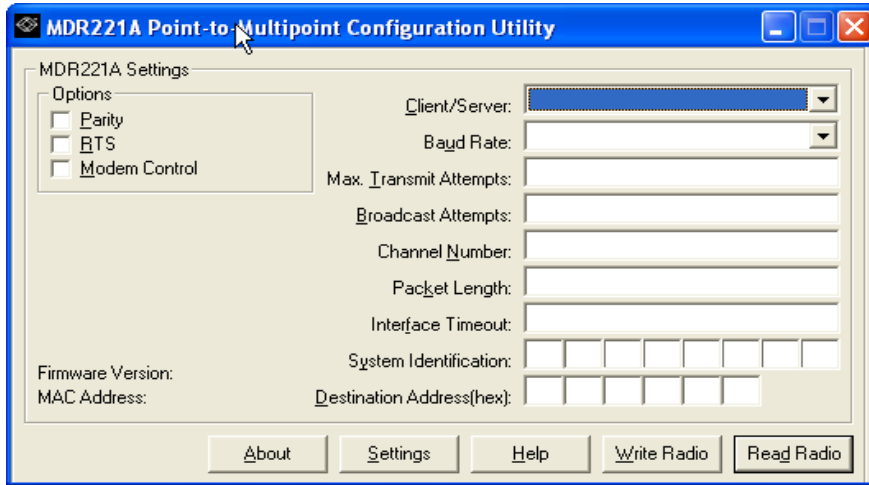
### 3.2 MDR221A Configuration Utility Software

The software CD included with your MDR221A units provides a utility for changing the settings on each unit. The software is compatible with Microsoft® Windows 95, 98, 2000, Me, NT and XP.

#### 3.2.1 Installation

Double-Click the MDR221A software zip file. The software will automatically extract. It is recommended that the default location be used when loading the software.

### 3.2.2 Software Definitions



- 1) **Client/Server:** Designates MDR221A type. In each network, there must be only one Server. All other MDR221A units must be programmed as Clients. The number of Clients in the network is not limited; however, if performance diminishes, consider additional RF Networks.
  
- 2) **Baud Rate:** This defines the serial baud rate between the MDR221A unit and the host device, such as a PC. The RF transmission rate is fixed. Default baud rate setting is 57600 unless the units have been pre-configured by Black Box. The Baud Rate setting of the MDR221A must match the Baud Rate setting of its host device.
  
- 3) **Maximum Transmit Attempts:** For Point-to-Point networks only. This value represents the maximum number of times a data packet can be sent by the MDR221A units. The default value is 16 attempts. If communication is lost and the Client's Link LED is on, try increasing this value in small increments until communication is reestablished. The valid range of values for this field is 1 to 255.
  
- 4) **Broadcast Attempts:** For Point-to-Multipoint networks only. This value represents the number of times a data packet will be sent by the Server MDR221A unit. The default value is 4 attempts. If communication is lost and the Clients' Link LED is on, try increasing this value in small increments until communication is reestablished. The valid range of values for this field is 1 to 255.
  
- 5) **Channel Number:** A number that designates an independent network of MDR221A units. Up to 77 independent networks can be created. The valid range of values for this field is 0 to 76.

- 6) **Packet Length:** Defines the fixed length or size of data packet to be transmitted. Any packets larger than the Packet Length will be parsed and sent consecutively by a MDR221A. For example, if the Packet Length is 128 bytes and the Host sends 150 bytes, a MDRA221A will send 128 bytes and then 22 bytes after the Interface Timeout expires. Any packets smaller than the Packet Length will be transmitted once the Interface Timeout has expired.

The Host can send variable-sized data packets, all of which are equal to or smaller than the Packet Length. A MDR221A will wait until the Interface Timeout expires or until the Packet Length size is reached. Therefore, if multiple packets and/or portions of packets are sent before the Interface Timeout expires, the receiving MDR221A Host must be able to process the multiple packets and/or portions of packets.

Packets will be transmitted over the RF interface when one of the following conditions occurs:

- 1) The number of data bytes received over the serial interface is equal to the Packet Length, the maximum packet length is 2047 bytes.
- 2) A byte gap larger than the Interface Timeout occurs.

Interface Timeout	Time in Milliseconds
0	6.5
1	Invalid
2 - 255	Value x 0.9ms
64	21
128	137
192	235

**IMPORTANT NOTE:** The MDR221A cannot accept a fixed Packet Length of less than 6 Bytes. If the Packet Length is set lower than 6 Bytes, the MDR221A cannot be reconfigured.

- 7) **Interface Timeout:** This parameter specifies the amount of time between bytes that a MDR221A will wait before transmitting the data packet. This setting is automatically calculated by the configuration software based on the Baud Rate setting, but can be modified by the user for optimization purposes.

**IMPORTANT NOTE:** When configuring units with baud rates lower than 9600kbps it is important that the Interface Timeout is not set to a value lower than 3. It is strongly recommended that the default Interface Timeout be used. The default values are automatically calculated based of the unit's Baud Rate setting.

- 8) **System Identification:** A sequence of eight numbers that provide added security to each independent network of MDR221A units. The System ID is used in conjunction with the Channel Number and serves as a password to maintain secure transfers of data. The combination of the Channel Number and System ID must be unique to each network of MDR221As to establish communication. Here are some examples:

Network A: Channel Number – 13,  
System ID – 001 002 003 004 005 006 007 008

Network B: Channel Number – 25,  
System ID – 012 023 034 045 056 067 078 089

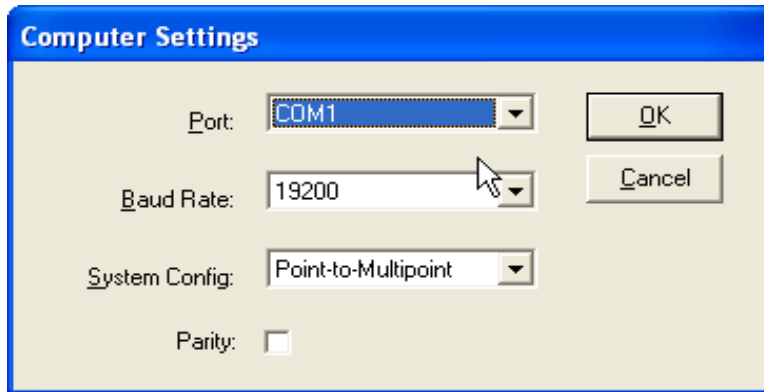
Multiple Servers in the same coverage area must be programmed with different Channel Numbers to prevent inoperability of the networks. The System ID will not prevent inoperability that occurs from locating multiple Servers with the same Channel Number in the same coverage area. The valid range of values for each of the eight numbers is 0 to 255.

**Important Note: Separate Collocated MDR221A networks must operate on different Channel Numbers. All units in a given MDR221A network must have identical Channel Numbers and System IDs.**

- 9) **Destination Address:** The MAC Address of the opposite MDR221A unit in a point to point application. Used to optimize point to point communications by utilizing RF Acknowledgement.
- 10) **Parity:** Considered 9-Bit mode. Needs to be enabled if host requires even or odd parity and 8 data bits. The Link LED will be deactivated when Parity is enabled.
- 11) **RTS:** Enables the Request to Send control line.
- 12) **Modem Control:** Enables DCD, DTR, DSR and Ring Indicator control lines.
- 13) **Firmware Version:** Displays the MDR221A's firmware version.
- 14) **MAC Address:** A unique 6 Byte, IEEE 802.3 Ethernet address assigned by Black Box to each MDR221A. The user must not change this information.



### 3.2.3 Computer Settings Window



- 1) **Port:** Serial communications port connected to the MDR221A unit.
- 2) **Baud Rate:** Must equal the baud rate setting of the MDR221A unit that is about to be programmed.
- 3) **System Config:** Type of MDR221A network to be configured. Valid choices are Point-to-Point (one Server and one Client) or Point-to-Multipoint (one Server and multiple Clients).
- 4) **Parity:** Must be checked when trying to Read or Reprogram a MDR221A with the Parity option enabled.

## 4) Programming

Programming is accomplished with the following procedure:

- 1) Connect an MDR221A unit to a serial communications port on your computer.
- 2) Connect the power supply to the MDR221A unit. Make sure the **Pwr** LED is on.
- 3) Start the MDR221A Configuration Utility.
- 4) Select **Settings** to display the Computer Settings window.
  - A) Select the COM Port that is connected to the MDR221A unit.
  - B) Select the baud rate of the MDR221A unit. All MDR221A units are shipped with a default baud rate of 115200. If the baud rate of the MDR221A unit is changed as described below in Section 4.1 Changing MDR221A Settings, then this setting must be set to the same baud rate to allow proper programming of the units.

- C) Select the system configuration for the MDR221A network, Point-to-Point (one Server and one Client) or Point-to-Multipoint (one Server and multiple Clients).

- 5) Select OK.

#### **4.1 Changing MDR221A Settings**

Changing the MDR221A settings is accomplished with the following procedure:

- 1) Select **Read Radio** to display the current settings of the MDR221A unit.
- 2) Change desired settings.
- 3) After all changes have been made, select Write Radio to save the changes.
- 4) Cycle Power to the unit after all changes have been saved. This will set the MDR221A unit to its normal mode of operation.

## 5) Troubleshooting

Problem	Solution
<p><b>Read Radio</b> displays error message: "Radio not responding."</p>	<ol style="list-style-type: none"> <li>1. Make sure the proper settings are set in the Settings Window. <b>See Section 4 Programming.</b></li> <li>2. If any other programs that utilize the same COM port as the MDR221A unit are open, close them and try to read the radio again.</li> <li>3. Reset the radio by cycling power after each unsuccessful Read.</li> </ol>
<p><b>Write Radio</b> displays error message: "Radio not responding."</p>	<ol style="list-style-type: none"> <li>1. Cycle power to the radio.</li> <li>2. Read the radio and make desired changes. <b>See Section 4 Programming.</b></li> </ol>
<p>Client's <b>Link</b> LED does not come on.</p>	<ol style="list-style-type: none"> <li>1. Make sure Server MDR221A unit is connected to power.</li> <li>2. Cycle power to the radio.</li> <li>3. If Parity is enabled on unit configuration, the Link LED will not turn on.</li> </ol>
<p><b>Link</b> LED is on, but data does not get transmitted or received.</p>	<ol style="list-style-type: none"> <li>1. Make sure the MDR221A unit(s) is connected to the correct COM Port.</li> <li>2. Check the COM port settings for correct Baud Rate, Parity and either Hardware or No Flow Control. Units can have transmission errors with Flow Control set to Xon/Xoff.</li> <li>3. Try increasing the <b>Maximum Transmit Attempts</b> (for Clients) and/or <b>Broadcast Attempts</b> (for Servers) values in small increments until communication is established.</li> <li>4. Connect a Null Modem adapter between the Client and its host device.</li> </ol>