

# RAD-80211-XD and RAD-80211-XD-WM

802.11a/b/g Transceiver with Serial Link

Quick Start Guide

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This Quick Start Guide is intended to provide adequate information necessary to get a functional system operating. For more detailed information, please consult the User Manual.

The RAD-80211-XD and RAD-80211-XD-WM are wireless transceivers that can function as an Access Point, Bridge or Client. They can send Ethernet data with the option of adding serial data over the wireless link. These products conform to IEEE 802.11a, b, and g standards.

This Quick Start Guide will show how to configure all three modes: Access Point, Client and Bridge.

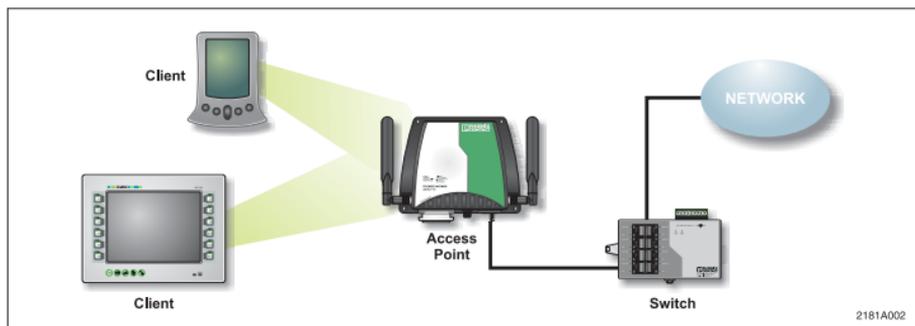


Figure 1. Access Point mode broadcasting to two clients

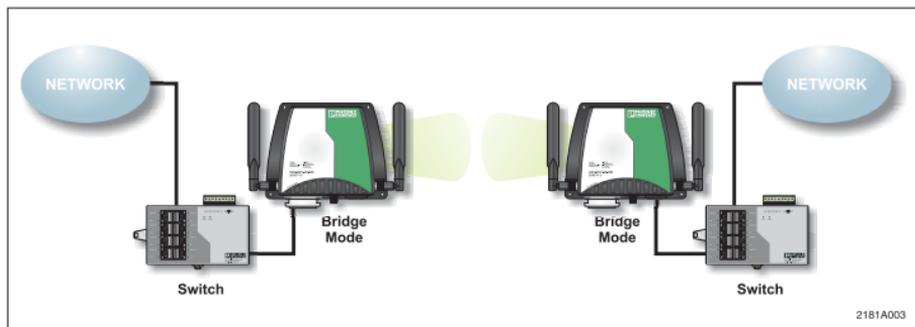


Figure 2. Two Bridges, each connected to hardwired Ethernet networks

## Power

Connect a regulated DC power source to the transceiver. The supply voltage can range from 12 to 30VDC with a nominal voltage of 24VDC recommended. The power supply must be able to supply 300mA of current @24VDC.

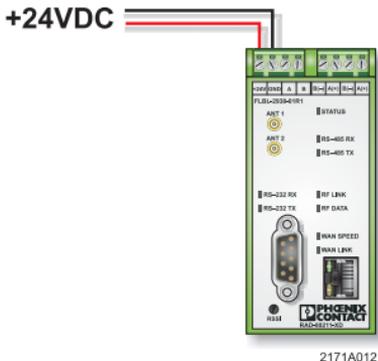


Figure 3. Power wiring diagram

## Antenna Connections

There are two antenna connectors on the transceiver. This is for the purpose of antenna diversity. The transceiver may be operated using a single antenna; however, in some environments you may experience multi-path problems (null spots). If using a single antenna, connect it to **ANT 1**.

Note that the transceiver can use either the 2.4GHz or 5GHz ISM band. The antenna you use must be specific to the frequency. There are dual band antennas available if you are using both frequency ranges. 802.11a uses the 5GHz band whereas 802.11b and g use the 2.4GHz band.

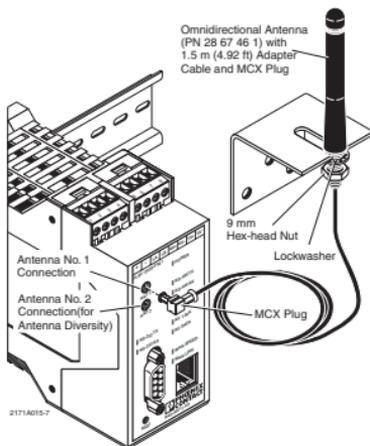


Figure 4. Antenna being connected to antenna connection on transceiver

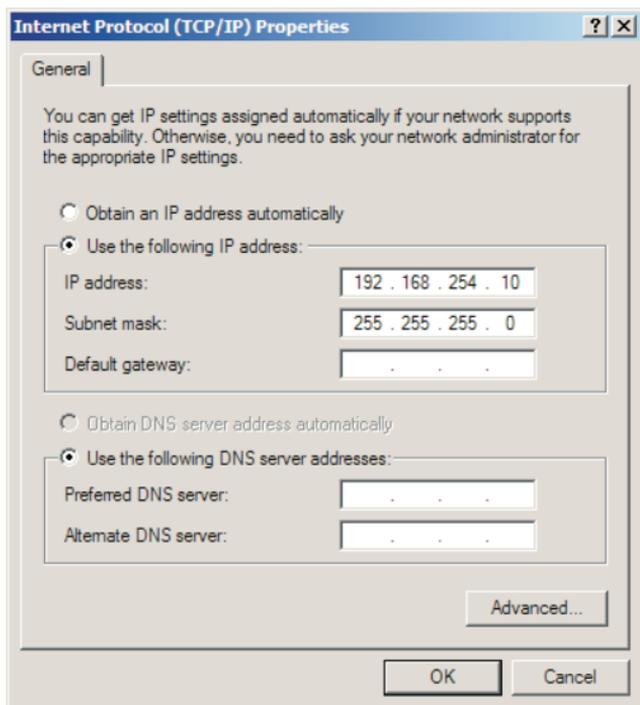
## Ethernet Connections for Transceiver Configuration

Connect an RJ-45 Ethernet cable to the transceiver and your computer. Either a line or crossover cable may be used as the radio has autocross capabilities.

### Configuring your PC to Communicate with the Transceiver

Note: The instructions below are for Windows 2000. Other versions of Windows will be similar but not identical. You must be logged in as an administrator to make the following changes to your computer.

- 1) Select **Start** ---> **Settings** ---> **Network and Dial up Connections**. Right click on the **Local Area Connection** that the transceiver is connected to and select **Properties**.
- 2) Highlight **Internet Protocol (TCP/IP)** and click **Properties**.
- 3) Select **Use the following IP address** and enter the following IP address:  
192.168.254.xxx (xxx can be 1-253)
- 4) Set the **Subnet mask** to 255.255.255.0
- 5) Click OK and enable the connection.



2171A002-1

Figure 5. Internet Protocol Properties screen

## Access Point Configuration

- 1) Apply power to the transceiver and run a web browser program such as Internet Explorer on your computer.
- 2) Enter the following IP address into the Address field of your browser:  
**https://192.168.254.254**
- 3) Enter the default case-sensitive credentials:  
Username: Admin  
Password: admin
- 4) Agree to the terms and conditions and click **Sign In**.



The image shows the sign-in screen for the RAD-80211-XD device. At the top, it displays "RAD-80211-XD" and "501 - Version 1.2 Build 1". Below this, there are two input fields: "Username:" with "Admin" entered and "Password:" with "\*\*\*\*\*" entered. To the right of the password field is a checkbox labeled "I agree to the terms and conditions below." Below the input fields is a "Sign In" button. At the bottom, there is a "Terms and Conditions" section with the text: "This device is for authorized use only. Any unauthorized use of this product is prohibited." and a copyright notice: "Copyright © 2005 PHOENIX CONTACT & OMNEX Control Systems, Inc. All rights reserved."

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Figure 6. Configuration Sign-in screen

- 5) Click **Expand All** in the menu to open all of the folders. Under the **Configuration** folder, select **General**.

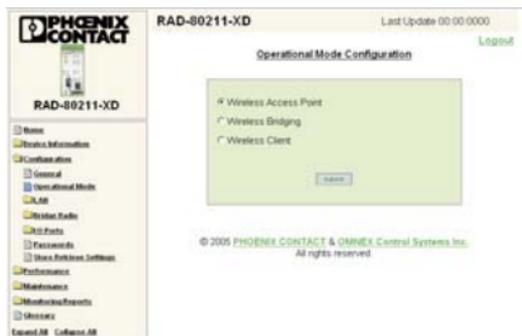


The image shows the "General Configuration" screen for the RAD-80211-XD device. The top left corner features the "PHOENIX CONTACT" logo and the device name "RAD-80211-XD". The top right corner shows "Last Update 00:00:0000" and a "Logout" link. The main content area is titled "General Configuration" and contains several sections: "Device Name - Location" with fields for "Device Name", "Location", "Device Model", and "Contact"; "System Time and Date" with fields for "Date" (01/01/2006) and "Time" (10:23:00); "Enabled" section with "New Device Address" and "New Date (mm/yyyy)" fields; "Use PC Check" section with a radio button; and "Use RTP Server" section with "New Zone" (set to "GAF-08-00 Pacific Time (US & Canada) System"), "New Server 1", and "New Server 2" fields. A "Save" button is at the bottom. On the left side, there is a navigation menu with "Expand All" selected under the "Configuration" folder.

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Figure 7. General Configuration screen

- 6) You have the option to enter a **Device Name/Location, Host Name, Domain Name, and Contact**. These are not necessary for proper operation, but make troubleshooting large networks easier.
- 7) Select a method for the radio to keep time. It can be done with the manual setting, by using the connected PC clock, or by connecting to an NTP server (requires an Internet connection).
- 8) Click **Submit** to make these settings active.
- 9) Select **Configuration, Operational Mode**.



2171A003

Figure 8. Operational Mode screen

- 10) Select **Wireless Access Point** as the operating mode. Click **Submit**. The radio will reboot. This may take up to one minute. You will have to log in again.
- 11) Click on **Access Point Radio, General**



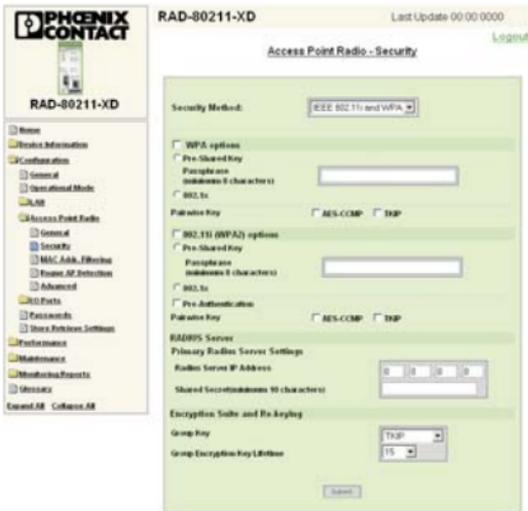
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Figure 9. Access Point Radio - General screen

- 12) Change the **SSID** (System Security Identity) to some value other than the factory default. All Client transceivers in the same network must have the same SSID.
- 13) Select a **Wireless Mode**. All transceivers in the same network must have the same Wireless Mode. Modes b and g can be mixed if 802.11b and 802.11g clients will exist in the network.
- 14) Select the **Channel No.** If 802.11b/g is used, Channels 1, 6 and 11 have the least amount of overlap to allow for the least amount of interference from other 802.11 wireless networks. 802.11a has no overlapping channels. The Channel No. must be the same for all transceivers. Click **Select the Optimal Channel** if you are unsure about the best channel to use.
- 15) Ensure that the **Tx Pwr Mode** is set to some value. Setting this to *Off* will disable the radio transmissions. Choosing *Auto* will allow the radio to adjust its power to a level that is optimized for the network structure. *Auto* mode is recommended, but the power level can be fixed in 5 levels. 5 is the highest power setting.
- 16) Set the **Broadcast SSID** to Disable. This is a minimum security setting that prevents other 802.11 transceivers from easily entering your network.
- 17) Click **Submit** to enter these settings.
- 18) Select **Access Point Radio, Security**.
- 19) Enter your desired method of security and appropriate settings. **Static WEP** is an older method of encryption that can be easily broken by determined individuals. **WPA** and **802.11i (WPA2)** are more advanced encryption methods and are recommended over WEP; however all transceivers in the network must have this capability. Most devices available today support WPA.
- 20) Enter your security settings as desired.

### **WPA and 802.11i(WPA2) Security Settings**

This Quick Start Guide will discuss the more secure WPA2 (802.11i) security method. For details on security, consult the complete manual.



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Figure 10. Wireless Access Point - Security screen

- Select either WPA, WPA2 (802.11i) or both to allow clients using either method to connect to the Access Point.
- To use 802.1x authentication, a RADIUS server must exist in the network. If a RADIUS server does not exist in the network, select **Pre-Shared Key** and enter up to 63 characters in the Passphrase field.
- Pairwise Key.** If wireless clients use **AES-CCMP** or **TKIP**, select accordingly. If there will be a mix of clients using AES-CCMP or TKIP, select both.
- If 802.1x authentication was selected in step 2, enter the **Radius Server IP Address** and a **Shared Secret**.
- Under **Encryption Suite and Re-Keying**, enter the **Group Key** and **Group Encryption Key Lifetime**.
- Click **Submit** to activate the Security Settings.

- 21) Click on **LAN, IP Configuration** to set how the Access Point interfaces with the LAN.



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Figure 11 LAN - IP Configuration screen

- 22) Enter the speed of the LAN or select **Auto** to have the Access Point determine network speed automatically.
- 23) If the network does not support **DHCP** (Dynamic Host Configuration Protocol), **specify a static IP Address, Subnet Mask and Default Gateway.**
- 24) Click **Submit** to activate the new LAN settings.

## Client Configuration:

- 1) Apply power to the transceiver and open a web browser program such as Internet Explorer on your computer.
- 2) Enter the following IP address into the Address field of your browser:  
**192.168.254.254**
- 3) Enter the default case-sensitive credentials:  
Username: Admin  
Password: admin

- 4) Agree to the terms and conditions and click **Sign In**.



The image shows the sign-in screen for the RAD-80211-XD device. At the top, the title "RAD-80211-XD" is displayed in a large, bold font, with "501 - Version 1.2 Build 1" underneath. Below this, there are two input fields: "Username:" with the text "Admin" and "Password:" with six black dots. To the right of the password field is a checkbox labeled "I agree to the terms and conditions below." Below these fields is a "Sign In" button. At the bottom of the screen, there is a "Terms and Conditions" section with the text: "This device is for authorized use only. Any unauthorized use of this product is prohibited." Below that is a copyright notice: "Copyright © 2005 PHOENIX CONTACT & OMNEX Control Systems Inc. All rights reserved."

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Figure 12. Configuration Sign-in screen

- 5) Click **Expand All** in the menu to open all of the folders. Under the **Configuration** folder, select **General**.



The image shows the "General Configuration" screen for the RAD-80211-XD device. The top header includes the device name "RAD-80211-XD" and "Last Update 00:00:0000". A "Logout" link is visible in the top right. The main content area is titled "General Configuration" and contains several sections: "Device Name / Location" with a text box containing "Water Tower"; "Host Name" with an empty text box; "Domain Name" with a text box containing "default"; and "Contact" with a text box containing "Jim". Below this is the "System Time and Date" section, showing "Date: 03/03/2006" and "Time: 10:21:00". There are three radio button options: "Manual" (selected), "Use PC Clock", and "Use NTP Server". Under "Manual", there are fields for "New Time (hh:mm:ss)" and "New Date (mm/dd/yyyy)". Under "Use NTP Server", there is a "Time Zone" dropdown menu set to "(GMT-08:00) Pacific Time (US & Canada); Tijuana", and two "Time Server" text boxes. A "Submit" button is at the bottom. On the left side, there is a navigation menu with the "PHOENIX CONTACT" logo and "RAD-80211-XD" title. The menu items include Home, Device Information, Configuration (expanded), General (selected), Operational Mode, LAN, Bridge Radio, I/O Ports, Passwords, Store/Retrieve Settings, Performance, Maintenance, Monitoring Reports, and Glossary. At the bottom of the menu are "Expand All" and "Collapse All" buttons.

2171A017

Figure 13. General Configuration screen

- 6) You have the option to enter a **Device Name/Location, Host Name, Domain Name**, and **Contact**. These are not necessary for proper operation, but make troubleshooting large networks easier.
- 7) Select a method for the radio to keep time. It can be done with the manual setting, by using the connected PC clock, or by connecting to an NTP server (requires an Internet connection).
- 8) Click **Submit** to make these settings active. The radio will reboot. This may take up to one minute. You will have to log in again.
- 9) Select **Configuration, Operational Mode**.

The screenshot displays the web interface for a RAD-80211-XD device. On the left is a navigation menu with the following items: Home, Device Information, Configuration (expanded), General, Operational Mode (selected), LAN, Bridge Radio, IO Ports, Passwords, Store/Retrieve Settings, Performance, Maintenance, Monitoring Reports, and Glossary. Below the menu are 'Expand All' and 'Collapse All' links. The main content area shows the title 'RAD-80211-XD' and 'Last Update 00:00:0000'. A 'Logout' link is in the top right. The central heading is 'Operational Mode Configuration'. Below it is a form with three radio button options: 'Wireless Access Point', 'Wireless Bridging', and 'Wireless Client' (which is selected). A 'Submit' button is located at the bottom of the form. At the bottom of the page, the copyright notice reads: '© 2005 PHOENIX CONTACT & OMNEX Control Systems Inc. All rights reserved.'

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Figure 14. Operational Mode screen

- 10) Select **Wireless Client** as the operating mode. Click **Submit**. The device will reboot. This will take up to one minute. You will have to log in again to continue.

- 11) Click on **Security** in the left-hand column. *Note: The following security settings of the client must exactly match those of the Access Point.*
- 12) If using WEP, select **Shared**. Then select how many bits of encryption and enter the Key(s). If using **WPA** or **WPA2** (802.11i), select the correct one and enter the **Password** and **Encryption Method**.
- 13) Click **Submit** to load the security settings.
- 14) Select **Client, General** from the left-hand column.



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Figure 15. Client Radio Security Settings screen

- 15) Click **Scan** to allow the radio to search for nearby networks. Only those using the selected **Wireless Mode** will be displayed.
- 16) Enter the **SSID** of the network you wish to join in the dialog box and select the **Wireless Mode** the network is using from the drop-down box.
- 17) After clicking on **Connect**, the client will try to connect to the Access Point with a matching SSID. If the connection is successful, the **Status** box will display information about the connection.



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Figure 16. Client Radio Settings screen

- 18) Click on **LAN, IP Configuration** to set how the Client interfaces with the LAN.



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Figure 17. LAN - IP Configuration screen

- 19) Enter the speed of the LAN or select **Auto** to have the Client determine network speed automatically.
- 20) If the network does not support **DHCP** (Dynamic Host Configuration Protocol), **specify a static IP Address, Subnet Mask and Default Gateway.**
- 21) Click **Submit** to activate the new LAN settings.

## Bridge Configuration:

- 1) Apply power to the transceiver and open a web browser program such as Internet Explorer on your computer.
- 2) Enter the following IP address into the Address field of your browser:  
**192.168.254.254**
- 3) Enter the default case-sensitive credentials:  
Username: Admin  
Password: admin
- 4) Agree to the terms and conditions and click **Sign In.**



- 10) Select **Wireless Bridging** as the operating mode. Click **Submit**. The radio will reboot. This may take up to one minute. You will have to log in again.
- 11) Select **Bridge Radio, General**.



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Figure 20. Bridge Radio screen

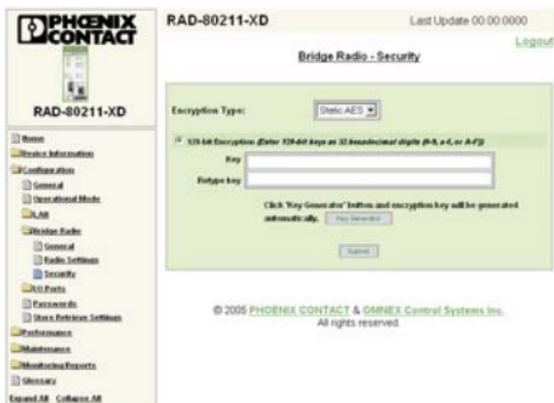
- 12) Enable **Spanning Tree Protocol** if three or more Bridge mode transceivers will be arranged in a ring. This will prevent the data from going in an endless loop through the RF network.
- 13) Select **Bridge Radio, Radio Settings**.



2171A008

Figure 21. Bridge Radio Settings screen

- 14) Select a **Wireless Mode** – 802.11a, 802.11b, 802.11g, or 802.11b/g mixed. All transceivers in a network need to have the same Wireless Mode.
- 15) Select a **Channel No.** All transceivers in a network need to use the same Channel No. For 802.11b/g., Channels 1, 6 and 11 have the least channel overlap.
- 16) Ensure that the **Tx Pwr Mode** is set to some value. Setting this to *Off* will disable the radio transmissions. Choosing *Auto* will allow the radio to adjust its power to a level that is optimized for the network structure. *Auto* mode is recommended, but the power level can be fixed in 5 levels. 5 is the highest power setting.
- 17) Enter the **Propagation Distance**. Set this distance based on the distance between this Bridge and the furthest transceiver it will be communicating with.
- 18) Enter the **BSSID** (MAC address) of the Bridge Mode radio to connect to. A note about that device may also be added.
- 19) Click **Add**. If another Bridge Mode radio should be connected, enter its BSSID. Up to 8 Bridge Mode radios can be added.
- 20) Click **Submit** to enable the settings. The radios will attempt to link. The RF Link LED will light on the radio if bridging is successful.
- 21) Select **Bridge Radio, Security** from the menu.



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Figure 22. Bridge Security Settings screen

- 22) Select from *None, Static AES*. To utilize AES security, all Bridges in the network must have this capability.
- 23) Select the length of the encryption key – *128-, 192-, or 256-bit*.
- 24) You may have the software automatically generate a key by selecting **Key Generator**, or you may manually enter a key. If you are manually entering a key, use hexadecimal characters only (0-9 or A-F) with no spaces. Retype the key in the lower box.
- 25) Record the key for use on additional transceivers. All transceivers must have the same security settings in order to communicate.
- 26) Click **Submit** to load the security parameters.
- 27) Click on **LAN, IP Configuration** to set how the Bridge interfaces with the LAN.



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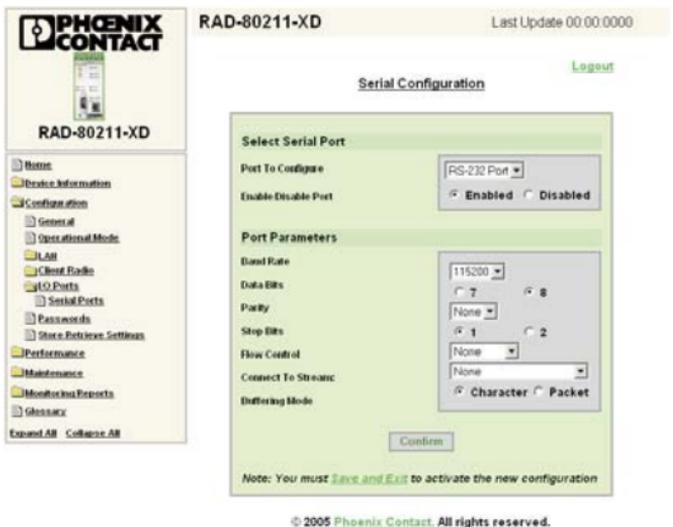
Figure 23. LAN - IP Configuration screen

- 28) Enter the speed of the LAN or select **Auto** to have the Bridge determine network speed automatically.
- 29) If the network does not support **DHCP** (Dynamic Host Configuration Protocol), **specify a static IP Address, Subnet Mask and Default Gateway**.
- 30) Click **Submit** to activate the new LAN settings.

## Serial Port Use:

There is an RS-232 port and an RS-485/422 port for the transmission of serial data. When enabled, any data sent to a Client's serial port will appear at the Access Point serial port, and any data sent into the Access Point appears at all Client serial ports.

The two serial streams operate independently from one another. For example, one Client could have Modbus protocol data sent between the RS-485 port of the Client and the RS-485 port of the Access Point while another Client could have Allen Bradley's DF1 protocol data sent between the RS-232 port of the Client and the RS-232 port of the Access Point.



2171A009

Figure 24. Serial Configuration screen

- 1) Click on **I/O Ports**, then **Serial Ports**.
- 2) Select which port you wish to use. If you wish to use RS422 communications, select RS485. The difference between RS485 and RS422 is only in the wiring to the terminal block (described in Figure 25). Then select **Enabled** to activate the port.

- 3) Select the **Baud Rate, Data Bits, Parity, Stop Bits and Flow Control** such that the transceiver's settings are the same as the serial device connected to it.
- 4) Under **Connect to Stream**, select which of the serial channels you wish the transceiver to use. The Modbus TCP Channel acts like a Modbus gateway, converting Modbus RTU to Modbus TCP.
- 5) Under **Buffer Mode**, select either **Character** (no buffering) or **Packet** (buffering enabled). If you are not sure which mode your protocol requires, select **Packet**.
- 6) Select **Save and Exit**.

### Serial Port Wiring:

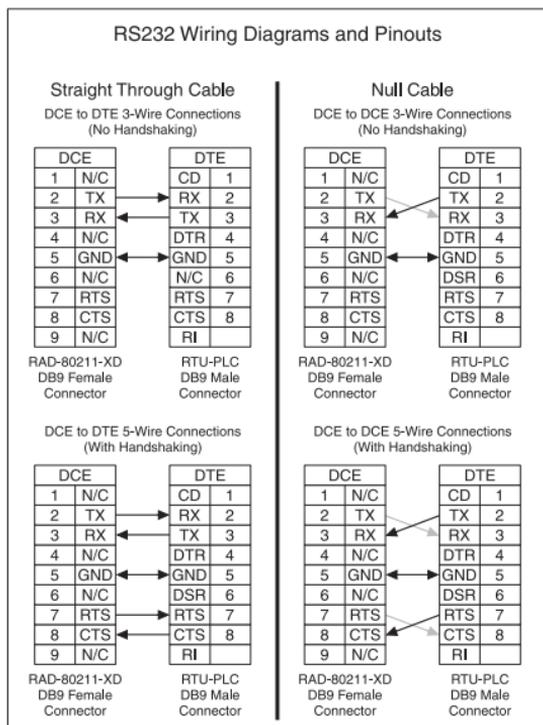


Figure 25. Wiring Diagrams and Pinouts

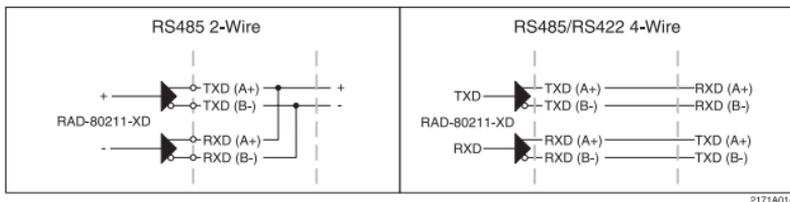


Figure 26. Serial Port Wiring



If used in a Class I, Div. 2 area, do not disconnect equipment unless power has been switched off or the area is known to be non-hazardous.

**Notice:** These devices must be wired in accordance with Class I, Division 2 wiring methods as described in the National Electric Code, Article 501-4(b) or the authority having jurisdiction. Transmitter unit is to be used with a purely resistive antenna when installed in Class I, Division 2 areas.

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Find the complete manual at [www.phoenixcon.com/wireless](http://www.phoenixcon.com/wireless)

