



Where Automation Connects.



## RLX2-IHx series

802.11a, b, g, n

Industrial Hotspots

July 5, 2017

**USER MANUAL**

## Your Feedback Please

We always want you to feel that you made the right decision to use our products. If you have suggestions, comments, compliments or complaints about our products, documentation, or support, please write or call us.

## How to Contact Us

### ProSoft Technology, Inc.

9201 Camino Media, Suite 200  
Bakersfield, CA 93311  
+1 (661) 716-5100  
+1 (661) 716-5101 (Fax)  
[www.prosoft-technology.com](http://www.prosoft-technology.com)  
support@prosoft-technology.com

RLX2-IHx series User Manual

July 5, 2017

ProSoft Technology®, is a registered copyright of ProSoft Technology, Inc. All other brand or product names are or may be trademarks of, and are used to identify products and services of, their respective owners.

In an effort to conserve paper, ProSoft Technology no longer includes printed manuals with our product shipments. User Manuals, Datasheets, Sample Ladder Files, and Configuration Files are provided at our website:  
[www.prosoft-technology.com](http://www.prosoft-technology.com)

## Content Disclaimer

This documentation is not intended as a substitute for and is not to be used for determining suitability or reliability of these products for specific user applications. It is the duty of any such user or integrator to perform the appropriate and complete risk analysis, evaluation and testing of the products with respect to the relevant specific application or use thereof. Neither ProSoft Technology nor any of its affiliates or subsidiaries shall be responsible or liable for misuse of the information contained herein. Information in this document including illustrations, specifications and dimensions may contain technical inaccuracies or typographical errors. ProSoft Technology makes no warranty or representation as to its accuracy and assumes no liability for and reserves the right to correct such inaccuracies or errors at any time without notice. If you have any suggestions for improvements or amendments or have found errors in this publication, please notify us.

No part of this document may be reproduced in any form or by any means, electronic or mechanical, including photocopying, without express written permission of ProSoft Technology. All pertinent state, regional, and local safety regulations must be observed when installing and using this product. For reasons of safety and to help ensure compliance with documented system data, only the manufacturer should perform repairs to components. When devices are used for applications with technical safety requirements, the relevant instructions must be followed. Failure to use ProSoft Technology software or approved software with our hardware products may result in injury, harm, or improper operating results. Failure to observe this information can result in injury or equipment damage.

Copyright © 2017 ProSoft Technology, Inc. All Rights Reserved.

Printed documentation is available for purchase. Contact ProSoft Technology for pricing and availability.

## Important Safety Information

The following Information and warnings pertaining to the radio module must be heeded:

**WARNING – EXPLOSION HAZARD – DO NOT REPLACE ANTENNAS UNLESS POWER HAS BEEN SWITCHED OFF OR THE AREA IS KNOWN TO BE NON-HAZARDOUS.**

"THIS DEVICE CONTAINS A TRANSMITTER MODULE":

FCC ID: OQ7IHNFC

IC ID: 5265A-IHNFC

Contains:

FCC ID: 2AE3B-AEX-AR95X

IC ID: 20662-AEXAR95X

"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 UNDESIRABLE OPERATION."

"CHANGES OR MODIFICATIONS NOT EXPRESSLY APPROVED BY THE PARTY RESPONSIBLE FOR COMPLIANCE COULD VOID THE USER's AUTHORITY TO OPERATE THE EQUIPMENT."

"This device is configured for operation in the USA during manufacturing. These configuration controls are not present in the software with which the unit is shipped; therefore the end user cannot change the max power settings or the country/region. The models sold & shipped within the U.S. are identified within the model number with -A as part of the identifier."

**Warning:** Explosion Hazard!! Do not disconnect while circuit is alive unless area is known to be nonhazardous.

**Avertissement:** Risque D'Explosion!! Avant De Deconnecter L' Equipment, Couper Le Courant Ou S' assurer Que L' emplacement Est designe non dangerueux.

802.11a devices must contain the following statements in the manual:

"Operation in the band 5150–5250 MHz is only allowed for indoor use to reduce the potential for harmful interference to co-channel mobile satellite systems"

"Operation dans la bande 5150-5250 MHz est autorisée uniquement pour un usage intérieur afin de réduire les risques d'interférence nuisible aux systèmes mobiles par satellite co-canal"

IC Statements:

"This device complies with Industry Canada licence-exempt RSS standard(s). Operation is subject to the following two conditions: (1) this device may not cause interference, and (2) this device must accept any interference, including interference that may cause undesired operation of the device."

"Cet appareil est conforme avec Industrie Canada exempts de licence standard RSS (s). Son fonctionnement est soumis aux deux conditions suivantes: (1) cet appareil ne doit pas provoquer d'interférences et (2) cet appareil doit accepter toute interférence, y compris celles pouvant causer un mauvais fonctionnement de l'appareil."

Health Canada RF Exposure Warning Statement

"This device complies with Health Canada's Safety Code. The installer of this device should ensure that RF radiation is not emitted in excess of the Health Canada's requirement."

French version:

"Cet appareil est conforme avec Santé Canada Code de sécurité 6. Le programme d 'installation de cet appareil doit s' assurer que les rayonnements RF n'est pas émis au-delà de l'exigence de Santé Canada.

**China RoHS Hazardous Material Declaration Table**

部件名称 Component Name	有害物质 Hazardous Substances					
	铅 Lead (Pb)	汞 Mercury (Hg)	镉 Cadmium (Cd)	六价铬 Hexavalent Chromium (Cr(VI))	多溴联苯 Polybrominated Biphenyls (PBB)	多溴二苯醚 Polybrominated Diphenyl Ethers (PBDE)
印刷电路板组件 Printed Circuit Board Assemblies	×	○	○	○	○	○
金属部件 Metal Components	×	○	○	○	○	○
电池 Battery	○	○	○	○	○	○
本表格依据SJ/T 11364的规定编制。This table is made per guidance of SJ/T 11364						
○: 表示该有害物质在该部件所有均质材料中的含量均在GB/T 26572规定的限量要求以下。 ○: Indicates that this hazardous substance contained in all of the homogeneous materials for the part is below the limit requirement in GB/T 26572.						
× 表示该有害物质至少在该部件的某一均质材料中的含量超出GB/T 26572规定的限量要求。 ×: Indicates that this hazardous substance contained in at least one of the homogeneous materials used for this part is above the limit requirement in GB/T 26572.						

## Industry Canada Requirements:

"THIS DEVICE HAS BEEN DESIGNED TO OPERATE WITH AN ANTENNA HAVING A MAXIMUM GAIN OF 24 dB. AN ANTENNA HAVING A HIGHER GAIN IS STRICTLY PROHIBITED PER REGULATIONS OF INDUSTRY CANADA. THE REQUIRED ANTENNA IMPEDANCE IS 50 OHMS."

"TO REDUCE POTENTIAL RADIO INTERFERENCE TO OTHER USERS, THE ANTENNA TYPE AND ITS GAIN SHOULD BE CHOSEN SUCH THAT THE EQUIVALENT ISOTROPICALLY RADIATED POWER (EIRP) IS NOT MORE THAN THAT REQUIRED FOR SUCCESSFUL COMMUNICATION."

"THE INSTALLER OF THIS RADIO EQUIPMENT MUST INSURE THAT THE ANTENNA IS LOCATED OR POINTED SUCH THAT IT DOES NOT EMIT RF FIELD IN EXCESS OF HEALTH CANADA LIMITS FOR THE GENERAL POPULATION; CONSULT SAFETY CODE 6, OBTAINABLE FROM HEALTH CANADA."

**Warning:** Explosion Hazard!! Do not disconnect while circuit is alive unless area is known to be nonhazardous.

**Avertissement:** Risque D'Explosion!! Avant De Deconnecter L' Equipment, Couper Le Courant Ou S' assurer Que L' emplacement Est designe non dangerueux.

### IC Statements:

"This device complies with Industry Canada licence-exempt RSS standard(s). Operation is subject to the following two conditions: (1) this device may not cause interference, and (2) this device must accept any interference, including interference that may cause undesired operation of the device."

"Cet appareil est conforme avec Industrie Canada exempts de licence standard RSS (s). Son fonctionnement est soumis aux deux conditions suivantes: (1) cet appareil ne doit pas provoquer d'interférences et (2) cet appareil doit accepter toute interférence, y compris celles pouvant causer un mauvais fonctionnement de l'appareil."

### Health Canada RF Exposure Warning Statement

"This device complies with Health Canada's Safety Code. The installer of this device should

ensure that RF radiation is not emitted in excess of the Health Canada's requirement."

French version:

"Cet appareil est conforme avec Santé Canada Code de sécurité 6. Le programme d 'installation de cet appareil doit s' assurer que les rayonnements RF n'est pas émis au-delà de l'exigence de Santé Canada.

## RLX2-IHNF series C, RLX2-IHA, RLX2-IHG, RLX2-IHW

This equipment is Suitable For Use in Class I, Division2, Groups A, B, C, D or Non-Hazardous Location Only.

**WARNING – EXPLOSION HAZARD** – Substitution of Any Components May Impair Suitability for Class I, Division 2.

**WARNING – EXPLOSION HAZARD** – Do not disconnect equipment unless power has been removed or the area is known to be non-hazardous.

The unit is to be connected only to PoE networks without routing to the outside plant.

**WARNING – EXPLOSION HAZARD** – The SIM Card/Personality Module connection is for initial setup and maintenance only. Do not use, connect, or disconnect unless area is known to be non-hazardous. Connection or disconnection in an explosive atmosphere could result in explosion.

Device must be powered by a Class 2 Power Source.

Device is an open-type and is to be installed in an enclosure suitable for the environment.

**Warning:** Explosion Hazard!! Do not disconnect while circuit is alive unless area is known to be nonhazardous.

**Avertissement:** Risque D'Explosion!! Avant De Deconnecter L' Equipement, Couper Le Courant Ou S' assurer Que L' emplacement Est designe non dangerueux.

## RLX2-IHNF-W

The equipment shall be properly grounded with the external ground screw provided connected to building ground as well as the antenna coaxial screen of the connector shall be grounded.

The common or earth side of the circuit is connected to the screen of the coaxial cable and to all accessible parts and circuits.

FCC ID: OQ7IHNFC

IC ID: 5265A-IHNFC

Contains:

FCC ID: 2AE3B-AEX-AR95X

IC ID: 20662-AEXAR95X

Shall be installed in Restricted Access Location Only.

**SUITABLE FOR USE IN CLASS I, DIVISION 2, GROUPS A, B, C AND D HAZARDOUS LOCATIONS, OR  
NONHAZARDOUS LOCATIONS ONLY.**

**WARNING - EXPLOSION HAZARD - DO NOT DISCONNECT EQUIPMENT WHILE THE CIRCUIT IS LIVE OR  
UNLESS THE AREA IS KNOWN TO BE FREE OF IGNITABLE CONCENTRATIONS.**

**WARNING - EXPLOSION HAZARD - SUBSTITUTION OF COMPONENT MAY IMPAIR SUITABILITY FOR CLASS I,  
DIVISION 2.**

**WARNING – DO NOT CONNECT OR DISCONNECT WHEN ENERGIZED.**

Antennas are to be installed in accordance with Control Drawing 06/2514

Unit does not comply to the cable assy requirements of ISA 12.12.01 but does comply with the ATEX standards IEC60079-0 & IEC60079-15. In ATEX environments, do not connect/disconnect unless area is known to be non-hazardous.

Unit must be wired with Phoenix Contact M12 Cable Assemblies, Model Series SAC-HZ-XX-XX-XX/XX-XXX/XXXXXXXX, that are suitable for use in Class 1, Division 2, Groups A, B, C, and D Hazardous Locations.

**Warning:** Explosion Hazard!! Do not disconnect while circuit is alive unless area is known to be nonhazardous.

**Avertissement:** Risque D'Explosion!! Avant De Deconnecter L' Equipment, Couper Le Courant Ou S' assurer Que L' emplacement Est designe non dangerue.

## RLX2-IHNF-WC

The equipment shall be properly grounded with the external ground screw provided connected to building ground as well as the antenna coaxial screen of the connector shall be grounded.

The common or earth side of the circuit is connected to the screen of the coaxial cable and to all accessible parts and circuits.

Shall be installed in Restricted Access Location Only.

SUITABLE FOR USE IN CLASS I, DIVISION 2, GROUPS A, B, C AND D HAZARDOUS LOCATIONS, OR NONHAZARDOUS LOCATIONS ONLY.

WARNING - EXPLOSION HAZARD - DO NOT DISCONNECT EQUIPMENT WHILE THE CIRCUIT IS LIVE OR UNLESS THE AREA IS KNOWN TO BE FREE OF IGNITABLE CONCENTRATIONS.

WARNING - EXPLOSION HAZARD - SUBSTITUTION OF COMPONENT MAY IMPAIR SUITABILITY FOR CLASS I, DIVISION 2.

WARNING – DO NOT CONNECT OR DISCONNECT WHEN ENERGIZED

Antennas are to be installed in accordance with Control Drawing 06/2514

**Warning:** Explosion Hazard!! Do not disconnect while circuit is alive unless area is known to be nonhazardous.

**Avertissement:** Risque D'Explosion!! Avant De Deconnecter L' Equipment, Couper Le Courant Ou S' assurer Que L' emplacement Est designe non dangerue.

### IC Statements:

"This device complies with Industry Canada licence-exempt RSS standard(s). Operation is subject to the following two conditions: (1) this device may not cause interference, and (2) this device must accept any interference, including interference that may cause undesired operation of the device."

"Cet appareil est conforme avec Industrie Canada exempts de licence standard RSS (s). Son fonctionnement est soumis aux deux conditions suivantes: (1) cet appareil ne doit pas provoquer d'interférences et (2) cet appareil doit accepter toute interférence, y compris celles pouvant causer un mauvais fonctionnement de l'appareil."

### Health Canada RF Exposure Warning Statement

"This device complies with Health Canada's Safety Code. The installer of this device should ensure that RF radiation is not emitted in excess of the Health Canada's requirement."

### French version:

"Cet appareil est conforme avec Santé Canada Code de sécurité 6. Le programme d 'installation de cet appareil doit s' assurer que les rayonnements RF n'est pas émis au-delà de l'exigence de Santé Canada.

FCC ID: OQ7IHNFC

IC ID: 5265A-IHNFC

### Contains:

FCC ID: 2AE3B-AEX-AR95X

IC ID: 20662-AEXAR95X

**低功率射頻警語：**

DGT Warning Statement

**第十二條**

經型式認證合格之低功率射頻電機，非經許可，公司、商號或使用者均不得擅自變更頻率、加大功率或變更原設計之特性及功能。

Article 12

Without permission, any company, firm or user shall not alter the frequency, increase the power, or change the characteristics and functions of the original design of the certified lower power frequency electric machinery.

**第十四條**

低功率射頻電機之使用不得影響飛航安全及干擾合法通信；經發現有干擾現象時，應改善至無干擾時方得繼續使用。前項合法通信，指依電信法規定作業之無線電通信。低功率射頻電機須忍受合法通信或工業、科學及醫療用電波輻射性電機設備之干擾。

Article 14

The application of low power frequency electric machineries shall not affect the navigation safety nor interfere a legal communication, if an interference is found, the service will be suspended until improvement is made and the interference no longer exists.

**Recommended Antennas**

ProSoft offers a variety of Antennas and Cables for use with your RadioLinx device. The following is a sample of available antennas. For a complete list and description, please visit our website: [www.prosoft-technology.com](http://www.prosoft-technology.com).

ProSoft Part Number	Max Gain and Type
A2403NBH-OC	3 dBi Omni N-BH jack whip less 2.4GHz
A2404NBHW-OC	4 dBi Omni N BH jack low profile 2.4GHz
A2404NJ-OC	4 dBi Omni N jack collinear with mounting hardware 2.4GHz
A2405S-OA	5 dBi Omni RP-SMA articulating 2.4GHz
A2405S-OS	5 dBi Omni RP-SMA straight 2.4GHz
A2406NJ-OC	6 dBi Omni N jack collinear with mounting hardware 2.4GHz

A2406NJ-OCD	6 dBi Omni N jack heavy duty collinear with mounting hardware 2.4GHz
A2406S3-DP	6 dBi Panel RP-SMA MIMO antenna with 3 foot pigtail 2.4GHz
A2408NJ-DP	8 dBi Directional patch panel N jack with mounting hardware 2.4GHz
A2408NJ-OC	8 dBi Omni N jack collinear with mounting hardware 2.4GHz
A2409NJ-OCD	9 dBi Omni N jack heavy duty collinear with mounting hardware 2.4GHz
A2410NJ-DY	10 dBi Directional N jack Yagi with mounting hardware 2.4GHz
A2410NJ-OCM	10 dBi Omni N jack collinear for marine environment, 2.4GHz
A2412NJ3-DP	12 dBi Panel N-Jack MIMO antenna 2.4GHz
A2413NJ-DP	13 dBi Directional patch panel N jack with mounting hardware 2.4GHz
A2415NJ-DY	15 dBi Directional N jack Yagi with mounting hardware 2.4GHz
A2416NJ-DS	16 dBi Directional 120 degree sector N jack with mounting hardware 2.4GHz
A2419NJ-DB	19 dBi Directional N jack parabolic with mounting hardware 2.4GHz
A2419NJ-DP	19 dBi patch panel N jack with mounting hardware 2.4GHz
A2424NJ-DB	24 dBi Directional N jack parabolic with mounting hardware 2.4GHz
A2502S-OA	2 dBi Omni RP-SMA articulating 2.4/5GHz
A2506NJ-OC	6/8 dBi Omni N jack collinear with mounting hardware 2.4/5GHz
A5003S-OBH	3 dBi Omni RP-SMA bulkhead mount with 5' LMR195 pigtail 5GHz
A5006NJ-OC	6 dBi Omni N jack collinear with mounting hardware 5GHz
A5007S3-DP	7 dBi Panel RP-SMA MIMO antenna with 3 foot pigtail 5GHz
A5009NJ-OC	9 dBi Omni N jack collinear with mounting hardware 5GHz
A5017NJ3-DP	17 dBi Panel N-Jack MIMO antenna 5GHz
A5019NJ-DP	19 dBi directional N jack panel with mounting hardware 5GHz
A5024NJ-DP	24 dBi directional N jack panel with mounting hardware 5GHz
A5812NJ-OC	12 dBi Omni N jack collinear with mounting hardware 5.8GHz
A5829NJ-DB	29 dBi directional N jack parabolic with mounting hardware 5.8GHz
A2503S3-O	3/4 dBi Omni RP-SMA MIMO antenna with 3 foot pigtail 2.4/5GHz
A2503S6-O	3/4 dBi Omni RP-SMA Dual MIMO antenna with 3 foot pigtail 2.4/5GHz
A2506NJ3-O	6 dBi Omni N-Jack Single MIMO antenna with 3 foot pigtail 2.4/5GHz

**Note:** An adapter may be needed for some of the listed antennas to operate with certain radios.

## Antenna Spacing Requirements for User Safety

It is important to keep the radio's antenna a safe distance from the user. To meet the requirements of FCC part 2.1091 for radio frequency radiation exposure, this radio must be used in such a way as to guarantee at least 20 cm between the antenna and users. Greater distances are required for high-gain antennas. The FCC requires a minimum distance of 1 mW \*cm<sup>2</sup> power density from the user (or 20 cm, whichever is greater).

**Note:** If a specific application requires proximity of less than 20 cm, the application must be approved through the FCC for compliance to part 2.1093.

# Contents

Your Feedback Please.....	2
How to Contact Us .....	2
Content Disclaimer.....	2
Important Safety Information.....	3
Industry Canada Requirements: .....	4
RLX2-IHNF, RLX2-IHA, RLX2-IHG, RLX2-IHW .....	5
RLX2-IHNF-W .....	5
RLX2-IHNF-WC .....	6
RLX2-IHNF-TW.....	7
Recommended Antennas .....	7
Antenna Spacing Requirements for User Safety.....	8

---

<b>1</b>	<b>Start Here</b>	<b>15</b>
----------	-------------------	-----------

1.1	Before You Begin .....	15
1.2	About This Manual .....	15
1.3	About RLX2-IHx series Industrial Hotspot Products .....	16
1.3.1	Product Overview .....	16
1.3.2	General Features .....	17
1.3.3	Antenna Port Connections .....	18
1.4	Package Contents .....	20
1.4.1	RLX2-IHA, -IHG, -IHNF, -IHW .....	20
1.4.2	RLX2-IHNF-W .....	21
1.4.3	RLX2-IHNF-W Cables (sold separately) .....	21
1.4.4	RLX2-IHNF-WC.....	22
1.4.5	Industrial Hotspot Bench Test Kit (RLX-IHBTK) .....	22
1.5	Installing the RadioLinx Industrial Hotspot Browser.....	22
1.5.1	IH Browser System Requirements .....	23
1.5.2	Installing IH Browser Software .....	23
1.5.3	Starting the IH Browser .....	24

---

<b>2</b>	<b>Network Planning</b>	<b>25</b>
----------	-------------------------	-----------

2.1	Installing the ProSoft Wireless Designer.....	26
2.2	Installation Questions .....	27
2.3	Planning the Physical Installation.....	27
2.4	ProSoft Wireless Designer .....	28
2.4.1	Designer Functional Specifications .....	30
2.5	Testing the Network Installation .....	30
2.5.1	Improving Signal Quality .....	31
2.6	Detecting 802.11 Access Points .....	32

---

<b>3</b>	<b>RLX2-IHx series Quick Setup</b>	<b>33</b>
----------	------------------------------------	-----------

3.1	Preparing the Configuration Environment .....	34
3.2	Making Power and Data Connections .....	34
3.2.1	RLX2-IHW, IHNF, IHG, IHA Radio Connections.....	34
3.2.2	RLX2-IHNF-W Radio Connections.....	35
3.2.3	RLX2-IHNF-WC Radio Connections .....	37

3.3	Radio Power-Up.....	41
3.4	Using the IH Browser to Configure Radios.....	41
3.4.1	Viewing the Radios in the IH Browser .....	41
3.4.2	Refreshing the Display in the IH Browser .....	42
3.4.3	Setting the Radio IP Address in the IH Browser.....	42
3.4.4	Assigning a Temporary IP Address .....	42
3.5	Configuring a Radio - Getting Started .....	44
3.5.1	Connecting to the Radio Configuration Utility .....	44
3.5.2	Setting Up a Master Radio.....	46
3.5.3	Configuring a Repeater Radio .....	48
3.5.4	Configuring a Bridging Client Radio.....	50
3.5.5	Configuring a Client Radio.....	53
3.6	Viewing a Radio's Configuration.....	55
3.7	Replacing an Existing Radio.....	55

## 4 Configuring a Radio - Detailed Configuration 57

4.1	Connecting to the Radio Configuration Utility.....	57
4.1.1	Read-Only Fields .....	59
4.1.2	Configuration Help .....	59
4.1.3	Apply Changes.....	62
4.1.4	Cancelling Changes.....	62
4.1.5	Factory Defaults.....	62
4.2	Viewing Radio Status.....	63
4.2.1	Viewing Available Parents for a Radio .....	65
4.2.2	Viewing the Radio Address Table .....	66
4.2.3	Viewing the Radio Port Status .....	67
4.3	Configuring Basic Settings.....	70
4.3.1	Basic Wireless Settings .....	71
4.3.2	Wireless Security Settings .....	74
4.3.3	Access Settings .....	82
4.4	Configuring Advanced Settings .....	83
4.4.1	Advanced Wireless Settings .....	84
4.4.2	Roam Control Settings.....	88
4.4.3	Location Services Settings .....	90
4.4.4	Personality Module Settings .....	91
4.4.5	Changing Password Settings.....	93
4.5	Configuring Parent Link Settings .....	94
4.5.1	Parent Selection Method Settings .....	95
4.5.2	Repeater Parameters Settings .....	96
4.6	Configuring Advanced Network Settings .....	99
4.6.1	IGMP Settings.....	100
4.6.2	STP Settings .....	101
4.6.3	SNMP Agent .....	105
4.6.4	Cable Break Detection.....	106
4.7	Configuring Serial Settings .....	107
4.7.1	Serial Encapsulation Mode Setting.....	108
4.7.2	Remote IP Settings .....	109
4.7.3	Packet Delineation Settings.....	110
4.7.4	Port Settings .....	112
4.8	Configuring Quality of Service (QoS) Settings .....	113
4.9	Configuring VLAN Settings .....	115

---

<b>5</b>	<b>Using the IH Browser to Manage your Radios</b>	<b>117</b>
5.1	Viewing the Radios in the IH Browser .....	118
5.1.1	Refreshing the Display in the IH Browser .....	118
5.1.2	Defining the Scan Parameters in the IH Browser .....	118
5.1.3	Freezing the Display in the IH Browser .....	119
5.1.4	Changing IH Browser Columns in List View .....	120
5.1.5	Switching between List and Topology Views .....	120
5.1.6	Printing the View in the IH Browser .....	125
5.1.7	Importing and Exporting IH Browser Data .....	125
5.1.8	Hiding the Toolbar and Status Bar in the IH Browser .....	126
5.2	Viewing the Radio Properties .....	126
5.3	Setting the Radio IP Address in the IH Browser .....	128
5.4	Assigning a Temporary IP Address .....	129
5.5	Viewing Additional Data in the IH Browser .....	130
5.6	Connecting to the Radio Configuration Utility .....	130
5.7	Updating the Radio Firmware .....	132
5.8	Pinging Devices on the Network .....	133
5.8.1	Setting the Ping Parameters .....	134
5.9	Viewing Network Data in the IH Browser .....	135
5.9.1	Viewing Wireless Clients in the IH Browser .....	136
5.9.2	Viewing Ethernet Nodes in the IH Browser .....	137
5.9.3	Viewing the Scan List in the IH Browser .....	138
5.9.4	Viewing the Port Table in the IH Browser .....	140
5.9.5	Viewing the Radio Event Log in the IH Browser .....	141
5.9.6	Viewing Parent Radios in the IH Browser .....	143
<b>6</b>	<b>Diagnostics and Troubleshooting</b>	<b>145</b>
6.1	Checking the Ethernet Cable .....	146
6.2	LED Display .....	146
6.3	Resetting a RLX2-IHx series Radio .....	148
6.3.1	Resetting the RLX2-IHNF-W and RLX2-IHNF-WC .....	148
6.3.2	Resetting All Other Radios .....	149
6.4	Unable to scan for AP's error message .....	149
6.5	Finding Missing Radios .....	150
<b>7</b>	<b>Appendix A - Adding a Radio to RSLogix 5000</b>	<b>151</b>
7.1	Adding the Radio to RSLogix 5000 .....	152
7.2	Importing the Add-On Instruction .....	155
7.3	RLX2 Controller Tags .....	159
7.3.1	RLX2.CONTROL .....	159
7.3.2	RLX2.STATUS .....	160
<b>8</b>	<b>Appendix B - Radio Hardware</b>	<b>163</b>
8.1	Radio Power Requirements (RLX2-IHNF-W) .....	163
8.2	Radio Power Requirements (All other radios) .....	165
8.3	Ethernet Cable Specifications .....	167
8.4	Ethernet Cable Configuration .....	168
8.4.1	Ethernet Cable Configuration (RLX2-IHNF-W) .....	168
8.4.2	Ethernet Cable Configuration (all other radios) .....	169

---

<b>9 Appendix C - RLX2-IHx 5 GHz Radio DFS Support</b>	<b>171</b>
9.1            DFS Radio Operations.....	171
9.1.1        Selecting a DFS 5 GHz Channel .....	172
<b>10 Appendix D - RLX2-IHx series Virtual LAN (VLAN) Functionality</b>	<b>175</b>
10.1           Transparent Support of VLAN Tags (802.1Q).....	176
10.2           Port/Radio-based VLAN Tagging with Managed Switches .....	177
10.3           Port/Radio-based VLAN Tagging without Managed Switches .....	178
<b>11 Appendix E - EtherNet/IP and Modbus TCP/IP Support</b>	<b>179</b>
11.1          Modbus TCP/IP Server Support .....	179
11.1.1      Modbus Memory Map Diagnostic Information .....	180
11.2          EtherNet/IP™ Server Support .....	181
<b>12 Appendix F - Master Channel-Frequency Table</b>	<b>183</b>
<b>13 Appendix G - Antenna Configuration</b>	<b>185</b>
13.1          Antennas.....	185
13.1.1      Control Drawing .....	186
13.1.2      Antenna Pattern .....	187
13.1.3      Antenna Gain .....	188
13.1.4      Antenna Polarity .....	188
13.2          Antenna Types.....	189
13.2.1      Whip Antennas.....	189
13.2.2      Collinear Array Antennas.....	189
13.2.3      Yagi Array Antenna.....	190
13.2.4      Parabolic Reflector Antennas .....	191
13.3          RLX2-IHx series Approved Antennas .....	191
13.3.1      Approved Antenna Table .....	192
13.3.2      Approved Antennas in Europe/CE.....	192
13.3.3      Approved Antennas in Mexico .....	193
13.3.4      Approved Antennas with Power Amp .....	193
13.4          Antenna Location, Spacing, and Mounting .....	194
<b>14 Appendix H - FCC Emission Regulations</b>	<b>195</b>
14.1          2.4 GHz Band, Point-To-Multipoint.....	195
14.2          2.4 GHz Band, Point-To-Point .....	196
14.3          5 GHz Bands, Point-To-Multipoint .....	196
14.4          5 GHz Bands, Point-To-Point .....	197
<b>15 Appendix I - Compatibility with ProSoft RLXIB Series Radios</b>	<b>199</b>
<b>16 Appendix J - Detailed Radio Specifications</b>	<b>201</b>
16.1          RLX2-IHA Detailed Specifications .....	201

16.1.1	Agency Approvals & Certifications .....	202
16.2	RLX2-IHG Detailed Specifications .....	202
16.2.1	Agency Approvals & Certifications .....	203
16.3	RLX2-IHNF, -W, -WC Detailed Specifications .....	204
16.3.1	Agency Approvals & Certifications .....	206
16.4	RLX2-IHW Detailed Specifications.....	206
16.4.1	Agency Approvals & Certifications .....	207
<b>17</b>	<b>Appendix K - Application Examples</b>	<b>209</b>
<b>18</b>	<b>Support, Service &amp; Warranty</b>	<b>211</b>
18.1	Contacting Technical Support .....	211
18.2	Warranty Information .....	212
<b>19</b>	<b>Glossary of Terms</b>	<b>213</b>
<b>Index</b>		<b>225</b>

---



# 1 Start Here

## In This Chapter

❖ Before You Begin .....	15
❖ About This Manual .....	15
❖ About RLX2-IHx series Industrial Hotspot Products .....	16
❖ Package Contents .....	20
❖ Installing the RadioLinx Industrial Hotspot Browser .....	22

## 1.1 Before You Begin

For most applications, the installation and configuration steps described in the following topics work without additional programming. ProSoft Technology strongly recommends that you complete the steps in this chapter before developing a custom application.

## 1.2 About This Manual

This manual covers the entire RadioLinx® RLX2-IHx series Industrial Hotspot™ series of radio products. There are six models available in this product line:

Model	Standards	Maximum Output Power
RLX2-IHA	IEEE 802.11a	24 dBm (250 mW)
RLX2-IHG	IEEE 802.11b/g	24 dBm (250 mW)
RLX2-IHNF	IEEE 802.11a/b/g/n	17 dBm (50 mW)
RLX2-IHNF-W	IEEE 802.11a/b/g/n	17 dBm (50 mW)
RLX2-IHNF-WC	IEEE 802.11a/b/g/n	17 dBm (50mW)
RLX2-IHW	IEEE 802.11a/b/g	20 dBm (100 mW)

Although they have different operating frequencies and output power levels, these radios all operate in a similar fashion. Different models operating on common frequencies can communicate with each other. Furthermore, RLX2-IHx series radios can communicate with ProSoft Technology's legacy RLXIB series of radios (except the RLXIB-IHN). See Appendix I - Compatibility with ProSoft RLXIB Series Radios (page 198) for details on the specific differences between the RLX2-IHx series and RLXIB series products.

## 1.3 About RLX2-IHx series Industrial Hotspot Products

### 1.3.1 Product Overview

The RLX2-IHx series radio is an industrial high-speed Ethernet radio. Use it in place of Ethernet cables to save money, extend range, and make connections that may not otherwise be feasible. The radio operates as a wireless Ethernet switch. Any data that can be sent over a wired network can also be sent over the radio.

The RLX2-IHx series radio series is certified for unlicensed operation in the United States, Canada, Europe and other approved countries at 2.4 and 5 GHz. Contact ProSoft Technology for a list of currently approved antennas. With approved high-gain antennas, the radios can achieve distances over 5 miles with line-of-site between them. Multiple repeaters can be used to extend this range to far greater distances.

A highly reliable wireless network can be developed by creating redundant wireless paths. Multiple master radios can be installed without any special programming or control. Repeater radios can connect to any master at any time; if one master goes down, the repeater connects to another. Likewise, if a repeater goes down, any repeater that was connected to it can reconnect to a different repeater, keeping the network intact. Creating large, self-healing tree-like networks can be done in this fashion. Fully redundant paths are possible because the Spanning Tree protocol in the radios disables and enables paths as necessary to avoid Ethernet loops, which would otherwise halt communications.

In addition to acting as a switch, every master or repeater radio in an RLX2-IHx series wireless network can simultaneously act as an 802.11 access point. This allows 802.11 Wi-Fi clients to connect and roam between radios for monitoring of the wireless network or general network access. (An example of an 802.11 client is a laptop with Wi-Fi™). The RLX2-IHx series has a special client mode that allows connection of any Ethernet device to any existing 802.11 access point, regardless of the brand.

**Note:** Wi-Fi is a trademark of the Wi-Fi Alliance, used to describe the underlying technology of wireless local area networks (WLAN) based on the IEEE 802.11 specifications.

A high level of security is inherent with AES (Advanced Encryption Standard) encryption. TKIP (Temporal Key Integrity Protocol) is also available. If necessary, adding WEP128 or WEP64 (Wired Equivalent Protocol) encryption in addition to AES or TKIP for clients that do not support AES can be done. If desired, a simple Media Access Control (MAC) filter table also restricts the radios or clients that can link to a selected radio according to the MAC IDs entered in the table.

The radio is designed for industrial applications with a metal enclosure, DIN-rail mounting, and shock and vibration tested to IEC 60068.

The RLX2-IHx series radio series is easy to use. Access the built-in web pages with any web browser to configure the radio. Also, an SNMP manager can be used for configuration. The radio comes with a Windows-based utility called *IH Browser*. It finds all the radios on the network and lists information about them. A topology view in the IH Browser shows how the wireless network is linked together at any point in time. Firmware updates can be done at anytime from anywhere on the network. This includes over the wireless link or over the Internet.

ProSoft Technology radios can easily be installed into new or existing systems. You can download sample programs, utilities, firmware images, and documentation for your radio from the ProSoft Technology website ([www.prosoft-technology.com](http://www.prosoft-technology.com)). If your computer does not have access to the Internet, you must download the software from the ProSoft Technology website to removable media, and then copy it to your computer.

### **1.3.2 General Features**

The RadioLinx 802.11 Industrial Hotspots are high-speed wireless Ethernet radios with Power over Ethernet (PoE) and Serial Encapsulation. All radios operate at speeds up to 54 Mbps, and the RLX2-IHNF operates at speeds up to 300 Mbps. Designed for industrial installations, the RLX2-IHx series offers many features including hazardous location certifications, Bridging, IGMP Snooping, OFDM for noise immunity, repeater mode to extend range, QoS, VLANs, RADIUS Server support, automatic parent selection for self-healing, OPC server diagnostics, extended temperature, high vibration/shock and DIN-rail mounting. For individual radio product specifications and agency approvals, see Appendix J - Detailed Radio Specifications (page 201). For descriptions of the LEDs, see LED Display (page 146).



### 1.3.3 Antenna Port Connections

This section only addresses physical antenna connections. Actual antenna selection and configuration is discussed in other chapters in this manual. You must install antennas in accordance with Control Drawing 06/2514. See Appendix G - Antenna Configuration (page 185) for further details.

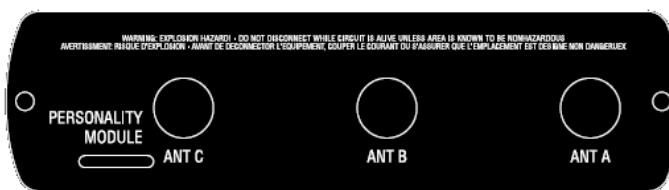
Each radio must have an antenna connected to the Main antenna port on the RLX2-IHA/G/W radio models. The RLX2-IHNF radio supports up to three antennas, configurable on the *Advanced Settings* page. Match the #antennas control (Port A, Port A – Port C, or Port A – Port B – Port C) to the number of antennas that are in use. Antennas must be connected to the radio when in use on the network.

Mount all antennas that are directly connected to the radio so that polarization is the same. You can mount antennas with an N-jack connector directly to the radio using an N-plug to SMA-RP-plug adapter. Screw the antenna onto the antenna port connector until snug.

For remote placement of antennas, you may use an extension cable with N-plugs. Because the antenna cable attenuates the RF signal, use an antenna cable length that is only as long as necessary to ensure optimum performance.

**Important:** If the radio is to be used in a hazardous location, you must mount the radio in an enclosure approved for hazardous locations.

Each RLX2-IHx series radio has active antenna connectors on the top as shown below:

<p><b>RLX2-IHA</b> <b>RLX2-IHG</b></p> <ul style="list-style-type: none"> <li>▪ Single Antenna Port</li> </ul>	
<p><b>RLX2-IHNF</b></p> <ul style="list-style-type: none"> <li>▪ 3 Active Antenna Ports</li> <li>▪ Allows MIMO operation</li> </ul>	
<p><b>RLX2-IHNF-W</b></p> <ul style="list-style-type: none"> <li>▪ 3 Active Antenna Ports</li> <li>▪ Allows MIMO operation</li> <li>▪ Weatherproof</li> <li>▪ Hazardous Location</li> <li>▪ Class I, DIV2 compliant</li> </ul>	

<p><b>RLX2-IHNF-WC</b></p> <ul style="list-style-type: none"> <li>3 active antenna ports</li> <li>MIMO operation</li> <li>Hazardous location</li> <li>Conduit version</li> <li>Class I, DIV 2 compliant</li> </ul>	
<p><b>RLX2-IHW</b></p> <ul style="list-style-type: none"> <li>Right antenna port for transmit and receive</li> <li>Left antenna port for receive diversity to improve performance in some applications</li> </ul>	

## 1.4 Package Contents

### 1.4.1 RLX2-IHA, -IHG, -IHNF, -IHW

The following components are included with standard RLX2-IHx series radio products:

Qty.	Part Name	Part Number	Part Description
1	RLX2-IHx series Radio	Varies	RadioLinx® RLX2-IHx series 802.11 Industrial Hotspot
1	Personality Module	001-005700	Industrial Grade microSD card (blank, in plastic bag)
1	Power Connector	002-0116	Mating power connector for the RLX2-IHx series radios, for attachment to customer's power supply.
1	Power Connector Wiring Tool	357-0061	Tool to assist wiring the power connector.
1	Antenna	A2502S-OA	2 dBi Omni RP-SMA articulating, 2.4/5GHz. This antenna is suitable for all RLX2-IHx series radio products.

You can download sample programs, utilities, firmware images, and documentation for your radio from the ProSoft Technology website ([www.prosoft-technology.com](http://www.prosoft-technology.com)). If your computer does not have access to the Internet, you must download the software from the ProSoft Technology website to removable media, and then copy it to your computer.

#### **1.4.2 RLX2-IHNF-W**

The following components are included with Weatherproof RLX2-IHx series radio products:

Qty.	Part Name	Part Number	Part Description
1	RLX2-IHx series Radio	RLX2-IHNF-W	RadioLinx® RLX2-IHx series 802.11 Industrial Hotspot Weatherproof
2	U-mounting brackets		Pole mounting brackets
1	IP67 M12 Cap		Water tight cap

You can download sample programs, utilities, firmware images, and documentation for your radio from the ProSoft Technology website ([www.prosoft-technology.com](http://www.prosoft-technology.com)). If your computer does not have access to the Internet, you must download the software from the ProSoft Technology website to removable media, and then copy it to your computer.

#### **1.4.3 RLX2-IHNF-W Cables (sold separately)**

The following cables are for outdoor locations:

Part Name	Part Number	Part Description
Locking Clip	CUL-M12-LOCKCLIP	
7 foot (2m), M12 to RJ45, Network Cable/ PoE <b>or</b> 33 foot (10m), M12 to RJ45, Network Cable/ PoE	CULRJ45-M12-007	7 foot Network PoE cable
33 foot (10m), M12 to unterminated leads, Power Cable <b>or</b> 10 foot (3m), M12 to unterminated leads, Power Cable	CULPWR-M12-033	33 foot Power Cable
	CUPLWR-M12-010	10 foot Power Cable

#### 1.4.4 **RLX2-IHNF-WC**

The following components are included with Weatherproof Hazardous Location RLX2-IHx series radio products:

Qty.	Part Name	Part Number	Part Description
1	RLX2-IHx series Radio	RLX2-IHNF-WC	RadioLinx® RLX2-IHx series 802.11 Industrial Hotspot
1	5 foot CAT 6 Ethernet PoE cable		Preinstalled 6 foot CAT 6 Ethernet PoE cable
1	5 foot flying leads power cable		Preinstalled 6 foot flying leads power cable
2	U bolts for mounting		Pole mounting brackets

You can download sample programs, utilities, firmware images, and documentation for your radio from the ProSoft Technology website ([www.prosoft-technology.com](http://www.prosoft-technology.com)). If your computer does not have access to the Internet, you must download the software from the ProSoft Technology website to removable media, and then copy it to your computer.

#### 1.4.5 **Industrial Hotspot Bench Test Kit (RLX-IHBTK)**

The standard radio products are intended for use with production systems and do not include accessory power supplies or cables. For bench testing of radios, an optional bench test kit provides these accessories:

Qty.	Part Name	Part Number	Part Description
1	Power Supply	RL-PS007-2	AC Power Adapter, 12V1.6A w/2 pin & 4 plug Set
1	Cable	RL-CBL025	5 foot Ethernet Straight-Thru Cable
1	Cable	085-1007	6 foot RS232 serial cable
1	Adapter	HRDNULL-DB9	RS232 null modem serial adapter

### 1.5 **Installing the RadioLinx Industrial Hotspot Browser**

Use the *RadioLinx Industrial Hotspot Browser Configuration Tool* (hereafter called the *IH Browser*) to set up and configure the RLX2-IHx series radios. It is designed for personal computers running the Microsoft Windows operating systems.

### **1.5.1 IH Browser System Requirements**

The IH browser is designed to run on Microsoft Windows, and is supported on the following versions:

- Microsoft Windows XP professional 32-bit with Service Pack 3
- Microsoft Windows 7 Professional 32- or 64-bit, with Service Pack 1
- Microsoft Windows 8 Release Preview 32- or 64-bit

Other Microsoft Windows operating system versions may work but have not been tested by ProSoft Technology and are not officially supported.

The minimum hardware requirements for the IH Browser are:

- Pentium® II 450 MHz minimum. Pentium III 733 MHz (or better) recommended
- 128 Mbytes of RAM minimum, 256 Mbytes or more of RAM recommended
- 100 MB available hard drive space
- 256-color VGA graphics adapter, 800 x 600 minimum resolution (True Color 1024 x 768 resolution or better recommended)
- At least one 100BASET or 1000BASET network interface. A second interface is often useful to setup a small private network for initial configuration and testing.

In addition, these items may be needed:

- An RS-232 port on the PC or a USB-to-serial convertor cable, to use serial encapsulation features or to access system debugging information.
- An internet connection to download updated product information from the ProSoft Technology website at [www.prosoft-technology.com](http://www.prosoft-technology.com).

### **1.5.2 Installing IH Browser Software**

You must install the *RadioLinx Industrial Hotspot Browser* (IH Browser) software to configure the radio. You can always get the newest version of ProSoft Configuration Builder from the ProSoft Technology website ([www.prosoft-technology.com](http://www.prosoft-technology.com)).

#### **To install IH Browser from the ProSoft Technology website**

- 1 Open your web browser and navigate to [www.prosoft-technology.com](http://www.prosoft-technology.com).
- 2 Use the search box on the ProSoft Technology page to search for *IH Browser* and then click the link for the *RadioLinx IH Browser*.
- 3 Click the *Download* tab and then click *RadioLinx IH Browser* to download the latest version of the IH Browser.
- 4 Choose **SAVE** or **SAVE FILE** when prompted.
- 5 Save the file to your *Windows Desktop*, so that you can find it easily when you have finished downloading.
- 6 When the download is complete, locate and double-click the zip file. This extracts the installation file (RadioLinx IH Browser 3.130.msi or a newer version).
- 7 Double-click the **.msi** file to install the IH Browser.

---

If your computer does not have access to the Internet, you must download the software from the ProSoft Technology website to removable media, and then copy it to your computer.

### **1.5.3 *Starting the IH Browser***

To start the *RadioLinx Industrial Hotspot Browser* (ID Browser), click **START > ALL PROGRAMS > PROSOFT > IH BROWSER**. If the software is not installed, see [Installing IH Browser Software \(page 23\)](#). For more information on the IH Browser and its functions, see [Using the IH Browser to Manage your Radios \(page 117\)](#).

## 2 Network Planning

### In This Chapter

❖ Installing the ProSoft Wireless Designer .....	26
❖ Installation Questions .....	27
❖ Planning the Physical Installation .....	27
❖ ProSoft Wireless Designer .....	28
❖ Testing the Network Installation .....	30
❖ Detecting 802.11 Access Points .....	32

It may be helpful to create a network plan before configuring and installing your RLX2-IHx series radio wireless network. This topic assumes a bridge network of Master and Repeater radios. Client radios can also be configured to work with devices on existing wireless LANs. For more information, see [Configuring a Client Radio \(page 53\)](#).

The simplest way to design the physical network of radios, antennas, connectors, cables, amplifiers and other accessories is to use the *ProSoft Wireless Designer*. This is a free software application that determines the hardware needs based on your answers to a few questions.

The *ProSoft Wireless Designer* generates a *Bill of Materials* specifying all the components you need for the installation. *ProSoft Wireless Designer* is included on the ProSoft Technology media supplied with the RLX2-IHx series radio, and is also available by downloading it from the ProSoft Technology website. See [Installing the ProSoft Wireless Designer \(page 26\)](#).

- 1 To begin, identify the potential radio locations. For example, you may install the Master radio near a PC in a central plant location. You can then use this PC to locate and configure the radios through the IH Browser. If the plant is an oil refinery, for example, you may need to install radios installed near the oil tanks.
- 2 The next important issue is how to link the radios. Unless the radios are very close together, make sure that each pair of radio antennas in the network has a clear line of sight between them. In other words, you must be able to see from one antenna to another, either with your eyes or with binoculars.
- 3 If there is no line of sight between antennas, you must locate an additional site for a Repeater radio. The Repeater radio creates a bridge between the radio antennas.

- 4 Choose the appropriate antennas for the network. You may need a power amplifier (available from ProSoft Technology) if an antenna is connected to the radio by a long cable. Signal loss at the radio is proportional to the distance between an antenna and its radio (longer cable, more signal loss). *ProSoft Wireless Designer* can suggest suitable antennas for the application based on frequency band, data rate, distance, power output level, and other factors.
- 5 Consider drawing the network plan on paper. Assign a logical name to each radio in your plan. You can then assign these names to the Radios during configuration.
- 6 A site survey may be helpful as part of the planning. You can hire ProSoft Technology or a surveyor to perform a survey, or you can conduct the survey on your own.
- 7 Plan to protect radios from direct exposure to weather, and provide an adequate, stable power supply. Make sure the plan complies with the radio's power requirements and cable specifications.

**Important:** Radios and antennas must be located at least 8 inches (20 cm) away from personnel.

## 2.1 Installing the ProSoft Wireless Designer

You can install the *ProSoft Wireless Designer* software to help you design your RLX2-IHx series radio network. You can always get the newest version of ProSoft Wireless Designer from the ProSoft Technology website ([www.prosoft-technology.com](http://www.prosoft-technology.com)).

### To install ProSoft Wireless Designer from the ProSoft Technology website

- 1 Open your web browser and navigate to [www.prosoft-technology.com](http://www.prosoft-technology.com).
- 2 Use the search box on the ProSoft Technology page to search for *ProSoft Wireless Designer* and then click the link for the *ProSoft Wireless Designer*.
- 3 Click the *Downloads* tab and then click *ProSoft Wireless Designer* to download the latest version of the software.
- 4 Choose **SAVE** or **SAVE FILE** when prompted.
- 5 Save the file to your *Windows Desktop*, so that you can find it easily when you have finished downloading.
- 6 When the download is complete, locate and double-click the zip file. This extracts the installation file (Installer.msi).
- 7 Double-click the **.msi** file to install the software.

You can download sample programs, utilities, firmware images, and documentation for your radio from the ProSoft Technology website ([www.prosoft-technology.com](http://www.prosoft-technology.com)). If your computer does not have access to the Internet, you must download the software from the ProSoft Technology website to removable media, and then copy it to your computer.

## 2.2 Installation Questions

The following questions will help in getting familiar with the system.

How many radios are in the network?	
Master ID:	
Repeater ID:	
Client ID:	
Locations:	
Is there a clear line of sight between them?	
What type of antennas will be used in the network?	
Will you use the Personality Module configuration restoration feature (MicroSD card)?	

## 2.3 Planning the Physical Installation

A network's performance is affected by attributes specific to the installation site. Consider the following cautions:

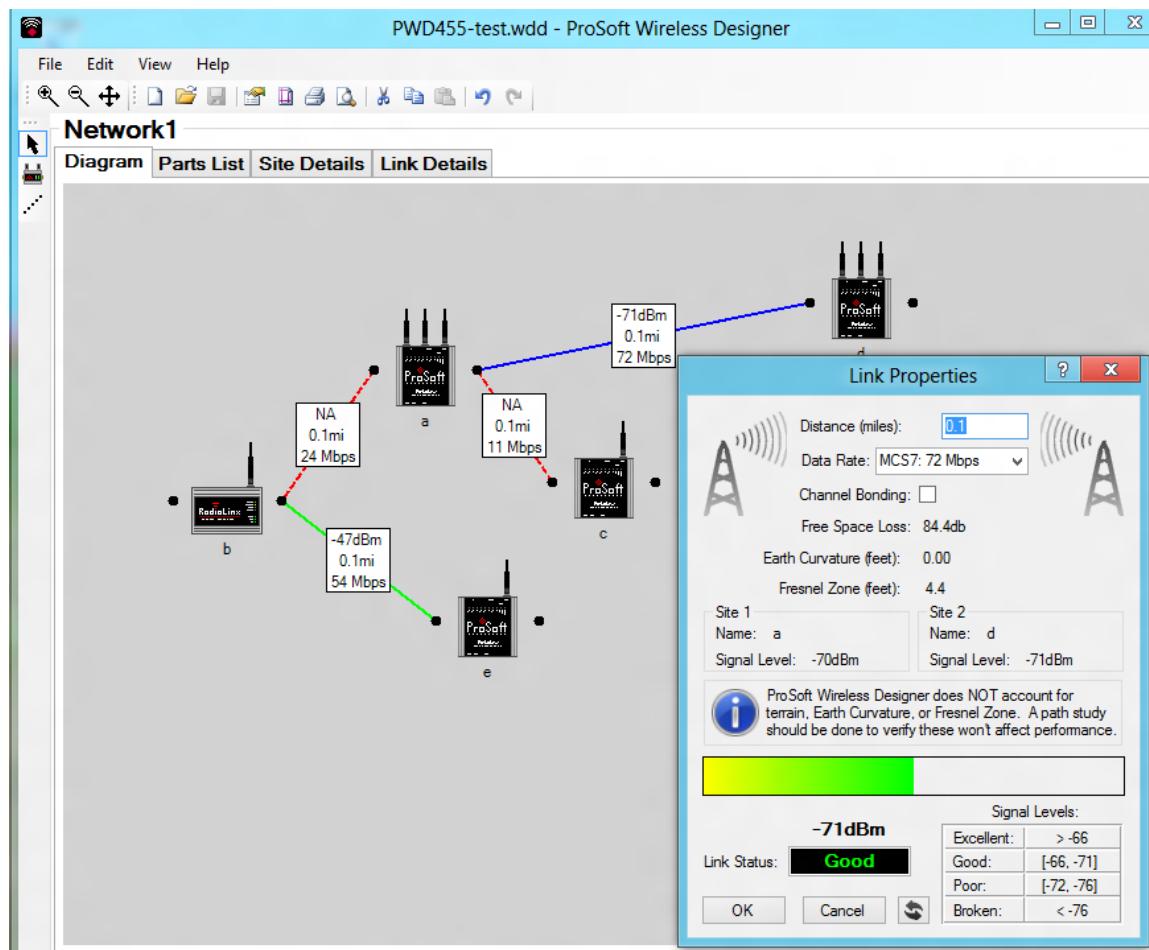
- Add Repeater radios to extend the distance to the next radio or where line of sight to the next radio is limited.
- Radios or antennas CANNOT be placed within 8 inches (20 cm) of personnel.

Though radio frequency communication is reliable, sometimes the performance can be affected by other factors. A good network installation plan includes both the time and the resources for testing the performance and modifying the installation.

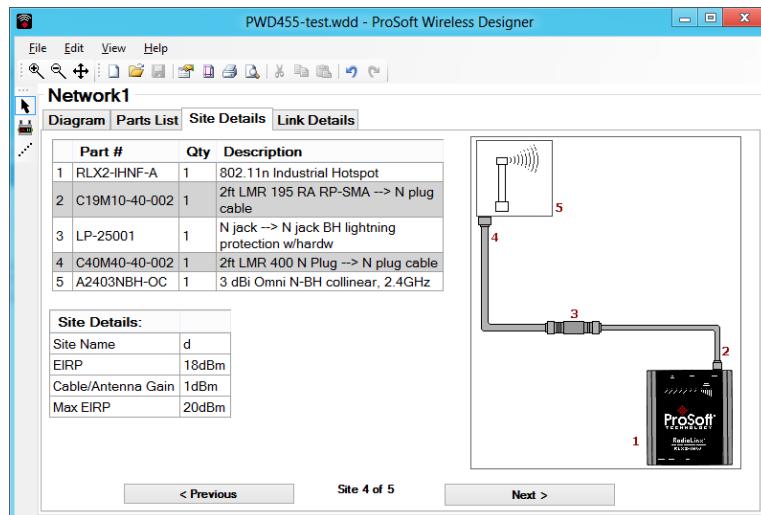
Test the installation plan before the network installation is complete. See Testing the Network Installation (page 30).

## 2.4 ProSoft Wireless Designer

*ProSoft Wireless Designer* is a free software tool from ProSoft Technology that simplifies the task of creating a ProSoft wireless installation. The following image shows an example of a wireless radio network and an estimate of signal quality between two radios.



*ProSoft Wireless Designer* can also compute a Bill Of Materials (BOM) for a complete radio installation, including antennas, cables, connectors and other required materials.



You can download the *ProSoft Wireless Designer* from the ProSoft Technology website. It provides a variety of views of your networks, along with an accurate description of each site in a wireless network. These include:

- Visual diagram of site layout
- Location (latitude/longitude, based on GPS coordinates)
- Radio type, frequency range, and country-specific channel and power requirements
- Length, type and estimated signal loss for cables
- Required accessories, including lightning protection, cable adaptors and antennas
- Complete parts list

ProSoft Technology technical personnel use *ProSoft Wireless Designer* if you request a site audit for customers, and then give you a complete list of components and a detailed description for each site and link. You can use this information to understand and visualize your wireless network, and have the necessary information for technical support and maintenance.

#### 2.4.1 Designer Functional Specifications

ProSoft Wireless Designer includes the following features:

- It contains a database of all currently available RadioLinx radios, antennas, cables, connectors and accessories.
- It exports parts lists, site and link details, and setup Wizard settings into a variety of common file formats for import into applications such as spreadsheets, databases, and word processors.
- It checks wireless link feasibility based on path length and recommended accessories.
- It predicts signal strength based on distance, local regulations, and hardware choices.
- It fully documents the ProSoft Technology wireless network plan.

### 2.5 Testing the Network Installation

Use the following steps to test your wireless network before you permanently install the radios and antennas.

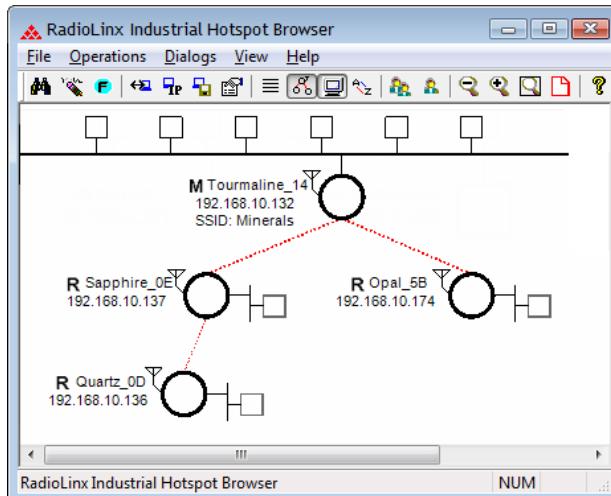
**Note:** If you are using the Personality Module feature (MicroSD card), remove the MicroSD card from its plastic bag and insert it into the Personality Module slot in each radio before you configure the radio. After you save the configuration in the *Radio Configuration / Diagnostic Utility* (or write it to the card by clicking **WRITE SD CARD** on the **ADVANCED SETTINGS** tab), you can leave the MicroSD card in the radio, or store it in some other location. The plastic bag for the card includes a sheet to record the MAC ID and radio name. It is important that you keep the MicroSD card in a secure location in case it is needed when you replace a radio.

- 1 Configure all the radios in the network. See Using the IH Browser to Configure Radios (page 41). If possible, configure all the radios side by side in an office setting and make sure they link before installing them in the field. If feasible, test with the radios and end-device equipment together before they are installed in the field.

**Tip:** To make it easier to physically identify the radios, apply a label to each radio indicating the radio name and IP address.

- 2 Install the Master radio in its proposed permanent location.
- 3 Connect the PC with the IH Browser software to the Master radio. See Making Power and Data Connections (page 34).
- 4 Install the other radios (Repeater, Client, and Bridging Client) in their proposed locations.
- 5 Temporarily place each radio's antenna near its proposed mounting location. The antenna can be held in place by hand. However, one person must hold the antenna while the other person monitors the Remote radio's signal strength in the IH Browser on the PC.

6 To see how a radio is linked in the network, make sure that the Master radio is connected to the PC. Then, in the IH Browser, from the **VIEW** menu click **TOPOLOGY VIEW**.



7 The Topology view shows a diagram of the network's wireless connections. Use this view to see whether all the radios are linked, and verify that the radios are linked correctly.

- A radio that is not linked to a parent appears as a circle outlined by a flashing dashed red line. It may be near the bottom of the window. Scroll down to view all available radios.
- See [Improving Signal Quality \(page 31\)](#) for more information on overcoming poor signal strength between radios.

### 2.5.1 *Improving Signal Quality*

To improve the signal quality of each Remote radio, try the following.

- Increase the height of the antenna's placement
- Use higher-gain antennas
- Decrease any TX attenuation that has been configured in the radios
- Select a new location for the Remote radio and/or its antenna
- Decrease the length of antenna cable
- Determine and resolve sources of electrical noise which may be interfering with the radio transmission
- Add a Repeater radio between the radios that are not communicating, or reconfigure an existing radio as a Repeater if line of sight is available

## 2.6 Detecting 802.11 Access Points

You can use your RLX2-IHx series radio as an installation tool to analyze the 802.11 environment and provide information on choosing antenna location and channel selection.

- 1 Install the radio with its correct antenna.
- 2 Configure the radio as a Repeater radio with a Test SSID so it continuously scans.
- 3 Start the IH Browser. See Starting the IH Browser (page 24).
- 4 In the IH Browser, select the radio, and then from the **DIALOGS** menu choose **SCAN LIST**. See Using the IH Browser to Manage your Radios (page 117).

The *Scan List* dialog box displays information all active 802.11 radios in the area, including:

- Each 802.11 Access Point detected, including the AP's SSID
- The actual RSSI (signal strength) from each AP in dBm
- The channel of each radio detected

Use this information to help choose a channel that has the lowest utilization, or to select appropriate antenna types and alignments to minimize interference.

## 3 RLX2-IHx series Quick Setup

### In This Chapter

❖ Preparing the Configuration Environment.....	34
❖ Making Power and Data Connections .....	34
❖ Radio Power-Up.....	41
❖ Using the IH Browser to Configure Radios.....	41
❖ Configuring a Radio - Getting Started .....	44
❖ Viewing a Radio's Configuration.....	55
❖ Replacing an Existing Radio.....	55

This chapter describes how to set up RLX2-IHx series radios in a minimal configuration before deploying them in the permanent installation. The procedures in this section help familiarize you with basic configuration procedures, and show you how to verify that the radios are operational.

**Note:** If you have not designed your wireless network, see Network Planning (page 25) for the steps to design your network using the *ProSoft Wireless Designer*. In addition to helping you design your network, *Prosoft Wireless Designer* also creates a Bill of Materials listing all the components for the network.

The procedures described in this section assume the radios are in their default configurations as shipped by ProSoft. If that is not the case, you can reset the radios to factory defaults before attempting these procedures. See Resetting a RLX2-IHx series Radio (page 148).

Note that in any given network, there must be at least one RLX2-IHx series radio acting as a *Master*. Other radios that you configure as *Repeaters* or *Clients* will connect wirelessly to the Master to form a network bridge between their Ethernet interfaces.

If you are replacing an existing radio with a new radio of the same type, you can easily transfer the radio configuration from the old radio to the replacement radio. See Replacing an Existing Radio (page 55).

**Important:** If you do not have a ProSoft Technology Power adapter RL-PS007-2 (supplied with the RLX-IHBTK Bench Test Kit), see Making Power and Data Connections (page 34) for instructions on wiring the power connector.

### 3.1 Preparing the Configuration Environment

If you have all the RLX2-IHx series radios on your workbench, you may not need antennas for this procedure. Radios without antennas may have sufficient signal strength to link over short distances, without radiating or receiving unnecessary RF energy in the surrounding environment. However, we recommend that you connect an antenna to the Master radio. See Antenna Port Connections (page 18).

**Important:** If the radios are close enough to each other that their received signal strength is greater than -40 dBm, performance may be degraded. Disconnect antennas from radios during bench testing, or move the radios further apart from each other.

**Tip:** To make it easier to physically identify the radios, apply a label to each radio indicating the radio name and IP address.

### 3.2 Making Power and Data Connections

#### 3.2.1 *RLX2-IHW, IHNF, IHG, IHA Radio Connections*

The power, Ethernet, and serial (RS-232) connections for these radios are located on the bottom of the case.



- 1 Attach an Ethernet cable to the radio you want to be the Master RLX2-IHx series radio. If you are connecting to a network, make sure this network connection is on the same subnet as the PC running the IH Browser configuration software.
- 2 Connect a power cable (power connection included with the radio) to the 10-24 VDC port.
  - o The Ethernet DATA LED illuminates when data is sent to or received from the radio.
  - o The Ethernet SPEED LED indicates the speed of the Ethernet connection:

Ethernet Connection speed	SPEED LED
10 Base T	LED is off
100 Base T	LED is on
1000 Base T	LED blinks about once every two seconds

### 3.2.2 RLX2-IHNF-W Radio Connections

All power and Ethernet connections for these radios are located on the bottom of the case.



- 1 Attach an Ethernet cable with an M12 connector to the radio you want to be the Master radio. If you are connecting to a network, make sure this network connection is on the same subnet as the PC running the IH Browser configuration software.

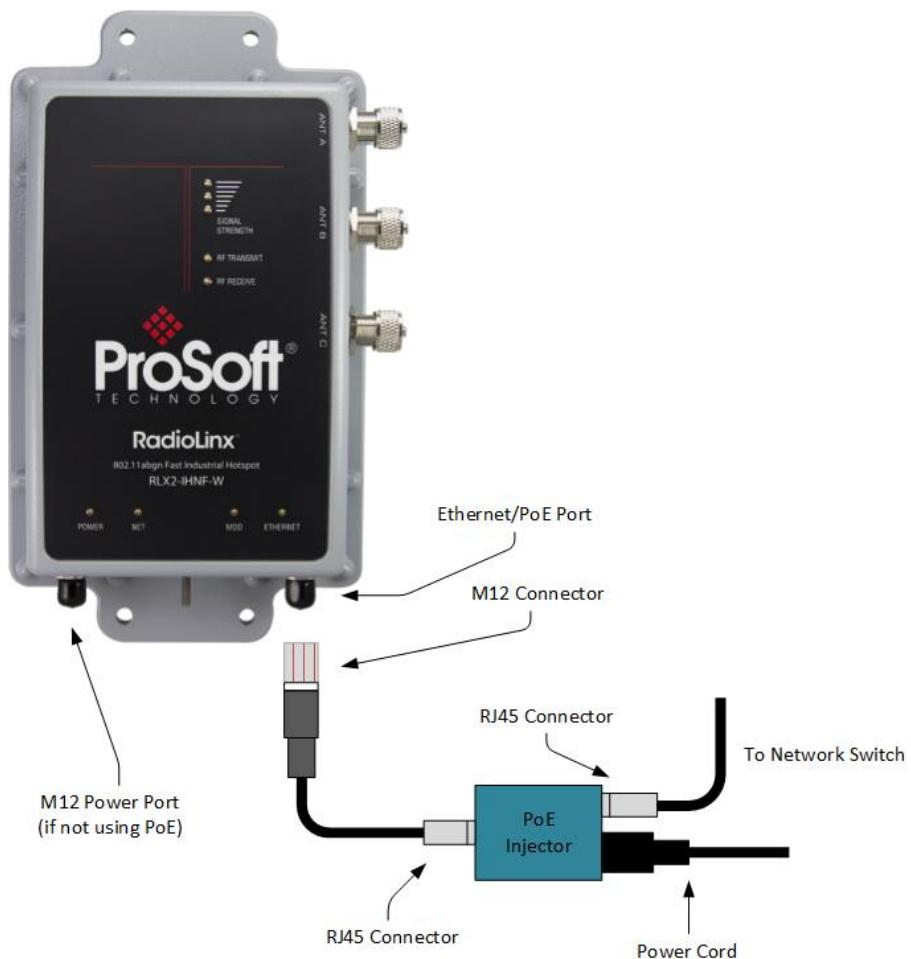
**Note:** The RLX2-IHNF-W Weatherproof radio uses M12 connectors for both Ethernet and power. You can order these cables directly from ProSoft Technology.

- 2 Connect the power cable with an M12 connector to the specified port shown.

**Note:** The RLX2-IHNF-W radio can be powered over Ethernet (POE) with an approved injector available from ProSoft. In this case, the Power connector would not be used.

- 3 If PoE is used, cap the Power Connector with the M12 Waterproof Cap.
- 4 Connect the Ethernet cable through the PoE injector (if using PoE) and into the network switch.

**Note:** Most off-the-shelf PoE Injectors work with this unit except the 802.3at/ PoE+ Injectors.



**Note:** The M12 PoE cable is not included with the radio but can be ordered through ProSoft.

**Warning:** Do not connect or disconnect the M12 Power Port or PoE connection when energized, that is, the cable is live.

### 3.2.3 RLX2-IHNF-WC Radio Connections

This radio is suitable for Class I, DIV2 hazardous locations. The power and Ethernet connections for these radios are a set of wires that protrude through a single conduit hub located on the bottom of the case.

- One wire is terminated with an RJ45 connector for Ethernet connections. This wire can also supply power when attached to a PoE Injector.
- The second wire supplies power to the radio if not attached to a PoE Injector. If you are using PoE, make sure you insulate this wire from the other wires to prevent shorting.

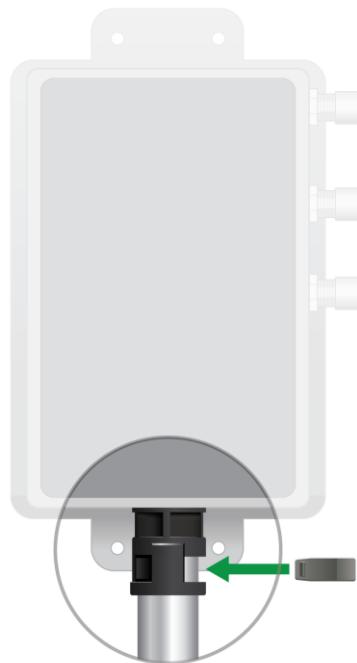
#### To install this radio

- 1 Place a seal cap over the top of the conduit as shown below.
- 2 Run both wires down through the conduit.
- 3 Push the conduit up into the permanently installed connector on the bottom of the radio. Push it up as far as it will go.



**Warning:** The recommend conduit is Thomas & Betts® PMA Series, Cat. No. CYLT-23B.

- 4 Place the oval clip into the opening in the connector until it snaps into place. This secures the conduit to the connector.



**Note:** In the event that you have to remove the conduit, simply remove the oval clip by using a screwdriver to pry it out. You can then remove the conduit from the connector.

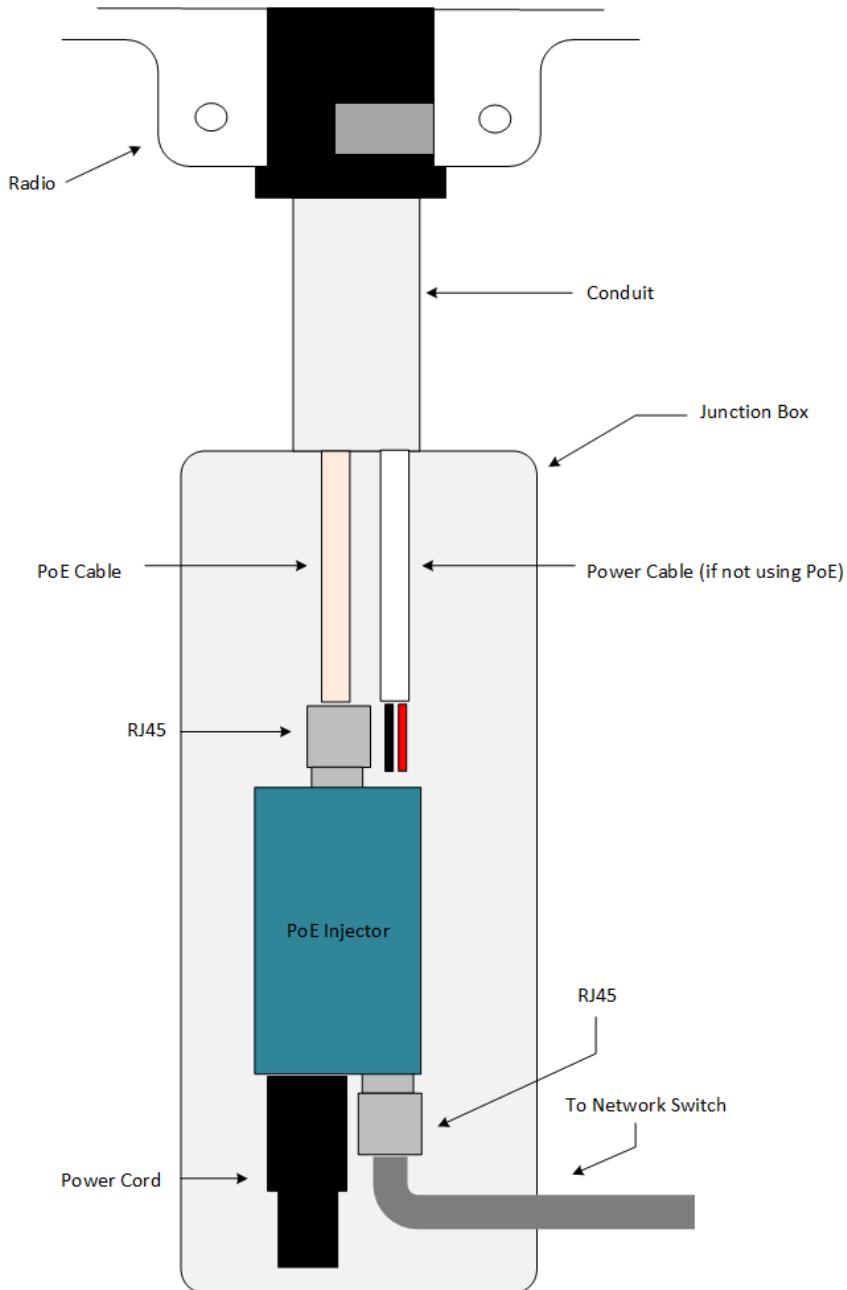


The wire with the RJ45 connector is your Ethernet connection and supports Power over Ethernet (PoE).

**Warning:** Do not connect or disconnect the PoE connection when energized.

- 5 If you are not using PoE, use the other wire set to power the radio.

**Note:** If you are using PoE to provide power to the radio, insulate the additional power cable from other wires inside the junction box during installation to prevent the wire assembly from shorting out.



### 3.3 Radio Power-Up

RLX2-IHx series radios power-up when power is supplied to the radio—there is no On/Off switch. The Power LED cycles when power is applied. First the Power LED lights AMBER when power is applied, then the LED goes out for a few seconds during initialization, and then lights GREEN. This process takes 10 to 15 seconds. Once the Power LED is green, the radio is booted and operational. Other LEDs on the radio may become active as well.

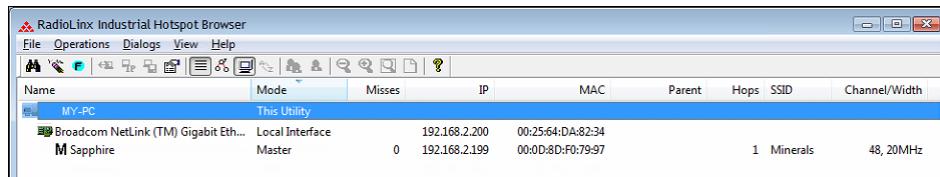
Please note the MAC address of the RLX2-IHx series radio, printed on a label attached to the front of the radio. The MAC address has the form 00-0D-8D-XX-YY-ZZ. For example, 00-0D-8D-F0-5C-8E. This number uniquely identifies the radio on the network. You use this number to identify the radio on the network when using the IH Browser.

### 3.4 Using the IH Browser to Configure Radios

This section describes how to use the *RadioLinx Industrial Hotspot Browser* (IH Browser) to set up RLX2-IHx series radios in a minimal configuration before deploying them in the permanent installation. See Using the IH Browser to Manage your Radios (page 117) for detailed descriptions of all the features available in the IH Browser.

#### 3.4.1 Viewing the Radios in the IH Browser

Start the IH Brower: see Starting the IH Brower (page 24). If the radio is powered up and connected, it appears in the IH Brower. Note that the *MAC* address is the same address as that of the label on the radio. The *List* view (shown in the image below) displays the RLX2-IHx series radios (or previous generation RLXIB radios, except the RLCIB-IHN) on the same network as the computer running the IH Brower.



**Note:** You can perform many common tasks by right-clicking on the radio and choosing a command.

### 3.4.2 Refreshing the Display in the IH Browser

#### To refresh the display

If you have made changes to a radio's configuration, refresh the IH Browser by clearing and scanning the display using the buttons on the toolbar.

-  The **Erase** button clears the radios from display (or from the **FILE** menu choose **CLEAR**).
-  The **Scan** button rescans the network for RLX2-IHx series radios (or from the **FILE** menu choose **SCAN**).

### 3.4.3 Setting the Radio IP Address in the IH Browser

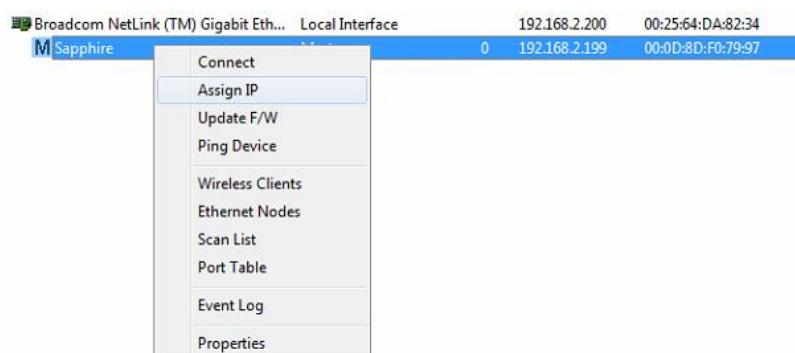
#### To set the radio IP address

- If the radio is on a network with a DHCP server, it gets an IP address through DHCP.
- If the radio is not on a network with a DHCP server, the radio appears with an IP address of 0.0.0.0. You can assign a temporary IP address to assist with configuring the radio. See [Assigning a Temporary IP Address \(page 42\)](#).

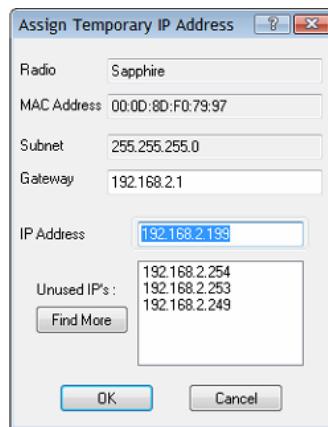
### 3.4.4 Assigning a Temporary IP Address

A temporary IP address allows you to access and configure a radio using the IH Browser and the *Radio Configuration / Diagnostic Utility*.

- 1 In the IH Browser, right-click the radio and then click **ASSIGN IP**.

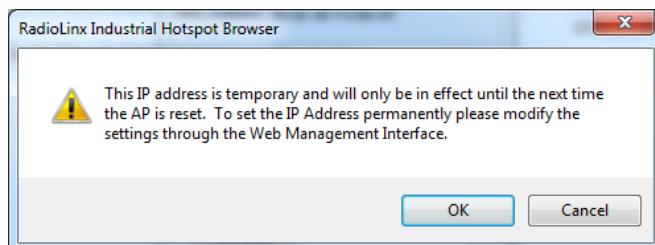


This opens the *Assign Temporary IP Address* dialog box.



The **UNUSED IP's** list are the IP addresses that are currently available on the network.

- 2 The IH Browser suggests the network parameters for the temporary IP address. It queries the IP addresses, and only displays them if it does not receive a response. Click one of the unused IP's, or enter an unused IP address, and then click **OK**. The IH Browser warns you that the IP address is temporary.



- 3 Click **OK**, and then refresh the display in the IH Browser. Your radio should now appear in the IH Browser window with the temporary IP address.
- 4 To set a permanent IP address for the radio, see Configuring a Radio - Getting Started (page 44).

### 3.5 Configuring a Radio - Getting Started

This section describes how to set up RLX2-IHx series radios in a minimal configuration before deploying them in the permanent installation. See Configuring a Radio - Detailed Configuration (page 57) for a detailed description of all the configuration parameters available for your radio.

#### 3.5.1 ***Connecting to the Radio Configuration Utility***

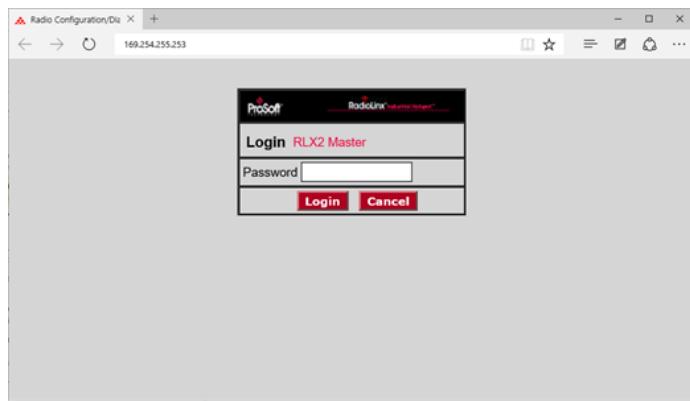
This section describes how to connect to the *Radio Configuration / Diagnostic Utility* using a web browser such as Internet Explorer or Firefox on your PC or other network-enabled device.

##### **To connect to the Radio Configuration / Diagnostic Utility**

**Important:** Your computer or other device must be connected to the same network as the RLX2-IHx series radio.

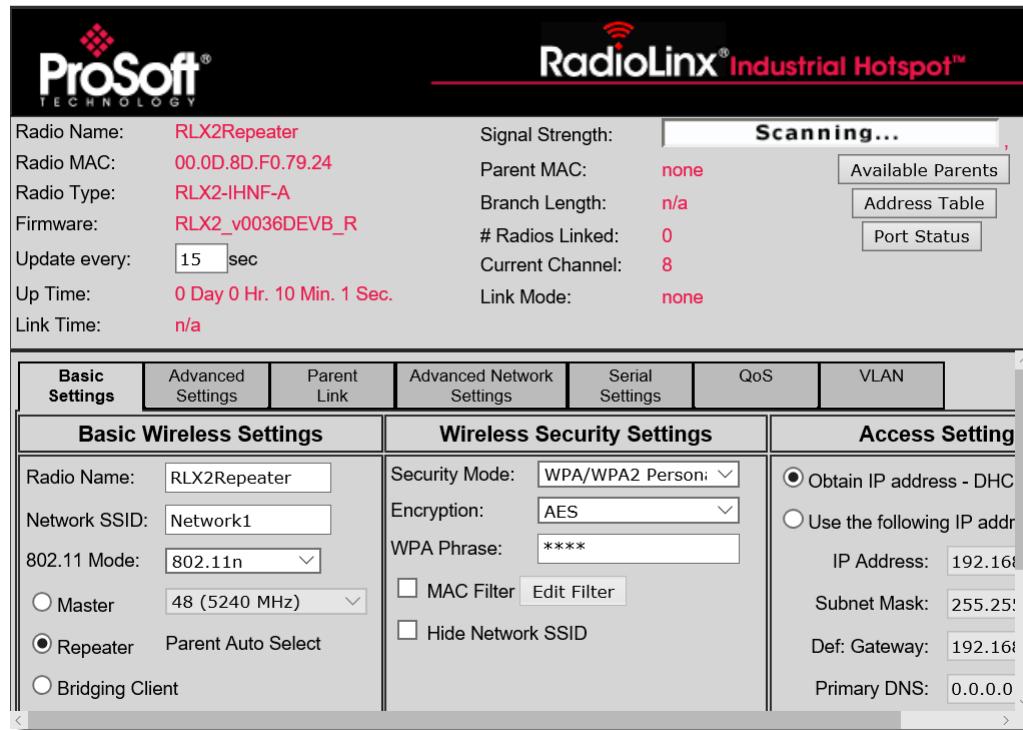
- 1 Open the *Radio Configuration / Diagnostic Utility* for the radio. You can do this in any of three ways:
  - In the IH Browser List view or Topography view, right-click the radio and then click **CONNECT**.
  - In the IH Browser List view or Topography view, double-click the radio.
  - Open a web browser on your PC, and then in the address bar, type `http://`, followed by the IP address for the radio, and then press **ENTER**. For example, `http://192.168.6.10`.

The login screen appears in the web browser.



- 2 Enter the password and then click **LOGIN**. The default password is *password*. If you have lost the password for the radio, you can reset the radio to its default settings. See Resetting a RLX2-IHx series Radio (page 148).

This opens the *Radio Configuration / Diagnostic Utility* for the radio. Note that some parameters may be different from the image depending on your specific radio model.



**Tip:** You can display the help topic for any parameter in the *Radio Configuration / Diagnostic Utility* by clicking the parameter name. The parameter name turns blue when you move the cursor over a parameter with a help topic. There is also a short description of the censored control at the bottom of the window.

### 3.5.2 Setting Up a Master Radio

Most wireless networks consist of one *Master radio* and multiple *Repeater radios*.

All RLX2-IHx series radios are shipped pre-configured as Repeaters by default.

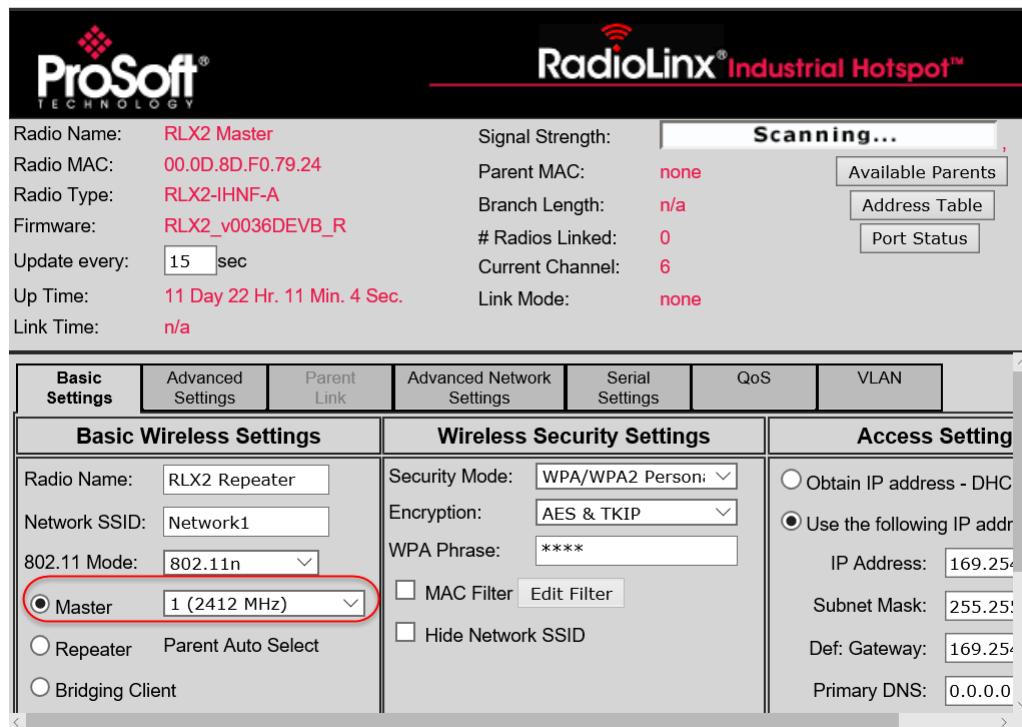
Your first task in setting up a new network is to configure one radio as the network Master. This section describes how to configure basic settings for a Master radio.

#### To configure a Master radio

- 1 Start the IH Browser.
- 2 Open the *Radio Configuration / Diagnostic Utility*. See Connecting to the Radio Configuration Utility (page 44).

**Tip:** You can display the help topic for any parameter in the dialog box by clicking the parameter name. The cursor changes shape when you move it over a parameter name with help. There is also a short description of the cursor control at the bottom of the *Radio Configuration / Diagnostic Utility* window.

- 3 On the **BASIC SETTINGS** tab, in the **BASIC WIRELESS SETTINGS** group, click the **MASTER** radio button and then select channel **1 (2412 MHz)** as shown in the following example.



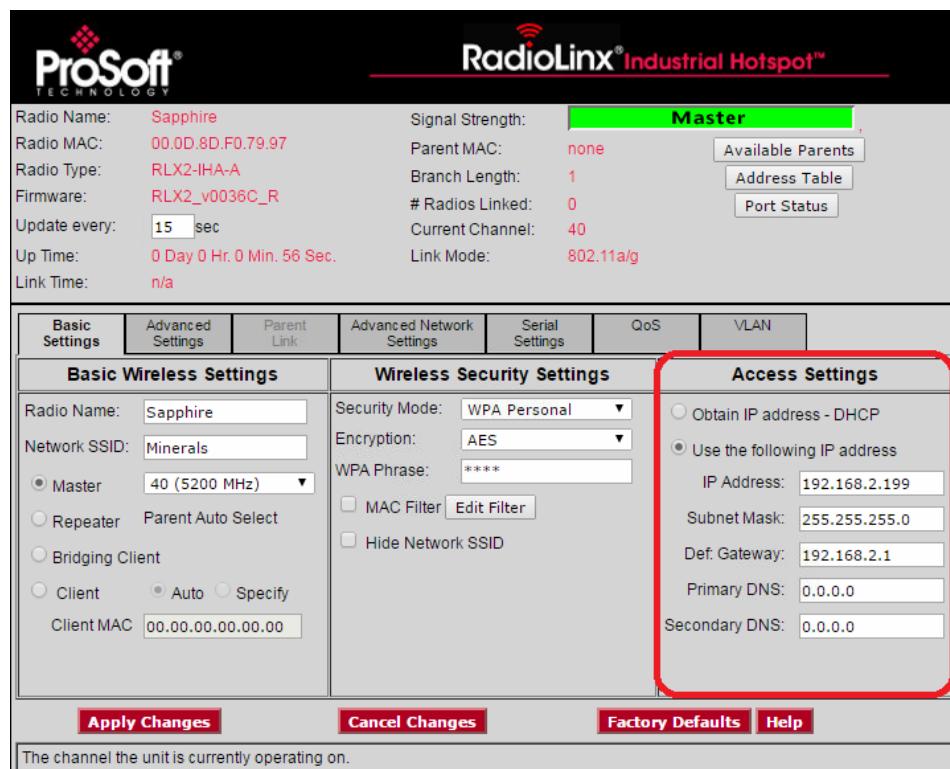
**Note:** To communicate with each other, all RLX2-IHx series radios must communicate over the same frequency in either the 2.4 GHz or the 5 GHz frequency band. The available frequency bands depend on the type of radio.

The RLX2-IHA uses 5 GHz frequency band only.

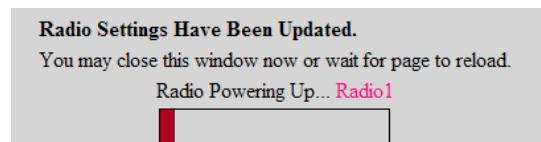
The RLX2-IHG uses 2.4 GHz frequency band only.

The rest of the RLX2-IHx series radios can use both 2.4 and 5 GHz.

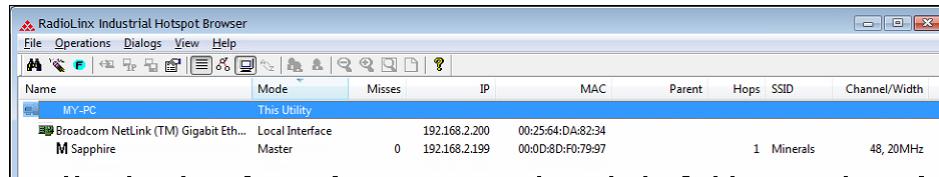
- 4 Edit the **RADIO NAME** if desired.
- 5 If you set a temporary IP address in the radio (see **Assigning a Temporary IP Address** (page 42)), set the permanent IP address. On the **BASIC SETTINGS** tab, in the **ACCESS SETTINGS** group, click **OBTAIN IP ADDRESS - DHCP** or **USE THE FOLLOWING IP ADDRESS**.



- 6 Click **APPLY CHANGES** to reboot the Radio. The IH Browser displays a progress bar while the radio is rebooting.



7 After the radio reboots successfully, refresh the display in the IH Browser. See Refreshing the Display in the IH Browser (page 42). The radio appears as a Master in the IH Browser window:

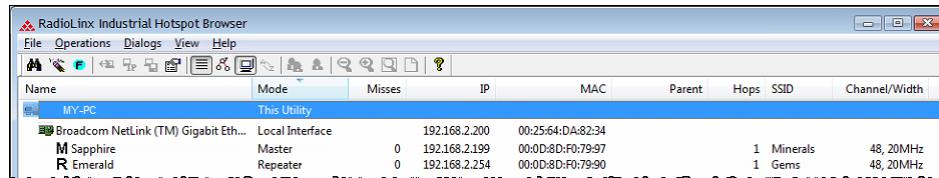


### 3.5.3 Configuring a Repeater Radio

After you configure one radio as the Master radio, any powered RLX2-IHx series radios in their default shipping configuration should automatically link to the Master radio. You do not need to attach an Ethernet cable to the additional radios.

#### To configure a Repeater radio

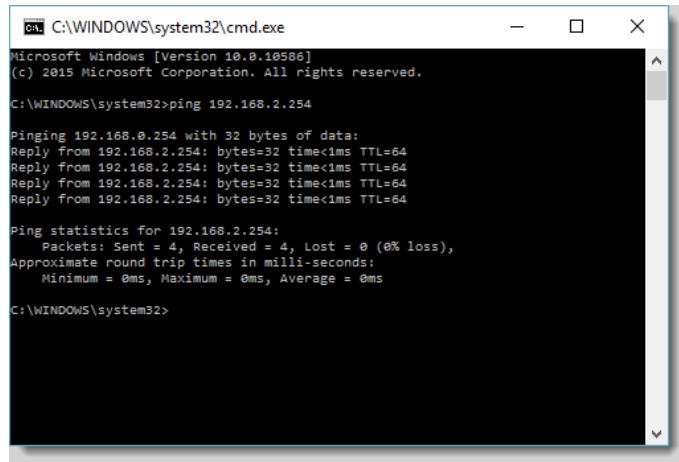
1 Start the IH Browser. After the radio starts, it should appear in the IH Browser.



Note that the Repeater radio above (whose MAC address ends in 54 in the above example) has linked to the Master radio (whose MAC address ends in 97).

2 Open the *Radio Configuration / Diagnostic Utility*. See Connecting to the Radio Configuration Utility (page 44).  
3 If the radio IP address is 0.0.0.0, assign a temporary IP address to the Repeater radio. See Assigning a Temporary IP Address (page 42). In this example, the Repeater has an IP address of 192.168.2.254.

- 4 On your PC, open a command prompt window and use the Ping command to ping the Repeater radio's IP address. The Master radio should ping the Repeater radio so that you see the following.



```
C:\WINDOWS\system32\cmd.exe
Microsoft Windows [Version 10.0.10586]
(c) 2015 Microsoft Corporation. All rights reserved.

C:\WINDOWS\system32>ping 192.168.2.254

Pinging 192.168.0.254 with 32 bytes of data:
Reply from 192.168.2.254: bytes=32 time<1ms TTL=64

Ping statistics for 192.168.2.254:
    Packets: Sent = 4, Received = 4, Lost = 0 (0% loss),
    Approximate round trip times in milli-seconds:
        Minimum = 0ms, Maximum = 0ms, Average = 0ms

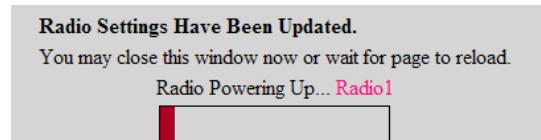
C:\WINDOWS\system32>
```

If this is successful, then you have successfully configured the RLX2-IHx series wireless network. You can add additional Repeater radios by repeating these steps. If you want to make more changes to the radio's configuration, you can use the following steps.

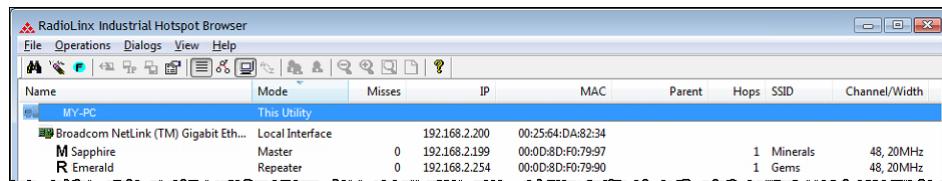
- 1 Open the *Radio Configuration / Diagnostic Utility*.
- 2 Edit the **RADIO NAME** if desired.

**Note:** To communicate with each other, all RLX2-IHx series radios must communicate over the same frequency as the Master radio.

- 3 If you set a temporary IP address in the radio (see *Assigning a Temporary IP Address* (page 42)), set the permanent IP address. On the **BASIC SETTINGS** tab, in the **ACCESS SETTINGS** group, click **OBTAINT IP ADDRESS - DHCP** or **USE THE FOLLOWING IP ADDRESS**.
- 4 Click **APPLY CHANGES** to reboot the Radio. A progress bar is displayed during reboot.



After rebooting successfully, the radio appears as a Repeater radio in the IH Browser window:



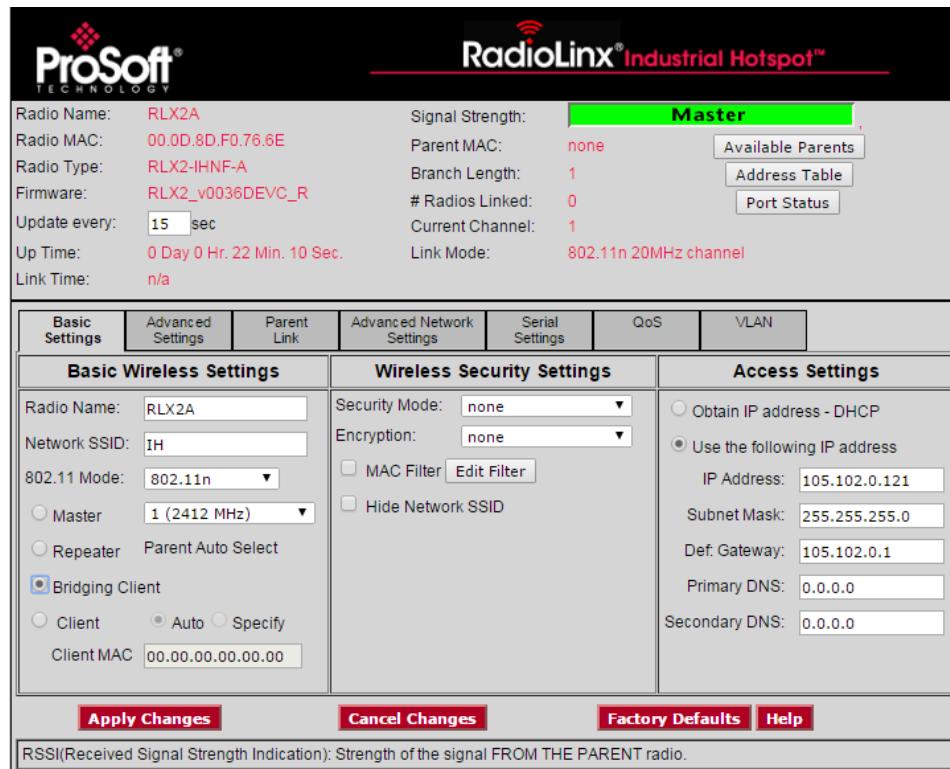
### 3.5.4 Configuring a Bridging Client Radio

You can configure RLX2-IHx series radios in *Client* or *Bridging Client* modes in the event that you want to connect to third-party 802.11 Access Points. See Configuring a Client Radio (page 53) for the differences in the modes. The most straightforward way to test a Client or Bridging Client mode radio configuration is to use a second PC connected as the downstream network device from a Client radio. The following example assumes that there is a second PC, and shows how to connect to the Master radio.

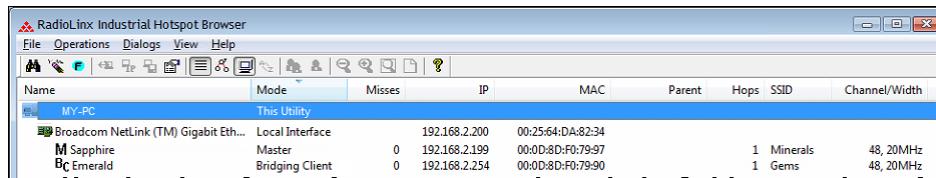
#### To configure a Bridging Client radio

- 1 Power up a new radio in the default configuration so that it connects to the Master radio.
- 2 Start the IH Browser. After the radio starts, it should appear in the IH Browser.
- 3 In the IH Browser, assign a temporary IP address to the Repeater radio. See Assigning a Temporary IP Address (page 42).
- 4 Open the *Radio Configuration / Diagnostic Utility*. See Connecting to the Radio Configuration Utility (page 44).

5 On the **BASIC SETTINGS** tab, in the **BASIC WIRELESS SETTINGS** group, change the radio to **BRIDGING CLIENT**.



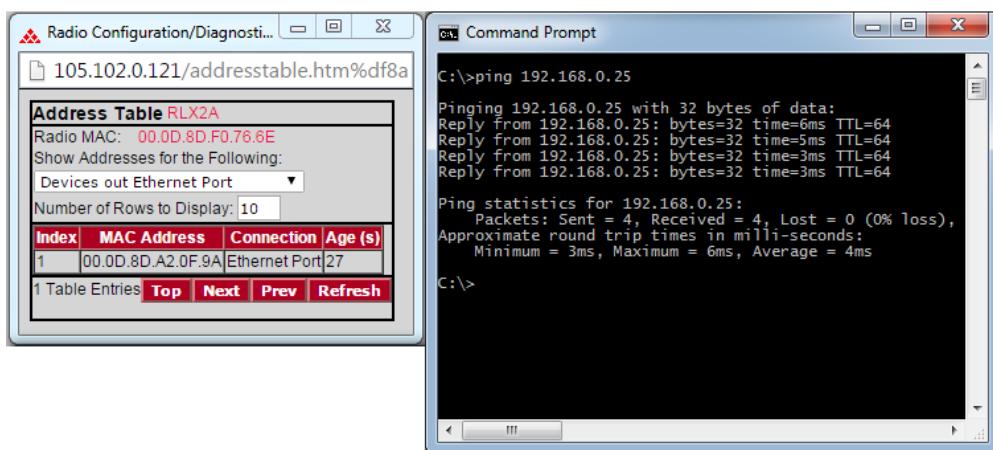
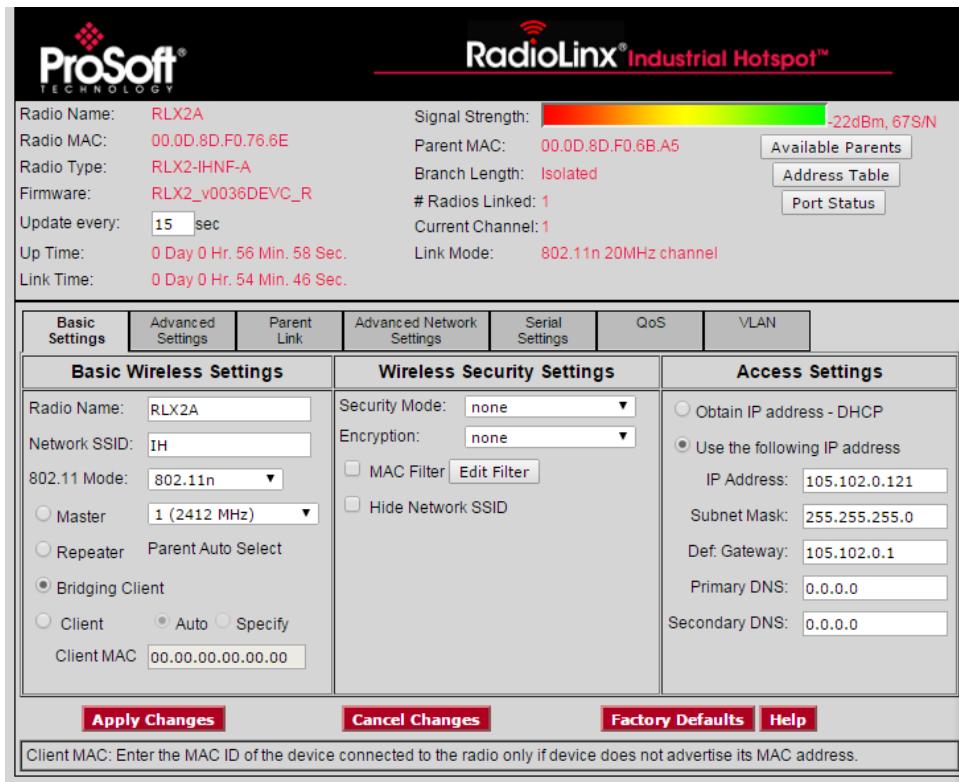
6 Click **APPLY CHANGES** to save the configuration.  
7 Refresh the display in the IH Browser. The radio appears in the IH Browser as a Bridging Client radio:



8 Set up another Master radio with the correct SSID. This allows the radio to connect to the Bridging Client radio.

In this mode, multiple Ethernet devices can connect with any 3rd-party access points (802.11 a/b/g/n).

The following example shows the settings for the Bridging Client radio and the results of the Ping command for the Ethernet device attached to its Ethernet port. The MAC address of the device is displayed by clicking **ADDRESS TABLE** and by selecting **DEVICES OUT OF THE ETHERNET PORT**.



### 3.5.5 Configuring a Client Radio

You can also configure RLX2-IHx series radios in *Client* mode in the event that you want to connect to third-party 802.11 Access Points. The following table highlights the most significant differences between Repeater, Client, and Bridging Client modes on RLX2-IHx series radios.

	Repeater	Client	Bridging Client
Number of attached Ethernet devices supported	Multiple (up to the limits of network)	One	Multiple (up to 16)
Can other wireless devices connect to the radio?	Yes	No	No
Can the radio connect to non-ProSoft Technology Access Points (Masters)?	No	Yes	Yes
Can I see the radio MAC address on the network?	Repeater radio's MAC address	MAC address of connected device or user-specified MAC address.	Bridging Client radio's MAC address

Client mode is a special mode in the radio that allows a user to connect an Ethernet device to a wireless network through any 802.11a, b, g, or n access point. Any Ethernet device that has an RJ45 Ethernet port can, in effect, become an 802.11a, b, g, or n wireless client by attaching the radio. Only a single device can be connected to the radio in Client mode. Do not connect to more than one Ethernet device (using a switch or hub).

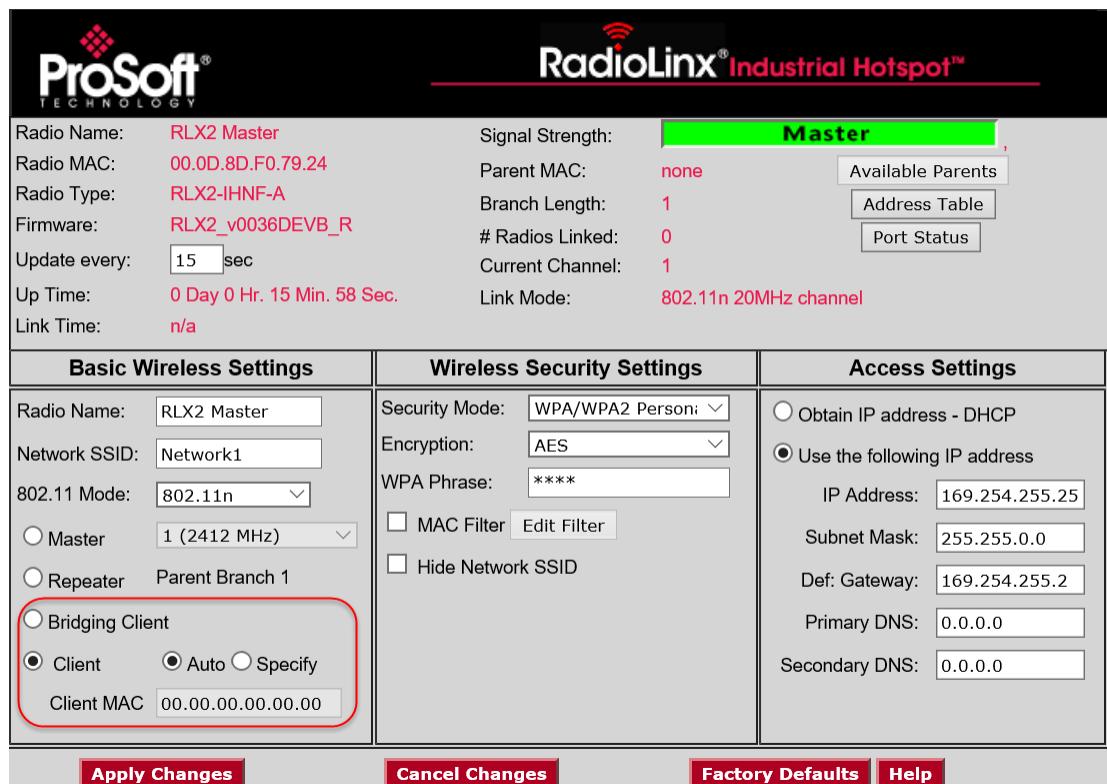
**Note:** You only use client mode if you need to connect to another brand 802.11a, b, g, or n access point. If you are using RLX2-IHx series radios, you should always use them as repeaters (and masters). Client mode radios are not necessary in Industrial network applications where an RLX2-IHx series Master radio acts as the Access Point. If you don't need a Client RLX2-IHx series radio in the system, you can skip this example configuration.

The most straightforward way to test a Client or Bridging Client mode radio configuration is to use a second PC connected as the downstream network device from a Client radio. The following example assumes that there is a second PC, and shows how to connect to the Master radio.

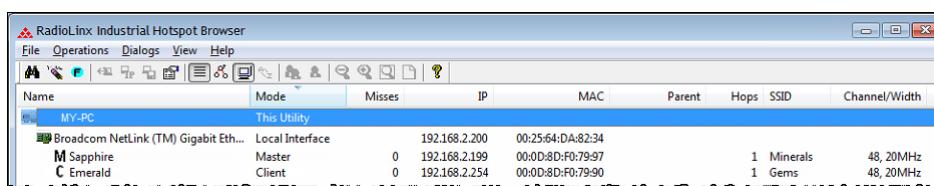
#### To configure a Client radio

- 1 Power up a new radio in the default configuration so that it connects to the Master radio.
- 2 Start the IH Browser. After the radio starts, it should appear in the IH Browser.

- 3 In the IH Browser, assign a temporary IP address to the Repeater radio. See [Assigning a Temporary IP Address \(page 42\)](#).
- 4 Open the *Radio Configuration / Diagnostic Utility*. See [Connecting to the Radio Configuration Utility \(page 44\)](#).
- 5 In the **BASIC WIRELESS SETTINGS** group, change the radio to **CLIENT**.



- 6 Edit the **RADIO NAME** if desired.
- 7 If you set a temporary IP address in the radio (see [Assigning a Temporary IP Address \(page 42\)](#)), set the permanent IP address. On the **BASIC SETTINGS** tab, in the **ACCESS SETTINGS** group, click **OBTAINT IP ADDRESS - DHCP** or **USE THE FOLLOWING IP ADDRESS**.
- 8 Click **APPLY CHANGES** to reboot the Radio. A progress bar is displayed during reboot.
- 9 Refresh the display in the IH Browser. The radio appears in the IH Browser as a Client radio.



- 10 When the Client radio reboots, connect an Ethernet cable from the radio to the second PC. Wait until the radio registers the MAC address of the PC's network interface (Client mode only).
- 11 Ensure that the IP address of the Ethernet interface on the second PC is on the same subnet as the network for the Client radio. For this example, set the IP address of the PC interface to 192.168.2.248.
- 12 Open a command prompt on the second PC, and verify that you can use the Ping command to ping the IP address of the Master radio.

### 3.6 Viewing a Radio's Configuration

You can quickly view a radio's configuration.

- 1 Start the IH Browser.
- 2 Right-click the radio and then click **PROPERTIES**.
- 3 If you want to view all the available properties, in the *Detailed Information for Radio* dialog box, click **MORE**.

Note that you cannot change the radio's configuration in this dialog box. If you want to change the configuration, or view more details, see Configuring a Radio - Getting Started (page 44) or Configuring a Radio - Detailed Configuration (page 57).

### 3.7 Replacing an Existing Radio

The RLX2-IHx series of industrial hotspots include a microSD card slot for quickly moving the configuration from an installed radio to a replacement using a microSD card. This feature reduces the time to replace a damaged radio.

If you are replacing an existing radio that had a Personality Module (microSD card) installed, then you do not need to manually configure the new radio.

Remove the microSD card from the existing radio with the stored configuration and install it in the new radio. When you power up the new RLX2-IHx series radio, the new radio uses all the configuration settings from the microSD card. This feature eliminates the need to manually configure the replacement radio.

By default, the RLX2-IHx series radios writes configuration changes to a microSD card (Personality Module) whenever you make configuration changes a microSD card is present in the radio. The RLX2-IHx series (by default) also reads the microSD card's configuration when it powers on and uses the stored configuration from the microSD card if the configuration is different than the configuration in the radio's memory.

While this feature can save you time when replacing a radio in the field, it is also a potential security risk. The configuration stored on the microSD could be inserted into another radio, and the radio could then access the network. The file itself on the microSD card is encrypted so the configuration information (principally the configuration password and encryption key) cannot be extracted. We highly recommend that you physically secure the radio and the microSD card.

If you are not using the Personality Module feature, we recommend that you turn **SD AUTO-CLONE ENABLE** and **SD AUTO-WRITE ENABLE** off. See Personality Module Settings (page 91).

**Note:** The RLX2-IHNF-W or WC radios do not have a microSD card slot (no Personality Module). For these models, you must manually configure the replacement radio. See Configuring a Radio - Getting Started (page 44).

**Important:** Before installing a new radio, please verify that all listed product items are present. See Package Contents (page 20). If any of these components are missing, please contact ProSoft Technology Support for replacements.

## 4 Configuring a Radio - Detailed Configuration

### In This Chapter

❖ Connecting to the Radio Configuration Utility .....	57
❖ Viewing Radio Status .....	63
❖ Configuring Basic Settings .....	70
❖ Configuring Advanced Settings .....	83
❖ Configuring Parent Link Settings .....	94
❖ Configuring Advanced Network Settings .....	99
❖ Configuring Serial Settings .....	107
❖ Configuring Quality of Service (QoS) Settings.....	113
❖ Configuring VLAN Settings.....	115

The RLX2-IHx series radios include a built-in *Radio Configuration / Diagnostic Utility* that allows you to both monitor and to configure your radio. The utility is an enhanced HTML webpage that you can display from any computer that can connect to the radio through a wired Ethernet connection or a wireless connection.

You can monitor and change the settings for your radio using any type of computer that has a web browser such as Microsoft Internet Explorer, Firefox, or Chrome. These include desktop PCs, laptops, tablets, or smart phones.

### 4.1 Connecting to the Radio Configuration Utility

This section describes how to connect to the *Radio Configuration / Diagnostic Utility* using a web browser such as Internet Explorer or Firefox on your PC or other network-enabled device.

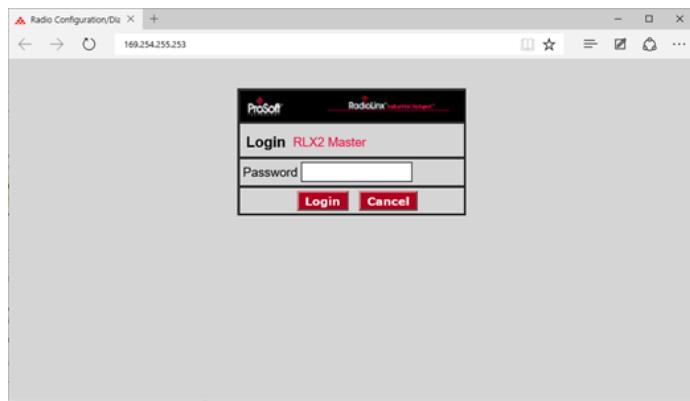
#### To connect to the Radio Configuration / Diagnostic Utility

**Important:** Your computer or other device must be connected to the same network as the RLX2-IHx series radio.

- 1 Open the *Radio Configuration / Diagnostic Utility* for the radio. You can do this in any of three ways:
  - o In the IH Browser List view or Topography view, right-click the radio and then click **CONNECT**.

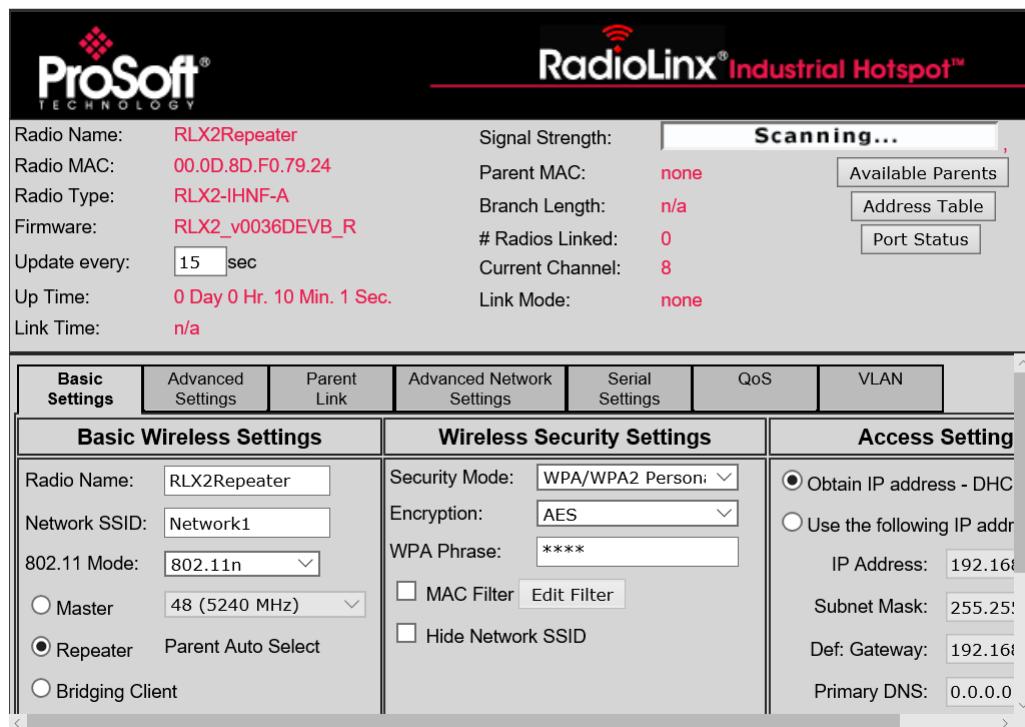
- In the IH Browser List view or Topography view, double-click the radio.
- Open a web browser on your PC, and then in the address bar, type `http://`, followed by the IP address for the radio, and then press **ENTER**.  
For example, `http://192.168.6.10`.

The login screen appears in the web browser.



- 2 Enter the password and then click **LOGIN**. The default password is *password*. If you have lost the password for the radio, you can reset the radio to its default settings. See Resetting a RLX2-IHx series Radio (page 148).

This opens the *Radio Configuration / Diagnostic Utility* for the radio. Note that some parameters may be different from the image depending on your specific radio model.



**Tip:** You can display the help topic for any parameter in the *Radio Configuration / Diagnostic Utility* by clicking the parameter name. The parameter name turns blue when you move the cursor over a parameter with a help topic. There is also a short description of the cursor control at the bottom of the window.

#### 4.1.1 Read-Only Fields

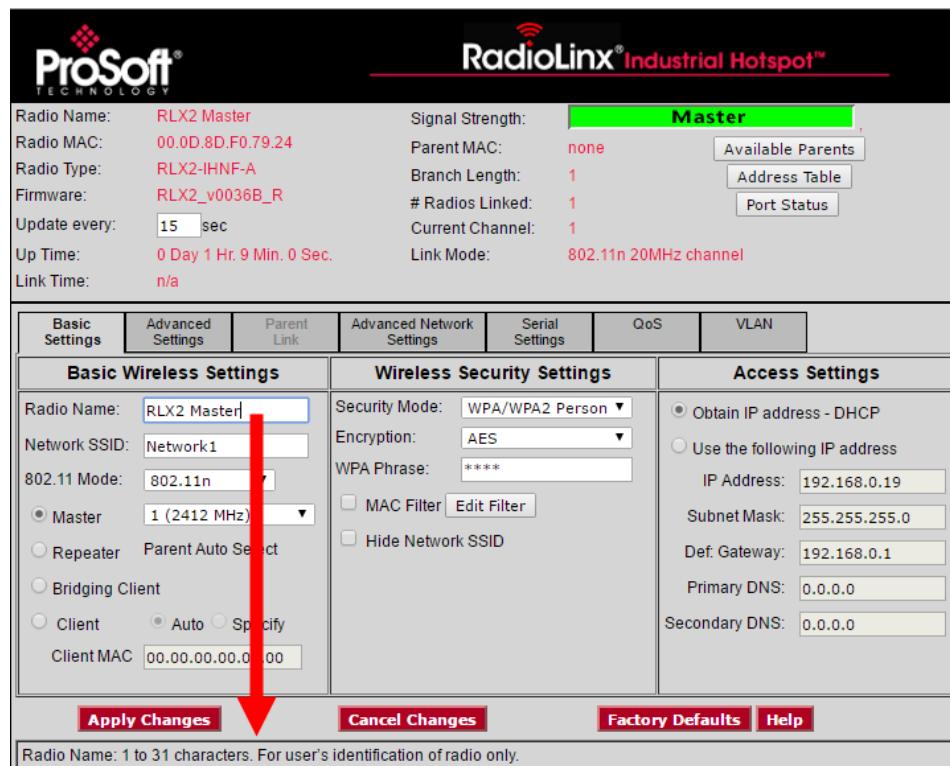
Some of the parameters on the *Radio Configuration / Diagnostic Utility* are for display, and only provide information about the state of the radio.

Note that depending on the model of the radio, and the radio configuration, some parameters and buttons may not be available or appear on the *Radio Configuration / Diagnostic Utility*.

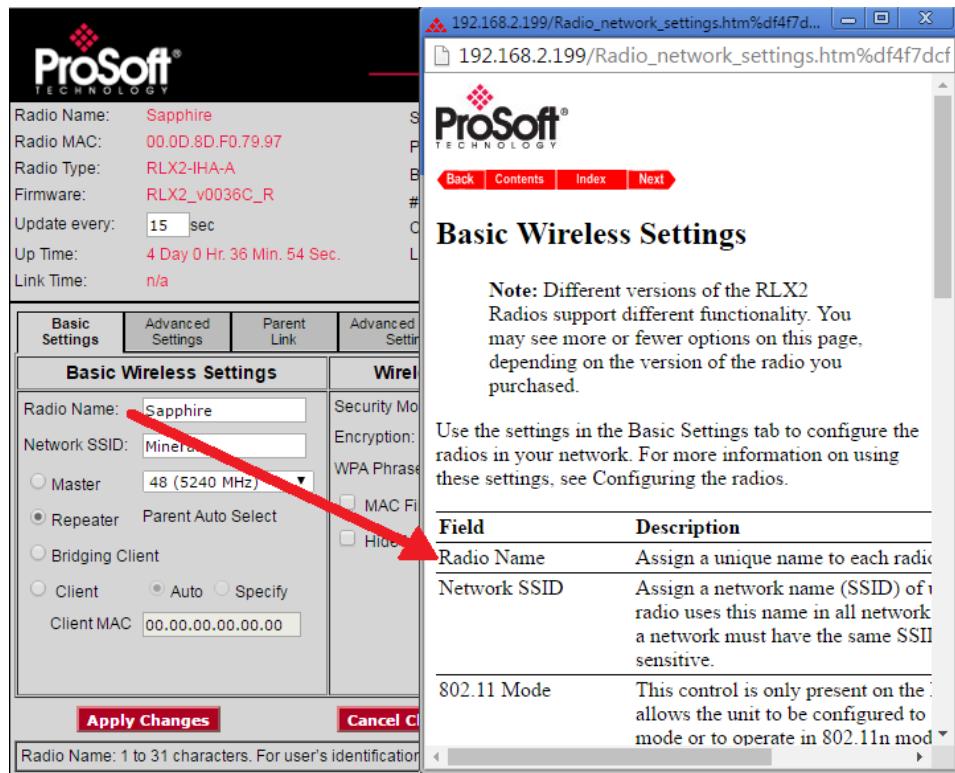
#### 4.1.2 Configuration Help

Help is available for each item in the *Radio Configuration / Diagnostic Utility*.

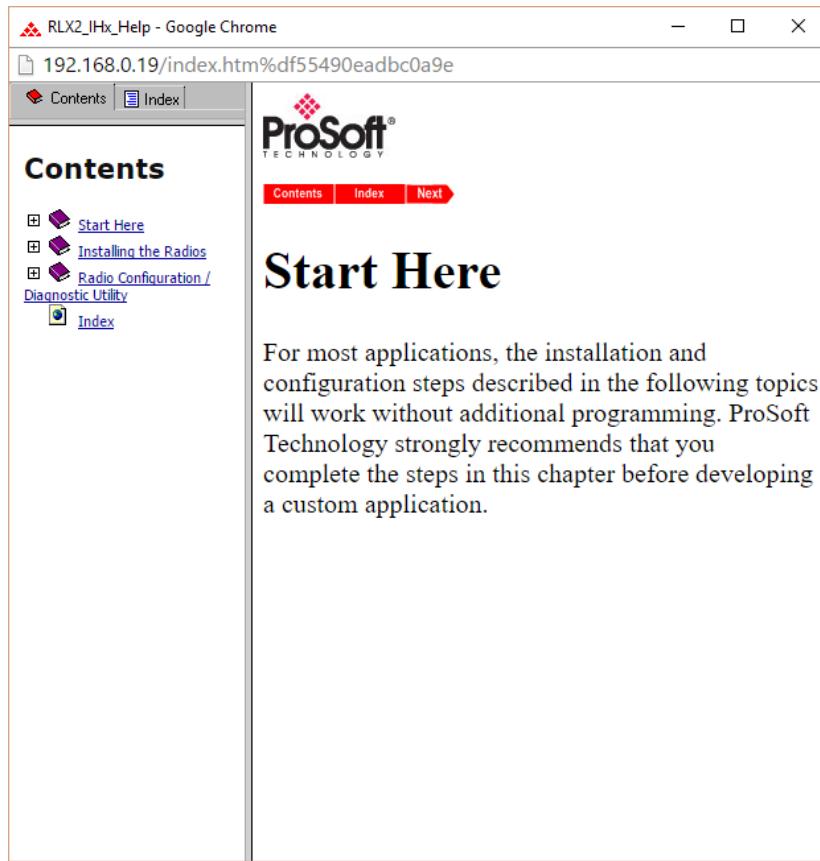
To view a brief help message about any parameter on the screen, move the cursor over the parameter until the parameter name turns blue, or press the **TAB** key to select the parameter. Refer to the text that appears at the bottom of the screen.



To view more help about the selected parameter, click the parameter name. This action opens a help page in a new browser window.

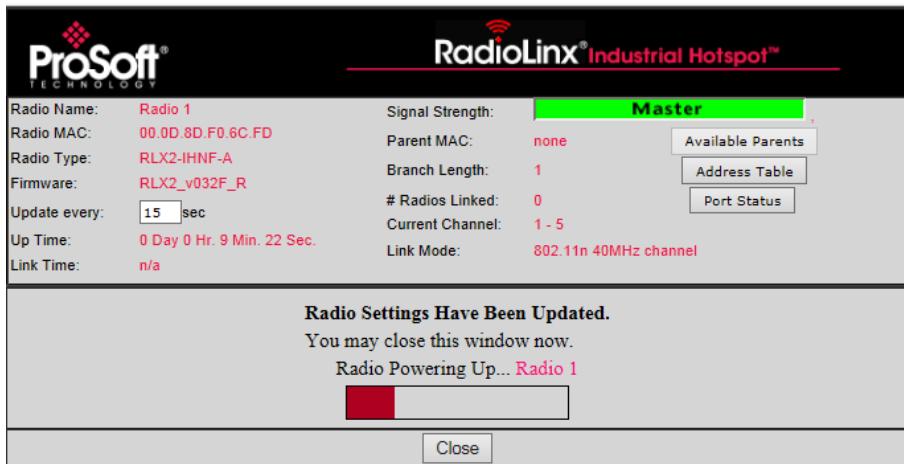


To view the complete online documentation for the RLX2-IHx series radio, click the **Help** button. This action opens the online documentation in a new browser window. Use the **Contents**, **Index** and **Search** tabs in the left frame to navigate the help system.



#### 4.1.3 Apply Changes

Click **APPLY CHANGES** to save changes to the radio configuration and restart the radio with the new configuration. A progress bar appears after you click **APPLY CHANGES**.



#### 4.1.4 Cancelling Changes

Click **CANCEL CHANGES** to discard any changes to the radio configuration you made during this session.

**Note:** This button only applies to changes made in the *Radio Configuration / Diagnostic Utility*, and not changes you made in the IH Browser. It only cancels the changes you made since you last clicked **APPLY CHANGES** in the *Radio Configuration / Diagnostic Utility*.

#### 4.1.5 Factory Defaults

Click **FACTORY DEFAULTS** to reset the radio to the original default settings.

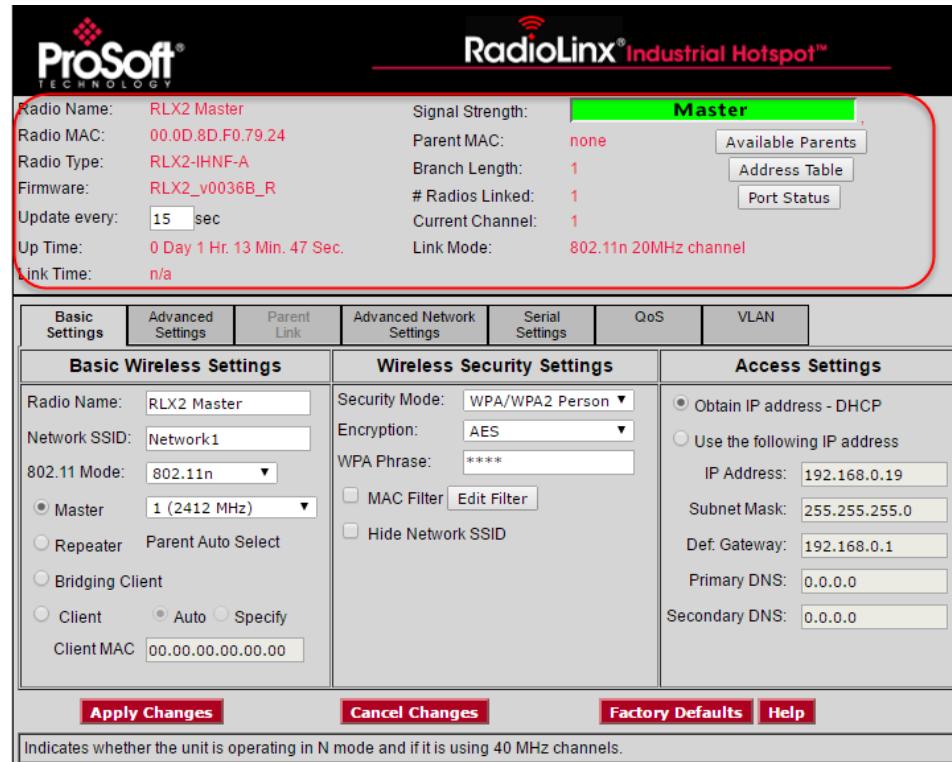
**Important:** This action discards all changes you have made to the radio configuration settings.

Two things to note if there is a microSD card in the radio's Personality Module slot.

- Clicking **FACTORY DEFAULTS** does not reset the configurations stored on the microSD Card in the radio's Personality Module slot.
- If you select **SD AUTOWRITE ENABLE** in the *Radio Configuration / Diagnostic Utility* on the **ADVANCED SETTINGS** tab, the radio overwrites the configuration on the microSD card with the factory default settings if you click **APPLY CHANGES** in the *Radio Configuration / Diagnostic Utility*. See Personality Module Settings (page 91).

## 4.2 Viewing Radio Status

The RLX2-IHx series radio status parameters appear at the top of the *Radio Configuration / Diagnostic Utility*.



**Note:** Different versions of the RLX2-IHx series radios and firmware support different functions. There may be fewer or more parameters on this page, depending on the version of the radio and firmware.

Most of the parameters in the radio status area are read-only, and display the current settings and status for this radio.

Parameter	Description
Radio Name	The user-assigned name for the radio.
Radio MAC	MAC address of the selected radio. The MAC ID is also printed on the side of the radio.
Radio Type	The Model Number of this radio; for example: <i>RLX2-IHA</i> , <i>RLX2-IHG</i> , <i>RLX2-IHNF</i> , or <i>RLX2-IHW</i> .
Firmware	The version of firmware currently installed in the radio. All radios on the network must have the same firmware versions to guarantee proper operations. For more information on firmware versions, see Updating the Radio Firmware (page 132).

Parameter	Description
Update every	The number of seconds the webpage waits between refreshing the data. To change the value temporarily, enter the new value and press the <b>TAB</b> key. To change the value permanently, enter the new value and press the <b>ENTER</b> key.
Up Time	The length of time the radio has operated since the last system power-up or reset.
Link Time	The length of time that the radio has been continuously connected to the parent.
Signal Strength	The strength of the signal from the parent.
Parent MAC	The MAC address of the parent to which the radio is linked.
Branch Length	The number of RF links from the radio to the Master radio.
# Radios Linked	The number of other radios that are linked to this radio.
Current Channel	The current operating channel for the radio. For a Master radio, this is the channel set in the <i>Basic Wireless Settings</i> . For a Repeater radio, this is the same channel as the linked parent. When the <b>LINK MODE</b> parameter shows that the unit is in 40 MHz mode, this parameter shows the main channel number, followed by the extension channel's number.
Link Mode	The 802.11 Mode in which the radio is operating (a/b/g/n). For a Master radio, this is the highest mode supported. For a Repeater radio, this is the highest common mode supported by both: <ul style="list-style-type: none"> <li>▪ The settings of the Repeater radio and its parent</li> <li>▪ The capability of the radio channel.</li> </ul>
Available Parents	Click this button to view the list of Access Points and Bridges (Parents) from which this radio can detect beacons. This button is only available when the radio is in Repeater mode (set in the <i>Basic Wireless Settings</i> ). See <a href="#">Viewing Available Parents for a Radio</a> (page 65).
Address Table	Click this button to view a list of MAC addresses for devices in the radio's address table. See <a href="#">Viewing the Radio Address Table</a> (page 66).
Port Status	Click this button to view the active ports on this radio. See <a href="#">Viewing the Radio Port Status</a> (page 67).

#### 4.2.1 Viewing Available Parents for a Radio

To view the *Available Access Points* table, in the *Radio Configuration / Diagnostic Utility* click **AVAILABLE PARENTS**. This table is only available when the radio is in Repeater mode.

Available Access Points RLX2 Master 1 Only Show Same SSID: <input type="checkbox"/> Refresh									
MAC ID	SSID	Channel	RSSI	Security	Encrypt	Speed	Cost	Age (s)	Hops
00:24:01:e9:a2:8e	ENGINEERING WIRELESS	10	-74	WPA PSK	TKIP	g	273	0	na
02:2b:cb:8e:68:2b	HP787DFO	10	-70	none	none	b	225	0	na
20:9fdb:b1:b5:1b	PSFT-Primary	1	-73	WPA2 PSK	AES	n	260	2	na
26:9fdb:b1:b5:1b	PSFT-Guest	1	-74	WPA2 PSK	AES	n	273	2	na
2a:9fdb:b1:b5:1b	PSFT-Backup	1	-75	WPA2 PSK	AES	n	286	2	na
2e:9fdb:b1:b5:1b	BGW	1	-73	WPA&2 Ent	AES	n	260	2	na
c2:9fdb:b1:6e:9c	BGW	36	-77	WPA&2 Ent	AES	n	314	0	na
c6:9fdb:b1:6e:9c	BGW-Guest	36	-77	WPA2 PSK	AES	n	314	0	na
ca:9fdb:b1:6e:9c	BGW-Mobile	36	-77	WPA2 PSK	AES	n	314	0	na

This page is helpful for viewing:

- The possible parents for a repeater. The current parent should normally be the radio with the lowest cost and a matching SSID.
- Other 802.11 networks in the area.

**Note:** You can click on a column header to sort the table by the values in that column

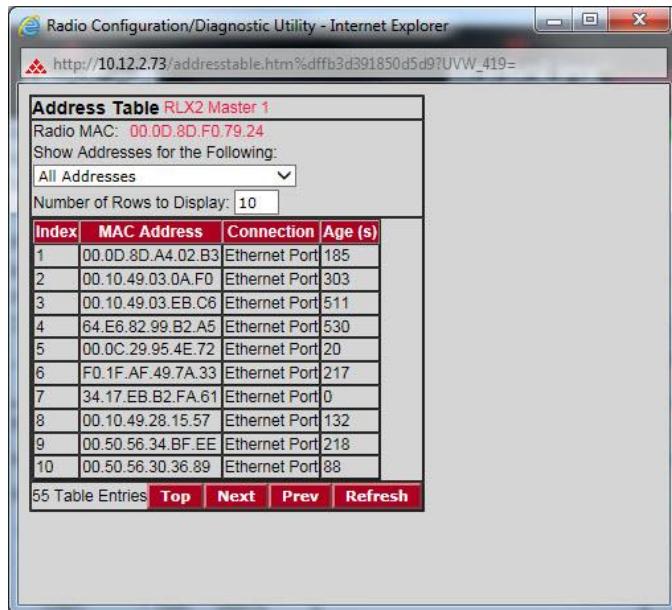
Parameter	Description
Only Show Same SSID	Select this check box to restrict the list of available parents to those with the same SSID as the radio you are configuring.
Refresh	Click this button to re-scan the network and update the devices in the list.
Mac ID	Displays the unique hexadecimal number that identifies an available Ethernet devices.
SSID	Displays the network name (Service Set Identifier) that identifies an available Ethernet device.
Channel	The radio channel on which the device is transmitting. The channel list indicates the channel number as well as the frequency (2.4 GHz or 5 GHz bands). <b>Important:</b> The RLX2-IHx series radio is supplied with a dual-band antenna that supports both frequency ranges. If you use a different antenna with the RLX2-IHx series radio, you must choose a channel and frequency range supported by the antenna. See Appendix G - Antenna Configuration (page 185).
RSSI	Displays the Received Signal Strength Indication.
Security	Displays the security mode enabled for the device.
Encrypt	Displays the encryption type enabled for the device
Speed	Displays the IEEE 802.11 connection speed (a, b, g or n). The RLX2-IHx series radio supports all of these 802.11 connection speeds.

Parameter	Description
Cost	Displays the calculated parent selection cost. The radio evaluates the link it has to its parent once per second to determine if this link is the best parent to use. The radio calculates the cost for each entry. The cost calculation is based not only on the strongest signal, but on several other factors to provide optimum network communication.
Age(s)	Displays the length of time (in seconds) since the radio last saw a packet from this MAC address (device).
Hops	Displays the number of hops to the Master device. A value of 0 (zero) appears for non-ProSoft Technology devices.

- This list contains both 802.11 devices that are part of the same SSID as the RLX2-IHx series itself (for example, *Minerals*) as well as devices that belong to different SSIDs (for example, *Network1* and *ProSoftInternal*). This list is updated continuously.
- The radio updates this list with each 802.11 packet that is received, whether from a radio of the same network or one that belongs to another SSID. It can also see radios from other vendors.

#### 4.2.2 Viewing the Radio Address Table

To view the *Address Table*, in the *Radio Configuration / Diagnostic Utility* click **ADDRESS TABLE**.



The Address Table shows the port through which each device (MAC address) is connected, along with the age in seconds since the radio last saw a packet from this MAC address.

Parameter	Description
Radio MAC	Displays the MAC address of the radio you are configuring. The MAC ID is also printed on the side of the radio.
Show Addresses for the Following	Allows you to filter the address list. Options are: <ul style="list-style-type: none"><li>▪ <b>ALL ADDRESSES</b></li><li>▪ <b>DEVICES OUT ETHERNET PORT</b></li><li>▪ <b>DIRECTLY LINKED RADIOS/CLIENTS</b></li><li>▪ <b>DEVICES BEYOND DIRECT RF LINKS</b></li></ul> When you select <b>DIRECTLY LINKED RADIOS/CLIENTS</b> , the table displays an additional RSSI column, showing the Received Signal Strength (RSS) from each radio or client linked to the radio. When you select <b>ALL ADDRESSES</b> , the RLX2-IHx series radio operates as an AeroScout sensor. Each Wi-Fi device detected and reported to the AeroScout engine appears as <i>Detected Wi-Fi device</i> .
Number of Rows to Display	Defines how many MAC addresses to display at one time. Click <b>NEXT</b> and <b>PREV</b> to scroll through the available MAC addresses.
Index	Displays the device position in the list.
MAC Address	Displays the MAC address for each device.
Connection	Displays the connection type for each device.
Age (s)	Displays the length of time (in seconds) since the radio last saw a packet from this MAC address
Top	Click this button to display the top of the table. The table displays updated data.
Next / Prev	Click these buttons to move up and down through the table.
Refresh	Click this button to update the data in the table.

#### 4.2.3 Viewing the Radio Port Status

To view the *Port Status* Table, in the *Radio Configuration / Diagnostic Utility* click **PORT STATUS**.

This table shows all of the active ports on the radio. This window displays information about the current **SPANNING TREE** including the MAC address of the **SPANNING TREE ROOT** device, and the timing parameters for the current Spanning Tree. Each RLX2-IHx series radio can have up to 34 active ports – one Ethernet cable, one parent RF link, and up to 32 child RF links.

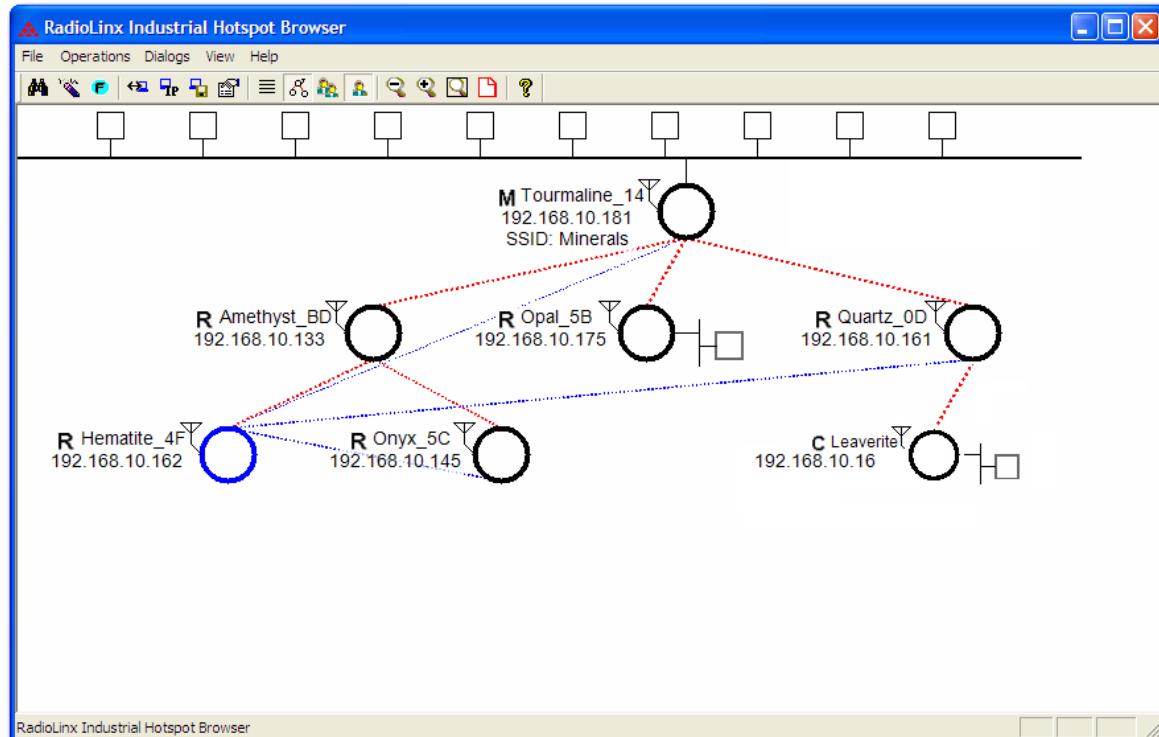
The primary reason for creating a Spanning Tree is that it allows you to create fully redundant paths. If any single radio in a redundant path loses its connection, and if another path still exists, the radio updates the connection to communication restored.



Parameter	Description
Spanning Tree Protocol: Wireless Ports	The Spanning Tree Protocol level for the wireless port (Rapid STP or STP).
Ethernet Port	The Spanning Tree Protocol level for the Ethernet port (Rapid STP or STP).
Edge Port	Displays <i>Active</i> or <i>Inactive</i> based on the setting of <i>Ethernet Edge Port</i> in the <i>Spanning Tree</i> configuration dialog.
Spanning Tree Root: MAC	The MAC ID of the root device in the spanning tree.
Priority	Spanning Tree device with the lowest-priority value is elected the root of the tree
Max Age	The length of time a port can stay enabled without any new spanning updates.
Hello Time	The length of time between the transmission of spanning update packets.
Forward Delay	The length of time a port must listen for spanning information before being activated.
#	Position in the list. Each page shows up to 10 ports. Use the Next and Previous buttons to move up and down through the table.
Connection	This parameter indicates what the port represents: Ethernet, a Parent radio, or a Child radio.
State	The current Spanning Tree state of the port. Possible states are Blocking, Learning, Listening, and Forwarding. Forwarding packets can be transferred.
Designation	The Spanning Tree designation for the branch off the port. Possible designations are Root (ports going to the root), Designated (ports going to a branch), or Normal.
Path Cost	The cumulative cost of all wired and wireless links from the port to the Spanning Tree root.
Designated Bridge	The Next bridge toward the Spanning Tree root for this port.
Top	Click the <b>Top</b> button to see the top of the table.
Next / Prev	If the table has more ports than it can display in the window, use the <b>NEXT</b> and <b>PREV</b> buttons to move up and down through the table.
Refresh	Click <b>REFRESH</b> to update the table.

The following illustration shows the IH Browser application provided with the radios. Notice it shows the radio named *Hematite\_4F*, linked to *Amethyst\_BD*. This link is shown with a red dotted line. Also visible is the level of redundancy in their network. Each of the blue lines represents an alternate parent. From this view, it is easily shown how much redundancy exists in their network.

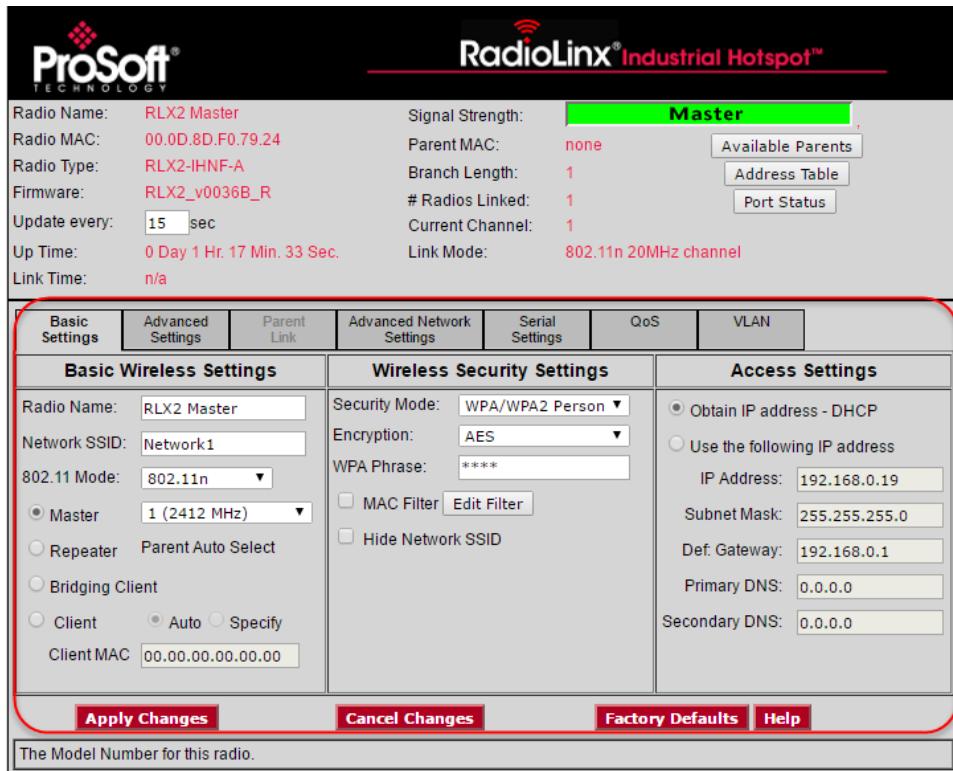
To display the redundant paths, select the toolbar button denoting two "parents." To view the redundancy on a per-radio basis, select the single **Parent** button, and then click on the radio to view its available redundancies.



## 4.3 Configuring Basic Settings

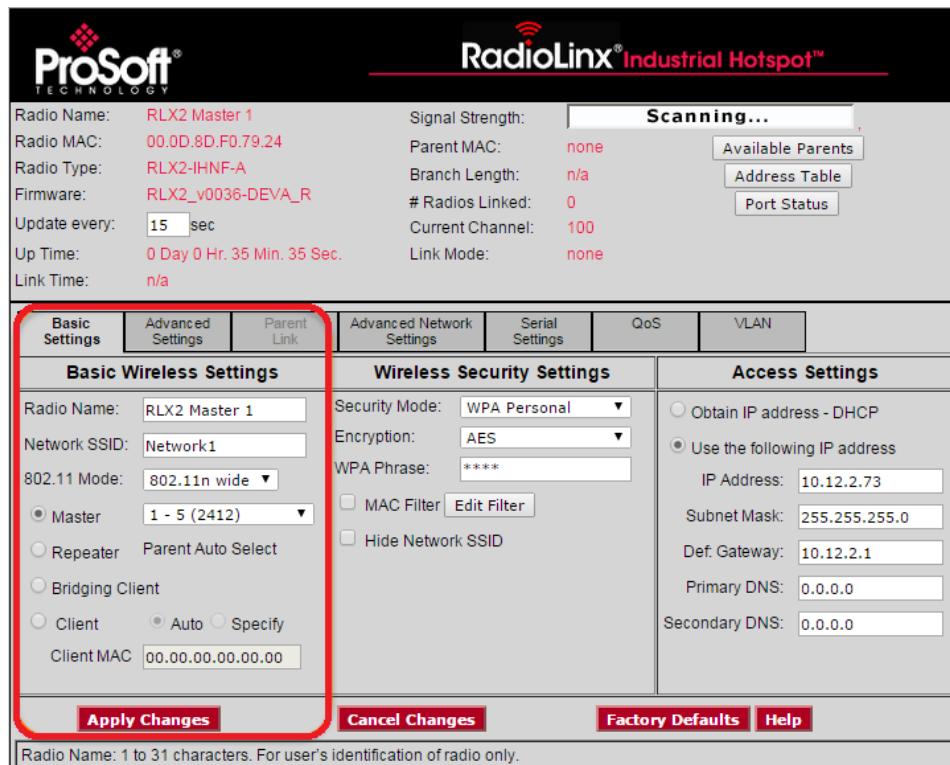
You use the *Radio Configuration / Diagnostic Utility* to configure your RLX2-IHx series radio. Basic settings include three groups:

- **BASIC WIRELESS SETTINGS**
- **WIRELESS SECURITY SETTINGS**
- **ACCESS SETTINGS**



### 4.3.1 Basic Wireless Settings

You use the parameters in the **BASIC WIRELESS SETTINGS** group in the *Radio Configuration / Diagnostic Utility* to define the identity of your RLX2-IHx series radio.



**Note:** Different versions of the RLX2-IHx series radios and firmware support different functions. There may be fewer or more parameters on this page, depending on the version of the radio and firmware.

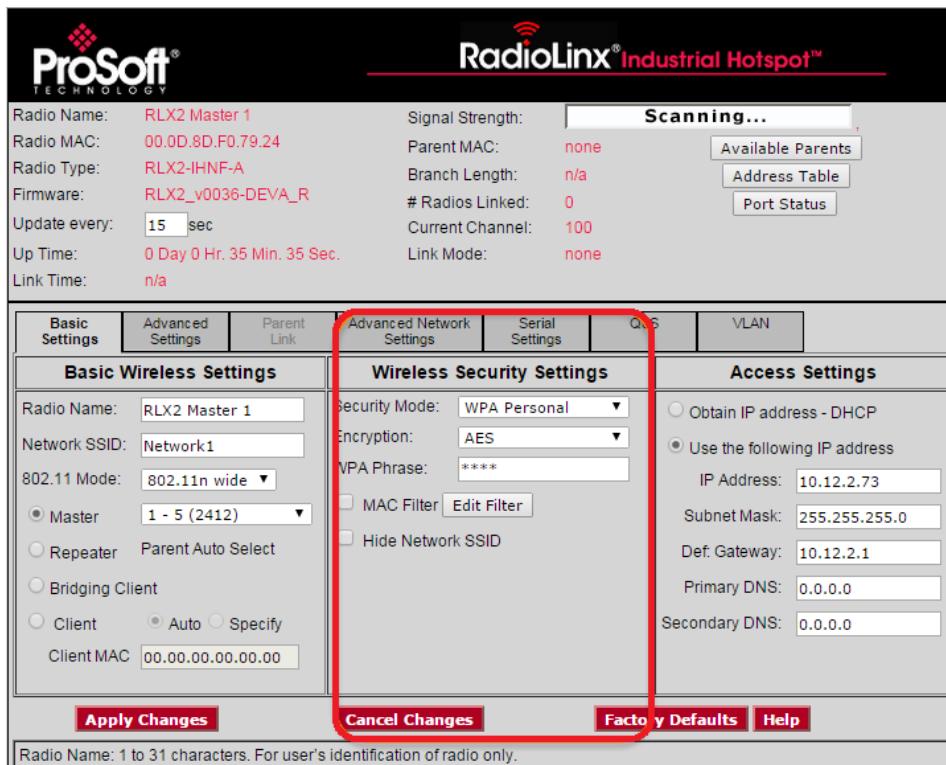
Parameter	Description
Radio Name	Specifies a unique name for the radio you are configuring.
Network SSID	Specifies a network name (SSID) of up to 32 characters. The radio uses this name in all network references. All radios in a network must have the same SSID. <b>Note:</b> SSID names are case-sensitive.

Parameter	Description
802.11 Mode (RLX2-IHNF only)	<p>This control only appears when configuring a model RLX2-IHNF radio. Specifies whether the radio operates in 802.11 a/g mode or in 802.11n mode (default). In addition, it specifies whether the radio allows use of 40 MHz wide channels for Child clients.</p> <p><b>Note:</b> A Repeater radio automatically uses a mode that is compatible with the Parent radio settings. For example, an RLX2-IHNF radio may connect to an RLX2-IHW Master radio which only operates in 802.11a/g mode, and still use 802.11n mode for any Child Repeater radios.</p> <p><b>802.11A/G</b> - The radio acts as an 802.11a radio on the 5 GHz band, and an 802.11g radio on the 2.4 GHz band. Data rates are limited to the 802.11 a/g rates (54 mbps maximum, and 802.11n operational features are disabled. It is <b>not</b> necessary to select this mode for RLX2-IHNF radios to link to other RLX2-IHx series or RLXIB series radios. These radios link at their best possible speeds regardless of mode. This mode is not commonly used. It is mainly used to allow 802.11 a/b/g client devices that cannot link to 802.11n devices to work. One example of such a device is the ProSoft 1734-AENTR wireless I/O client.</p> <p><b>802.11N</b> - The default operational mode of the RLX2-IHNF radio. All 802.11n features are operational, and the radio uses 20 MHz wide channels.</p> <p><b>802.11.N WIDE</b> - Utilizes adjacent pairs of 20 MHz-wide channels as a single 40 MHz-wide channel. This allows the fastest data throughput to other 802.11n devices. Only 802.11n devices can utilize this mode, but all RLX2-IHx series radios link at their best speed regardless of mode. Channels in the 5 GHz band are 20 MHz apart, so the 802.11n wide mode occupies only two channels in that band. However, channels in the 2.4 GHz band are spaced only five MHz apart, so 802.11n wide mode in the 2.4 GHz band occupies <i>eight adjacent channels!</i> Since there are at most 13 channels in the 2.4 GHz band, and only three channels do not overlap others, we do not recommend enabling wide mode on 2.4 GHz band channels.</p>
Master	Specifies that this radio is a Master radio. The Master radio is the root device in a network. You must have at least one Master radio in your network. For redundancy, you can assign more than one Master to a network. See <a href="#">Setting Up a Master Radio (page 46)</a> .
Available Channel List (Master radio only)	<p>Specifies the channel number, the frequency band (2.4 GHz, 5 GHz DFS, or 5 GHz), and the channel frequency in MHz.</p> <p><b>For RLX2-IHNF radios:</b></p> <p>When you set <b>802.11 MODE</b> to <b>802.11N WIDE</b>, each entry shows the main channel number, followed by the extension channel number if the particular channel supports 40 MHz.</p> <p>The 20 MHz channels are used whenever sending frames at an 802.11 a/g data rate (for example, Beacons at 6 Mbits/s). The main and extension channels are used together for 802.11n data rate transmissions. Note that the frequency indicated when in 802.11n wide mode is the center of the 40 MHz channel pair.</p> <p><b>Important:</b> The RLX2-IHx series radio is not supplied with an antenna. When choosing an antenna for use with your RLX2-IHx series radio, you must choose one that supports the frequency range set in the configuration for the radio. See <a href="#">Appendix G - Antenna Configuration (page 185)</a>.</p>

Parameter	Description
Repeater	Specifies that this radio is a Repeater radio. Repeater mode is the normal mode for the radios in the network that are not the Master radio. The Master radio specifies the network channel and is the root of the radio network tree. Repeater radios extend the range of a network and create the signal bridges that allow networked radios to communicate over a greater distance. All RLX2-IHx series radios are capable of being Repeaters. See Configuring a Repeater Radio (page 48).
Bridging Client	Specifies a special mode for use where there are multiple Ethernet devices that need to connect to any 3 <sup>rd</sup> -party 802.11 a, b, g, or n Access Points (AP). This mode uses a Layer 2 Network Address Translation mechanism, and can only work for IP-based protocols. If using non-IP-based protocols, then specify Client mode for this radio. See Configuring a Bridging Client Radio (page 50).
Client	This is a special mode that allows you to transparently connect a single Ethernet device to any non-ProSoft 802.11 a, b, g, or n Access Point (AP). To the AP, the MAC address of the Ethernet device would appear to be an 802.11 wireless client. Client mode supports all network protocols. See Configuring a Client Radio (page 53).
Auto / Specify (Client mode only)	Choose <b>SPECIFY</b> only if the device does not send out any unsolicited Ethernet packets. Try <b>AUTO</b> first.
Client MAC	Specify the MAC ID of the device connected to this radio, only if the device does not advertise its MAC address.

### 4.3.2 Wireless Security Settings

You use the parameters in the **WIRELESS SECURITY SETTINGS** group in the *Radio Configuration / Diagnostic Utility* to define the wireless security parameters for your RLX2-IHx series radio.



The parameters that appear in the Wireless Security Settings group depending on your selections these in other parameters:

- **SECURITY MODE**
- **802.11 MODE** (model RLX2-IHNF radio only)
- **MASTER, REPEATER, BRIDGING CLIENT, or CLIENT** radio modes

The parameters in the Wireless Security Settings group automatically change if necessary when you make a change in any of these parameters. You do not have to click **APPLY CHANGES** to see the changes in the Wireless Security Settings.

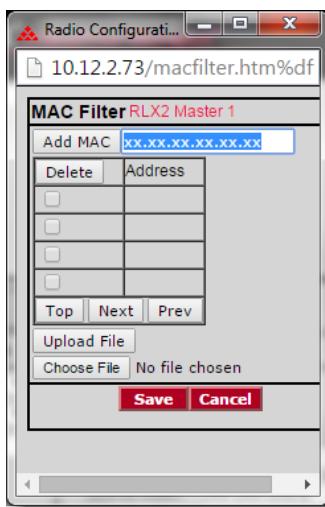
**Note:** Different versions of the RLX2-IHx series radios and firmware support different functions. There may be fewer or more parameters on this page, depending on the version of the radio and firmware.

Parameter	Description
Security Mode	<p>Specifies the security mode for the radio, as well as Legacy WEP encryption modes for interoperability with Legacy devices.</p> <p><b>NONE</b> - (not recommended)</p> <p><b>PERSONAL</b> - Security mode using a pre-shared key for networks that don't require an authentication server.</p> <p><b>ENTERPRISE</b> - Security mode requiring the use of an external RADIUS authentication server. For more information see Enterprise Mode Settings (page 78).</p> <p><b>WEP</b> - Legacy security setting using either a 64 or 128-bit key and WEP encryption.</p> <p>The following protocols are available with both Personal and Enterprise security modes:</p> <ul style="list-style-type: none"><li>▪ <b>WPA</b> - Original protocol introduced to replace WEP.</li><li>▪ <b>WPA2</b> - Latest 802.11 security protocol conforming to the 802.11i standard.</li><li>▪ <b>WPA/WPA2</b> - Allows client devices to connect using WPA if they do not support WPA2.</li></ul>
Encryption	<p>Specifies the encryption method for the radio. AES is the preferred encryption mechanism as it is the most secure protocol supported by the 802.11 standard. If using legacy devices that do not support AES, you can choose combinations of legacy methods depending on the 802.11 mode setting.</p> <p><b>NONE</b> - (Not recommended)</p> <p><b>AES</b> - The recommended setting, and can be used with all Personal and Enterprise modes.</p> <p><b>TKIP</b> - Only TKIP encryption. This setting is only available when in 802.11a/g mode. The 802.11n standard does not allow TKIP as the only encryption mechanism.</p> <p><b>AES AND TKIP</b> - Allows client devices that don't support AES to connect to the radio. This setting is available in all 802.11 modes.</p> <p><b>TKIP AND WEP128</b> - Allows client devices that don't support TKIP to connect to the radio. This setting is only available in 802.11a/g mode. Note that combinations including WEP and AES are not allowed.</p> <p><b>WEP128</b> - Legacy security setting using a 128-bit key and WEP encryption. This setting is only available when you select the <b>WEP</b> Security Mode.</p> <p><b>WEP64</b> - Legacy security setting using a 64-bit key and WEP encryption. This setting is only available when you select the <b>WEP</b> Security Mode.</p> <p>For more information, see Encryption Type (page 77).</p>
WPA phrase	<p>Specifies the WPA pass phrase of between eight and 63 normal keyboard characters. This control is present when you select any of the <b>PERSONAL</b> Security Modes. If a WPA or WPA2 Personal Security Mode is selected, enter a WPA phrase of between eight and 63 normal keyboard characters.</p> <p>This phrase automatically generates an encryption key of 128 hexadecimal characters. The default WPA Phrase is: <b>passphrase</b></p>
WEP Key	<p>Specifies the WEP key.</p> <ul style="list-style-type: none"><li>▪ For <b>WEP64</b>, enter either 5 normal text characters or 10 hexadecimal characters in the this parameter.</li><li>▪ For <b>WEP128</b>, enter either 13 normal text characters or 26 hexadecimal characters in the this parameter.</li></ul> <p>For more information, see WEP Key (page 78).</p>
MAC Filter	Select this check box to restrict connections by MAC address, then define the acceptable MAC addresses by clicking <b>EDIT FILTER</b> . See MAC Filter (page 76).

Parameter	Description
Edit Filter	Specifies the acceptable MAC addresses.
Hide Network SSID	Select this check box to hide the <b>NETWORK SSID</b> (defined in the <b>BASIC WIRELESS SETTINGS</b> group) from other 802.11 users. Clients can still connect to the radio network by manually entering the Network SSID.

### MAC Filter

To view the *MAC Filter* table in the *Radio Configuration / Diagnostic Utility* click the **BASIC SETTINGS** tab, then in the **WIRELESS SECURITY SETTINGS** group, select the **MAC FILTER** checkbox, and finally click **EDIT FILTER**. The MAC Filter table defines the acceptable MAC addresses when you configure the radio to use MAC filtering. See Wireless Security Settings (page 74).



Parameter	Description
Add MAC	Enter the MAC address to add to the table. This address appears in the list after you click <b>ADD MAC</b> .
Delete	Deletes the selected MAC address from the list. You first select the addresses to delete by selecting the checkbox next to the address.
Address	Displays the acceptable MAC addresses that can connect to the radio.
Top	Jumps to the top of the list.
Next / Prev	Navigates up and down through the address list.
Upload File	<p>Imports a pre-defined list of MAC addresses. This allows you to use the same list of MAC addresses in several radios</p> <ol style="list-style-type: none"> <li>1 Open a text editor such as Notepad.exe.</li> <li>2 Enter the MAC addresses in hexadecimal format, one MAC address per line, including the periods (for example, 00.0C.8D.F0.76.95).</li> <li>3 When finished, save the text file.</li> <li>4 In the MAC Filter window, click <b>CHOOSE FILE</b> to select the text file.</li> <li>5 Click <b>UPLOAD FILE</b> to upload the selected list of MAC addresses.</li> </ol>
Choose File	Selects a file of MAC addresses to upload.

### Encryption Type

We recommend that you use WPA or WPA2 (Wi-Fi Protected Access) using AES for the **SECURITY MODE** and **ENCRYPTION**.

- Use TKIP with an older client radio that does not support AES.
- Use WEP (Wired Equivalency Protocol) with an older client radio that does not support AES or TKIP.
- For compatibility with clients that do not support WPA, you can select TKIP+WEP128 for the **ENCRYPTION**.
- Older clients can connect to the RLX2-IHx series radio using the **WEP** setting, but all other links use the more secure WPA encryption.

**Important:** If the 802.11n data rates are supported and enabled in the RLX2-IHx series radio, then the *Radio Configuration / Diagnostic Utility* disables all TKIP and TKIP/WEP options. If a client radio only supports TKIP, then use the **AES AND TKIP** option. If the client radio only supports WEP, then in the **802.11 MODE** parameter, select **802.11 A/G** and then select the appropriate WEP setting.

**Important:** If you select **TKIP+WEP128**, some clients using WPA might not be able to connect unless you use a WEP key other than number 1, due to limitations in these clients. In such cases, you should set **WEP KEY** number to a value other than 1 and set this same key for all clients that are using WEP. See **WEP Key** (page 78).

When you select **WEP** for the **SECURITY MODE**, the WEP128 or WEP64 encryption types are available but neither are recommended.

WEP is the original security protocol used by 802.11 networks but should only be used if interoperability with a legacy device is essential. Tools are available that allow an attacker to break the WEP keys simply by sniffing an active WEP network for a few minutes. WPA offers vastly better protection against attacks. WPA distances the encryption key from the actual data by performing several algorithms to create a *Session key* before encrypting any data, and it performs dynamic key management by changing keys frequently.

**Note:** If an RLX2-IHx series radio is set to use TKIP+WEP128, it can connect to other radios set to WPA only or WPA+WEP, but it will not communicate with radios using only WEP. Likewise, an RLX2-IHx series radio in Client mode with TKIP+WEP128 selected will not connect to an access point using only WEP.

### WEP Key

A WEP key is a set of hexadecimal (hex) or ASCII characters used to encrypt data. This parameter is only available when using WEP **SECURITY MODE** and **ENCRYPTION**. Be sure to record the WEP encryption key so you can retrieve it if necessary.

To create a 64-bit WEP key, enter five normal text characters in the **WEP key** parameter, which converts the characters automatically to 10 hex digits.

Alternatively, enter 10 hex digits (0 to 9, a to f, A to F) directly in the **WEP KEY** parameter.

To create a 128-bit key, enter 13 normal text characters, which convert to 26 hex digits, or enter 26 hex digits (0 to 9, a to f, A to F) directly in the **WEP KEY** parameter.

**Note:** Clients often support more than one WEP key. Packets received can be decrypted using any one of the keys if programmed, but packets are always transmitted with the default WEP key number. If a transmit key number is set on the RLX2-IHx series radio, make sure all other radios and clients use the same key. To set keys other than key 1 on some clients using Windows, Advanced settings may be used.

Use these steps to program more than one key on the RLX2-IHx series radio.

- 1 Selecting the key number for the **WEP KEY**.
- 2 Enter the actual WEP key
- 3 Save the changes to the radio by clicking **APPLY CHANGES**.
- 4 After the radio restarts, repeat these steps for each WEP key, clicking **APPLY CHANGES** after each one.
- 5 Select the desired transmit key number if necessary and save again (If \*\*\*\* appears in the WEP Key parameter, the previously programmed key will not be changed when changes are applied).

### Enterprise Mode Settings

When you select one of the **ENTERPRISE** modes in the **SECURITY MODE** control in the **WIRELESS SECURITY SETTINGS** group, the *Radio Configuration / Diagnostic Utility* automatically displays a set of controls for Enterprise mode parameters.

There are two sets of controls:

- The first set is for the RLX2-IHx series radio in Master mode
- The second set is for the RLX2-IHx series radio Repeater or Client mode.

### **Enterprise mode parameters**

In Enterprise mode, the radio authenticator communicates directly with the RADIUS Server while it is relaying 802.1x frames received from an associating node's Supplicant. You must configure the following parameters in the **WIRELESS SECURITY SETTINGS** group on the Master radio in this **SECURITY MODE**:

Parameter	Description
IP Address	Specifies the IP address of the RADIUS server with which the Network Administrator has registered this radio.
UDP Port	Specifies the UDP port number the RADIUS server is using to listen to Radius frames from this radio. The default port number used for the Radius protocol is 1812.
Secret	Specifies the pass phrase that was used when this radio was registered to the RADIUS server. This validates that the Radius frames received on either end are legitimate.

### Repeater or Client mode parameters

When in Repeater or Client mode, the RLX2-IHx series radio Supplicant communicates via its Parent radio's authenticator with a RADIUS server. Several different authentication protocols are available and can be set using the following parameters.

Parameter	Description
EAP Method	Specifies the EAP Method, sometimes referred to as the 'outer protocol' defines the mechanism used to create a secure tunnel between the Supplicant and RADIUS server during the first phase of the Authentication sequence. The following EAP methods are supported: <b>EAP-PEAP</b> - EAP method using the Protected Extensible Authentication Protocol <b>EAP-TLS</b> - EAP method based on X.509 certificates that provides for mutual authentication. This is the most secure authentication mechanism available for 802.11. Certificates are required both on the radio and the RADIUS server. The only authentication option available for EAP-TLS is to use TLS for the inner protocol. <b>EAP-TTLS</b> - EAP Tunneled TLS. Similar to EAP-PEAP.
Anonymous ID	Specifies the identity request in the first phase of the exchange that is sent in the clear. The identity sent in this first phase can be set to an anonymous identity (for example <i>anon_user</i> ) or an anonymous identity at a domain (for example <i>anon@xyz.com</i> ). The real identity ( <i>username</i> ) is sent encrypted after the EAP tunnel is established in the second phase of the radius exchange. Use this parameter if you are concerned about the username being sent in the clear. Your IT department should specify the text for this parameter based on their RADIUS server(s) configuration.

Parameter	Description
Authentication Method	<p>Specifies the authentication method, sometimes referred to as the inner protocol. This defines the mechanism used to authenticate the Supplicant of the radio with the RADIUS server. The following authentication methods are supported:</p> <p><b>MS-CHAPv2</b> - Microsoft's version of the Challenge Handshake Authentication Protocol. This method provides mutual authentication between the Supplicant and the RADIUS server, using a user name and password and challenge text responses.</p> <p><b>MD5</b> - Message Digest cryptographic hashing algorithm based on a user name and password.</p> <p><b>TLS</b> - Certificate-based inner authentication protocol.</p>
User Name	Specifies the user name of the account that is to be authenticated. When using EAP-TLS, this represents the identity of the entity assigned to the device certificate being used.
Password	Specifies the required password when using <b>EAP-PEAP</b> or <b>EAP-TTLS</b> with <b>MS-CHAPv2</b> or <b>MD5</b> . This is the password of the account corresponding to the <b>USER NAME</b> .
Certificates	<p>Displays the current certificates installed in the radio, and provides controls to upload new certificates into the unit. For more information, see Certificate Management (page 80).</p> <p><b>Note:</b> The RLX2-IHx series radio does not ship with any certificates installed.</p>

### Certificate Management

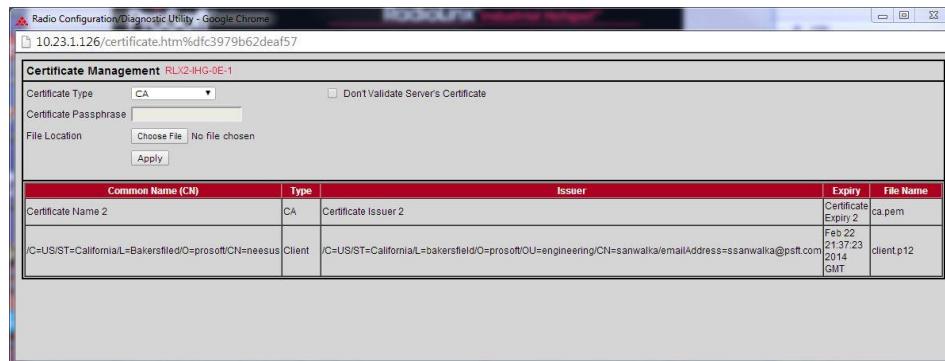
When using Enterprise-level security, some EAP methods require the use of X.509 certificates that you must upload to the RLX2-IHx series radio. There are two certificate types; a certificate from a 'Certification Authority' used to authenticate the RADIUS server to the radio supplicant, and device or client certificate created by the RADIUS server for the radio. The RLX2-IHx series radio is able to hold one of each certificate type.

- If using EAP-PEAP authentication, you need a CA Certificate (to authenticate the RADIUS server) and a username and password.
- If using EAP-TLS, you need a CA Certificate, a Client Certificate, and Private Key (contained in a single p12 file) to authenticate the client. The p12 file is encrypted and requires a password.
- Your IT person will provide you with the appropriate files that you'll need to load to the RLX2-IHx series Repeater radio.

### To configure the RLX2-IHx series Repeater radios with certificates

- 1 Obtain the required certificate files from your IT department.
- 2 Start the *Radio Configuration / Diagnostic Utility* for your radio. See Connecting to the Radio Configuration Utility (page 44).
- 3 In the *Radio Configuration / Diagnostic Utility* click the **BASIC SETTINGS** tab, then in the **WIRELESS SECURITY SETTINGS** group, select the **EAP METHOD**.
- 4 Enter the **USERNAME**.

5 Click **CERTIFICATES**. This displays the *Certificate Management* dialog box where you enter the certificate files.

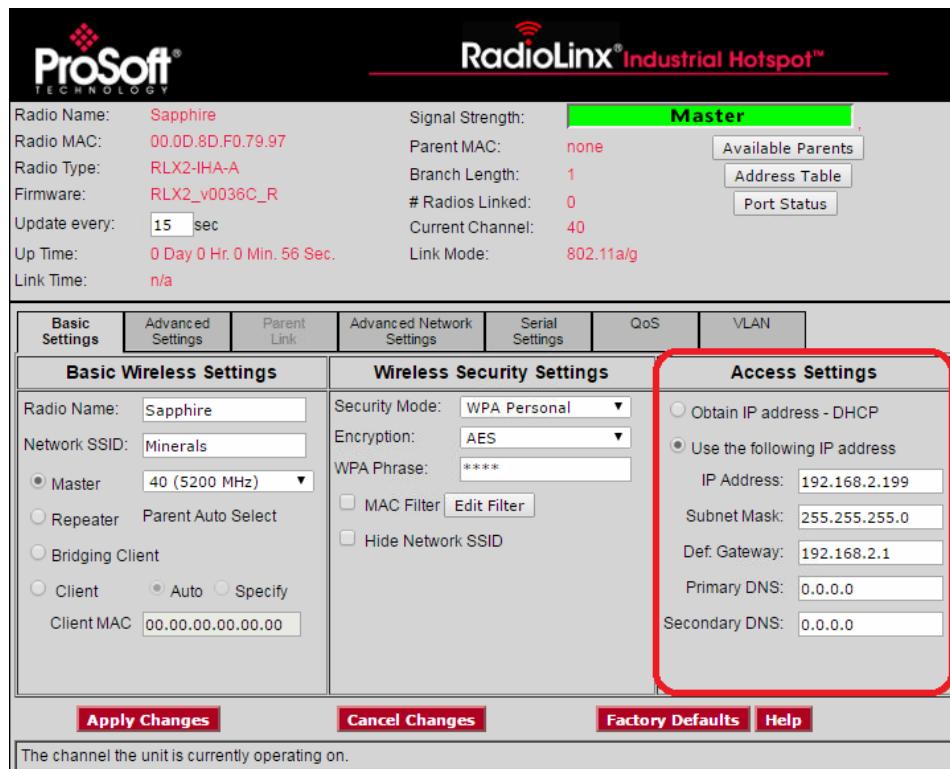


Parameter	Description
Certificate Type	Specifies the type of certificate that you are uploading. It is important that this is set correctly as the RLX2-IHx series radio does not distinguish between certificate types in any other way. A CA Certificate is required for both <b>PEAP</b> and <b>EAP-TLS</b> . This is used to authenticate the server's certificate. Additionally, for EAP-TLS, a client certificate and private key are required.
Certificate Passphrase	If the certificate is encrypted, enter the passphrase that was used to create it on the RADIUS server.
File Location	Selects the certificate file on your local PC that to be uploaded.
Don't Validate Server's Certificate	The radio does not validate the server's certificate.

- 6 Select the **CERTIFICATE TYPE**.
- 7 Click **CHOOSE FILE** to select CA Certificate file created previously (CAcert.pem) and click **APPLY**.
- 8 Click **CHOOSE FILE** to select the Client Certificate combined file (clientcert.p12) and the password associated with the file, and then click **APPLY**.
- 9 Close the *Certificate Management* dialog box.
- 10 In the *Radio Configuration / Diagnostic Utility* window, click **APPLY CHANGES** and attempt to connect to the Master radio.

### 4.3.3 Access Settings

You use the parameters in the **ACCESS SETTINGS** group in the *Radio Configuration / Diagnostic Utility* to define how your RLX2-IHx series radio gets an IP address.



**Note:** Different versions of the RLX2-IHx series radios and firmware support different functions. There may be fewer or more parameters on this page, depending on the version of the radio and firmware.

Parameter	Description
Obtain IP Address -DHCP	Select this if the radio is to automatically get an IP address through DHCP
Use the following IP address	Select this to manually define IP address for the radio. You must also enter the IP address information in the remaining parameters.
IP Address	Specifies the unique IP address assigned to the module
Netmask	Specifies the subnet mask of module
Def. Gateway	Specifies the network gateway (if used)
Primary DNS	Specifies IP address of the primary Domain Name Server
Secondary DNS	Specifies IP address of the secondary Domain Name Server

**To assign the IP address for your radio**

- 1 On the **BASIC SETTINGS** tab, in the **ACCESS SETTINGS** group, click **OBTAIN IP ADDRESS - DHCP** or **USE THE FOLLOWING IP ADDRESS**.
- 2 If you selected **USE THE FOLLOWING IP ADDRESS**, enter the information for the IP address.
- 3 Click **APPLY CHANGES** to reboot the Radio.

## 4.4 Configuring Advanced Settings

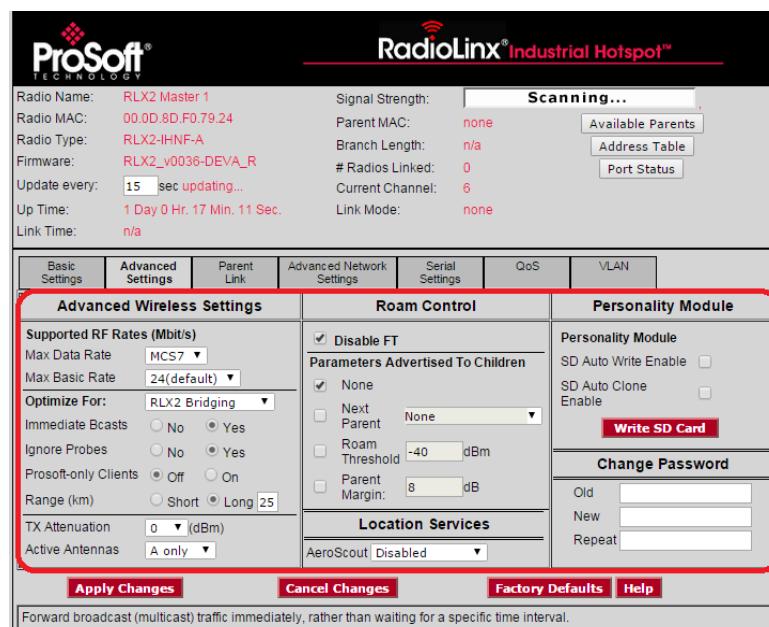
It is important to allow many industrial protocols to communicate properly over the RLX2-IHx series radios. The standard 802.11 AP operation for transmitting broadcast messages is to accumulate them and transmit them on specific time intervals. This allows clients that are in power-save mode to wake up at the synchronized time interval and receive the broadcast packets. However, the power-save mode is rarely used in industrial networks.

Additionally, many industrial protocols utilize multicast traffic, which is sent as broadcast messages over the wireless network. By enabling immediate broadcasting, these multicast messages are not delayed by waiting for the next time interval to occur. This results in improved network performance.

The settings allow you to configure the transmission rate and broadcast mode to optimize this radio's use on an industrial network.

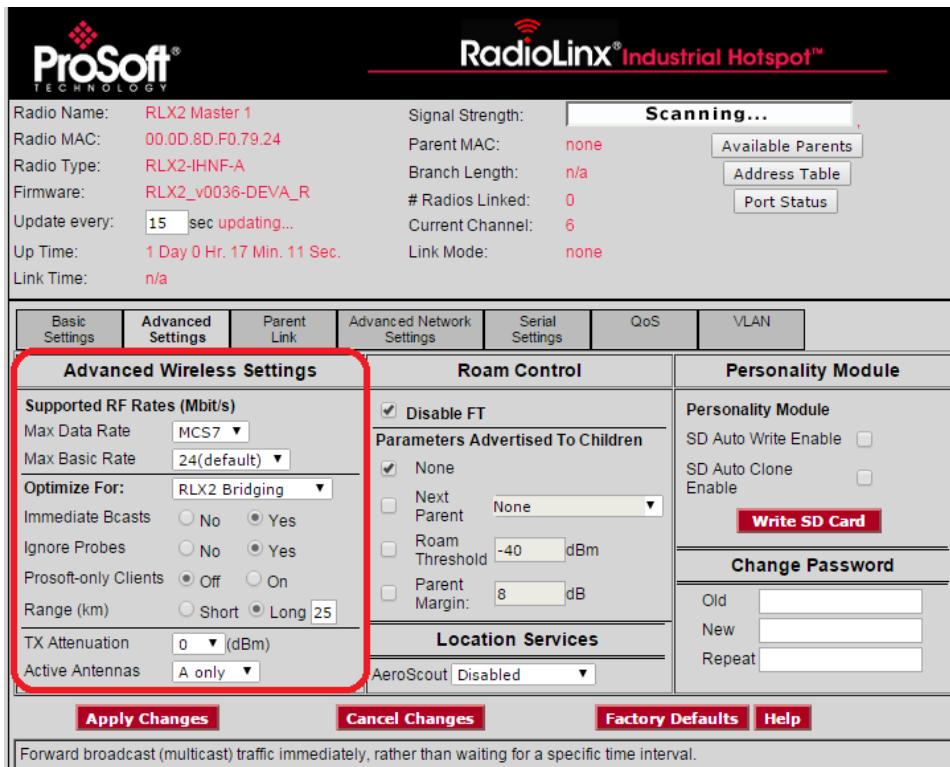
Advanced settings include:

- **ADVANCED WIRELESS SETTINGS**
- **ROAM CONTROL**
- **LOCATION SERVICES**
- **PERSONALITY MODULE**
- **CHANGE PASSWORD**



#### 4.4.1 Advanced Wireless Settings

You use the parameters in the **ADVANCED WIRELESS SETTINGS** group in the *Radio Configuration / Diagnostic Utility* to specify the wireless communication parameters of your RLX2-IHx series radio.



**Note:** Different versions of the RLX2-IHx series radios and firmware support different functions. There may be fewer or more parameters on this page, depending on the version of the radio and firmware.

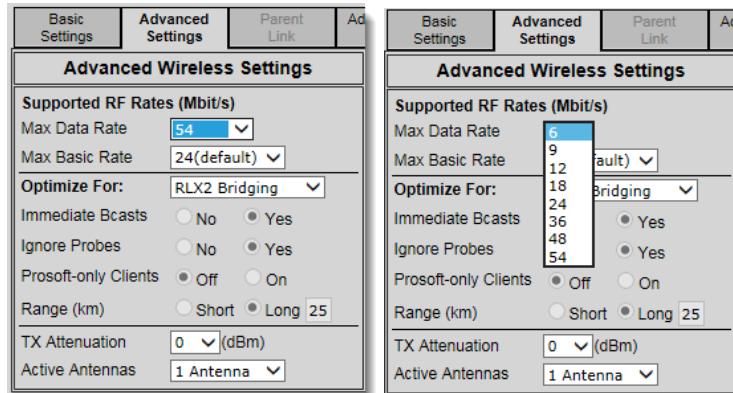
Parameter	Description
Max Data Rate	<p>Specifies the maximum data rate for generic data traffic for the radio. MCS rates are available only for model RLX2-IHNF radios.</p> <ul style="list-style-type: none"><li>0 to 7 are available with one antenna. This is the default configuration.</li><li>To select rates of 8 and above, configure the Active Antennas parameter to be <b>A AND C</b>, or <b>A, B, C</b>. See Max Data Rate (page 86) for a table of data rates.</li></ul>
Max Basic Rate	<p>Specifies the rate at which control packets such as beacons and acks are sent as well as packets that need to go to the entire network such as broadcasts.</p> <p>Because the packets are intended for the whole network, the <b>MAX BASIC RATE</b> setting for the Master radio is advertised to each of the radios in the network through beacons. Each radio, other than the Master radio, inherits the <b>MAX BASIC RATE</b> setting of the Master. Therefore, the setting only needs to be made in the Master radio. This setting for all other radios is ignored.</p>
Optimize For	<p>Specifies the radio operating environment. The <i>Radio Configuration / Diagnostic Utility</i> automatically selects the best choices for the parameters based on the <b>OPTIMIZE FOR</b> setting.</p> <ul style="list-style-type: none"><li><b>MANUAL</b> - Does not optimize the selections.</li><li><b>3RD PARTY CLIENTS</b> - Optimizes these parameters for peer devices such as laptops, tablets, phones or any other Wi-Fi devices that perform regular power savings and are expected to connect to this radio. If you do not select <b>3RD PARTY CLIENTS</b>, then client devices may have difficulty in finding the network's SSID, and their communication may be erratic due to broadcasts not being transmitted when expected. RLX2 Bridging still functions, although the RLX2-IHx series radios respond to all scanning client devices which may introduce some jitter to data being transferred.</li><li><b>RLX2 BRIDGING</b> - Optimizes these parameters when peer devices are primarily other RLX2-IHx series radios.</li><li><b>SECURE BRIDGING</b> - Similar to <b>RLX2 BRIDGING</b> but also enables the <b>PROSOFT-ONLY CLIENTS</b> control which rejects any connections from 3rd-Party clients.</li></ul>
Immediate Bcasts	Specifies that the radio forwards multicast traffic immediately, rather than waiting for specific time intervals.
Ignore Probes	Specifies that the radio does not respond to general probe requests that are not specific to the radio's SSID.
ProSoft-only Clients	Specifies that the radio rejects connections from 3 <sup>rd</sup> -party clients. Used with <b>SECURE BRIDGING</b> .
Range (km)	<p>Specifies that the radio accounts for round trip delays. The <b>RANGE</b> setting should be the same in all radios in the network and should be at least large enough to account for the length of any links.</p> <ul style="list-style-type: none"><li>Increasing the <b>RANGE</b> beyond what is necessary can cause a slight decrease in throughput.</li><li>Reducing the range setting for systems at closer range may improve throughput.</li><li>The default <b>LONG</b> range is 25km, which is valid for all operating modes of all radios.</li></ul>
TX Attenuation	Specifies how much the amount the output power of the radio is attenuated. Zero implies no attenuation meaning the radio uses full power.
Active Antennas	Specifies the number of active antennas. Available only for models RLX2-IHNF and RLX2-IHW radios. See Active Antennas: RLX-IHNF (page 87) and Active Antennas: RLX2-IHW (page 87).

Max Data Rate

MCS Index	Active Antennas	802.11n mode, Mbit/s		802.11n wide mode, Mbit/s	
		800 ns GI	400 ns GI	800 ns GI	400 ns GI
0	1, 2 or 3	6.50	7.20	13.50	15.00
1	1, 2 or 3	13.00	14.40	27.00	30.00
2	1, 2 or 3	19.50	21.70	40.50	45.00
3	1, 2 or 3	26.00	28.90	54.00	60.00
4	1, 2 or 3	39.00	43.30	81.00	90.00
5	1, 2 or 3	52.00	57.80	108.00	120.00
6	1, 2 or 3	58.50	65.00	121.50	135.00
7	1, 2 or 3	65.00	72.20	135.00	150.00
8	2 or 3	13.00	14.40	27.00	30.00
9	2 or 3	26.00	28.90	54.00	60.00
10	2 or 3	39.00	43.30	81.00	90.00
11	2 or 3	52.00	57.80	108.00	120.00
12	2 or 3	78.00	86.70	162.00	180.00
13	2 or 3	104.00	115.60	216.00	240.00
14	2 or 3	117.00	130.00	243.00	270.00
15	2 or 3	130.00	144.40	270.00	300.00

The radio automatically selects the Guard Interval (GI) based on current operating conditions. The system attempts to use a 400 microsecond GI, but will fall back to an 800 microsecond GI if excessive data corruption is detected. The radio will periodically attempt to resume using a 400 microsecond GI as conditions improve. A 400 microsecond GI results in about 11% more throughput than using an 800 microsecond GI. The user has no control of the GI.

For **RLX2-IHW/A/G** only: **ADVANCED WIRELESS SETTINGS** includes the **MAX DATA RATE** (see image below). The **ACTIVE ANTENNAS** parameter allows you to choose one or two antennas.



### Active Antennas: RLX-IHNF

There are three options for the **ACTIVE ANTENNAS** parameter.

- **A, B, C** (the default setting; use for a three connector MIMO antenna).
- **A ONLY** for one antenna
- **A, C** for two antennas. Note that if two antennas are used, they must be attached to the ANT A and ANT C antenna connectors

MIMO antennas generally have three connections so all three antenna ports must be activated. In general, using three antenna ports gives the best performance. When more than one antenna port is active, the radio monitors the signal appearing at all antenna ports and dynamically select the port(s) with the best signal. However, there are situations where performance may improve if fewer antenna ports are active. If radios are very close together (typically a few feet), all three antenna ports will receive essentially identical signal strengths and the radio may continuously change antenna ports, resulting in degraded performance.

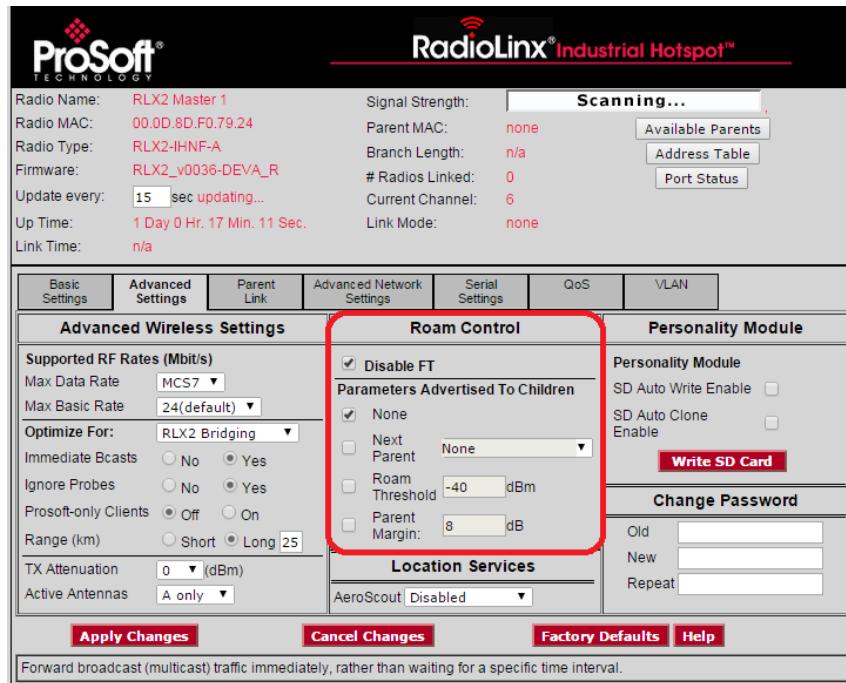
### Active Antennas: RLX2-IHW

There are three options for the **ACTIVE ANTENNAS** parameter.

- **1** (one antenna, default setting). Use the main connector labeled *Antenna*.
- **2** (two antennas). If you want to improve performance in high multipath environments through RX diversity, you can add a second antenna to the connector labeled *Rx Only* and set **ACTIVE ANTENNA** to 2 Antennas.

#### 4.4.2 Roam Control Settings

You use the parameters in the **ROAM CONTROL** group in the *Radio Configuration / Diagnostic Utility* to specify the roaming wireless communication parameters of a RLX2-IHx series Repeater radio.



**Note:** Different versions of the RLX2-IHx series radios and firmware support different functions. There may be fewer or more parameters on this page, depending on the version of the radio and firmware.

In roaming applications, a mobile platform equipped with an RLX2-IHx series Repeater radio roams from one Master radio's coverage area to another radio's coverage area. By default, a Repeater radio roams automatically by calculating the cost for each roam candidate based only on RSSI and hop count. A lower cost determines when a better Parent radio candidate is present.

The RLX2-IHx series radio uses parts of the Fast Transition (FT) standard to reduce the time it takes to roam. An FT Roam will be used if the Repeater radio, the current Parent radio, and the next Parent radio all have FT enabled. You can disable **FT ROAMING**, which results in normal non-FT Roaming.

Independent to the type of Roaming, there are several limitations when the RLX2-IHx series radios are operating in autonomous roam mode that you can overcome by using Parent Assisted Roaming.

Given that the current RLX2-IHx series radio only has one radio module, all Master radios, by necessity, have to be on the same channel to allow the roaming Repeater radios to detect them.

In applications where the mobile platform is traveling a known path, it is necessary to have an unambiguous option when it reaches a roam point. If multiple Parent radios are in range at the roam point, the radio may choose to roam to the wrong Parent radio.

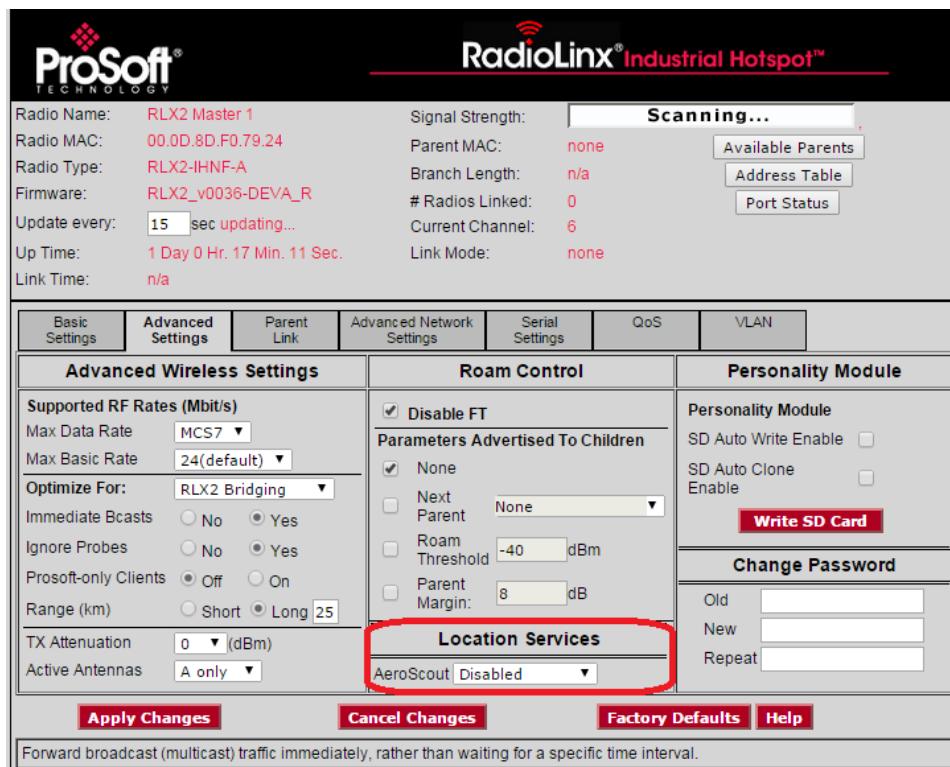
The Repeater radio uses the **ROAM THRESHOLD** and **PARENT MARGIN** parameters for every roam. Due to topology variances, there may be one or two coverage areas that would operate better with different settings for these roam parameters.

The following settings allow for Parent Assisted roaming by advertising these parameter values to any Child Repeater radio that associates to this unit. You can enable each parameter separately. Only enabled parameters are advertised to Child Repeater radios.

Parameter	Description
None	Select this check box to negate all other parameters so that no roam parameters are advertised to Child Repeater radios.
Next Parent	Select this check box to advertise the unit that a Child Repeater radio should roam to next. The <i>Radio Configuration / Diagnostic Utility</i> automatically populates the parameter with all the RLX2-IHx series units with the same SSID that are on the same Ethernet network as a unit.  Each entry is represented by the Name of the RLX2-IHx series radio, so it is important that you give each radio a unique name. If the desired next Parent radio has not been detected because it is not currently powered up or attached to the network, it does not appear in the list. In this case, you can manually enter its MAC Address into the parameter. Once saved, this MAC Address appears in the select box until that unit is detected on the Ethernet, at which time the radio's name replaces the MAC Address.  When an advertised <b>NEXT PARENT</b> radio is on the same channel as the current unit, the Child Repeater radio roams to the Next Parent radio when the Next Parent radio's cost is lower than its current Parent radio. When the advertised Next Parent radio is on a different channel, then the radio uses the <b>ROAM THRESHOLD</b> to make the roam decision.
Roam Threshold	Select this check box to advertise the <b>ROAM THRESHOLD</b> that a Child Repeater radio uses. This Roam Threshold overrides the Child Repeater radio's equivalent setting, but only while the Child Repeater radio is associated to this unit. If the Parent radio is not advertising a Roam Threshold, then the Child Repeater radio reverts to using its own value configured on the <b>PARENT LINK</b> tab of the <i>Radio Configuration / Diagnostic Utility</i> for the Child Repeater radio.  This parameter is critical when a Next Parent is also being advertised and that Parent is configured to be on a different channel than this unit. The Child Repeater uses this threshold to determine when to switch to the Next Parent's channel and associate with it. You must ensure that at a point where the current Parent's RSSI goes below the threshold, the Next Parent is in range. Otherwise, the roam fails.  The main point to remember is that a Child Repeater does not roam while its current Parent's RSSI is higher than the current Roam Threshold value. In the case where a Next Parent radio is not being advertised or the Next Parent radio is on the same channel, then the cost comparison to determine when to roam only occurs when the current Parent's RSSI is below the Roam Threshold. This allows the roam point to be controlled when a mobile platform travels a known path.
Parent Margin	Select this check box to advertise the <b>PARENT MARGIN</b> that a Child Repeater radio uses. This Parent Margin overrides the Child Repeater radio's equivalent setting, but only while the Child Repeater radio is associated to this unit. If the Parent radio is not advertising a Parent Margin, the Child Repeater radio reverts to using its own configured value. See <i>Configuring Parent Link Settings</i> (page 94).

#### 4.4.3 Location Services Settings

You use the parameters in the **LOCATION SERVICES** group in the *Radio Configuration / Diagnostic Utility* to enable and disable support for the AeroScout™ Location Services of a RLX2-IHx series Repeater radio. If not present, the feature was disabled at the factory.

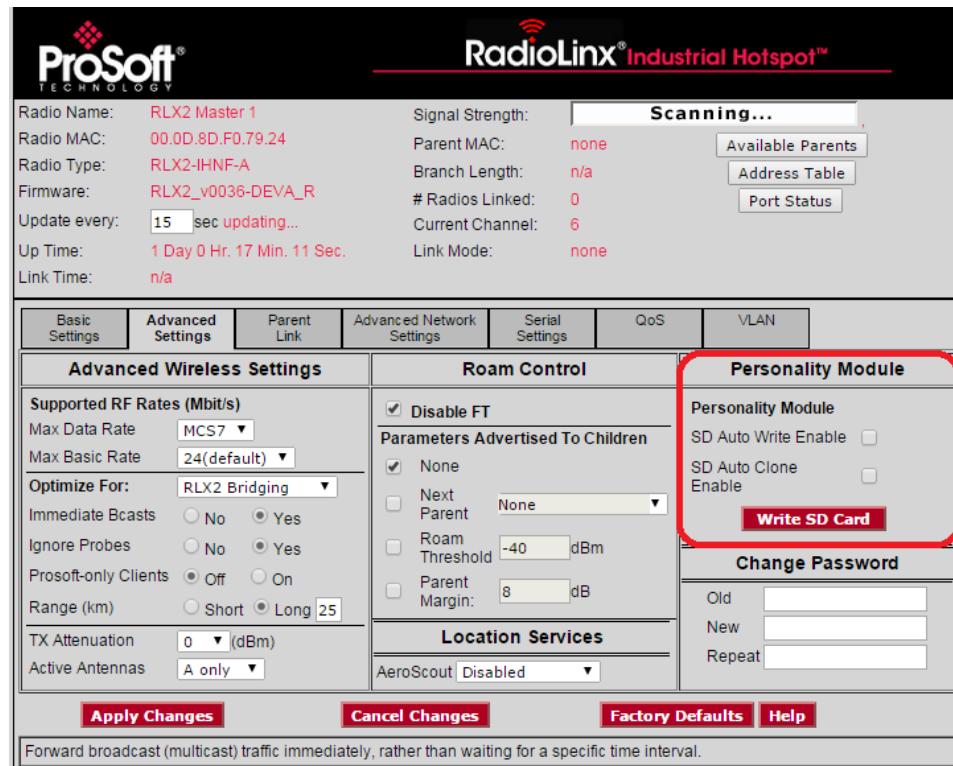


The AeroScout service listens on Port 1141 for commands from the AeroScout engine.

Parameter	Description
AeroScout	Specifies the state of the AeroScout service. <ul style="list-style-type: none"> <li>▪ <b>DISABLED</b> - Disables the AeroScout service.</li> <li>▪ <b>TAG ENABLED MODE</b> - Forwards any Tag Reports received by the radio to the AeroScout location engine.</li> <li>▪ <b>TAG AND MU ENABLED</b> - Forwards Tag Reports and any mobile unit packets heard from on the RLX2-IHx series radio's channel.</li> </ul>

#### 4.4.4 Personality Module Settings

You use the parameters in the **PERSONALITY MODULE** group in the *Radio Configuration / Diagnostic Utility* to enable and disable the use of the microSD card (Personality Module) feature of a RLX2-IHx series Repeater radio. You can use the microSD card to save the radio's configuration. This makes it easy to replace the radio with a new radio by moving the microSD card from the old radio to the replacement radio. See Replacing an Existing Radio (page 55).



**Note:** The configuration files on the microSD card are stored in a binary format so sensitive data (e.g. passwords, encryption keys) cannot be easily read from the files.

Parameter	Description
SD Auto Write Enable	Select this check box to have the radio write a copy of its configuration to the microSD card whenever new settings are saved from the <i>Radio Configuration / Diagnostic Utility</i> . The radio renames previous radio configuration files with a unique file name that allows you to audit changes made to the radio's configuration.

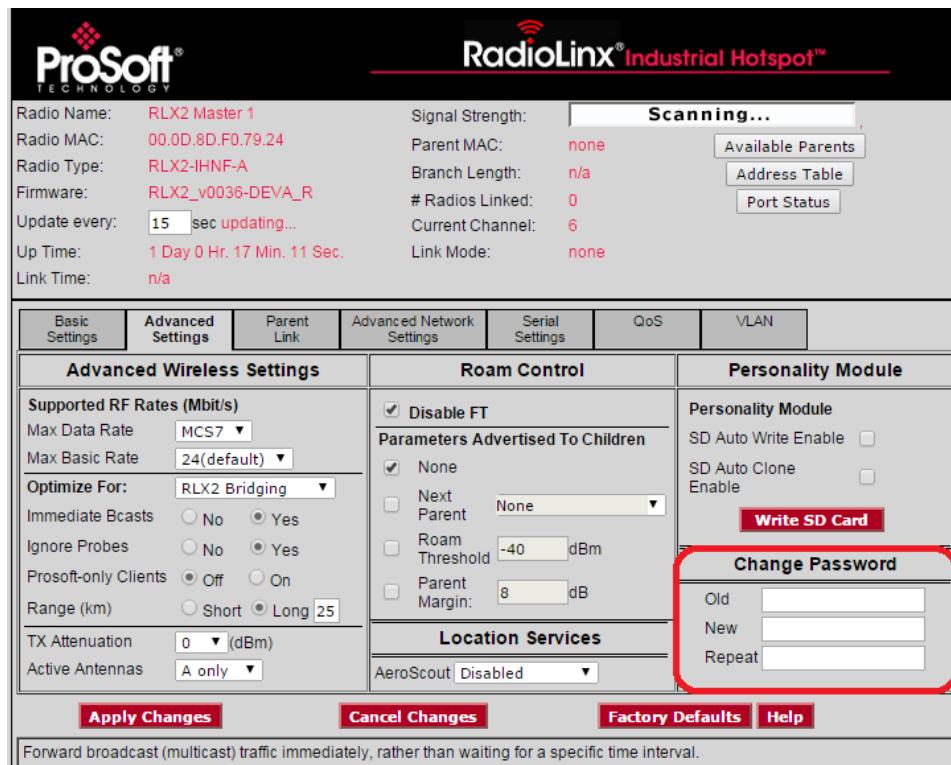
---

SD Auto Clone Enable	<p>Select this check box to have the radio use the configuration from the microSD card when the radio powers up.</p> <ul style="list-style-type: none"><li>▪ If a microSD card is present and has a configuration file that is different from the radio's current configuration, the radio uses the configuration from the SD Card.</li><li>▪ If the configuration on the micro SD card matches the radio's configuration, or there is no configuration file on the SD Card, then no action is taken.</li><li>▪ If you insert a microSD Card into a running radio, and if the configuration file on the SD Card is different from the radio's current configuration, the radio warns you by flashing the Signal Strength, MOD and NET LEDs. If you reboot the radio or cycle power to the radio, it uses the configuration from the microSD card.</li></ul> <p>If you want to save this control as enabled (checked), either the SD card slot in the radio must be empty, or you must enable the <b>SD AUTO WRITE ENABLE</b> control before saving. If these conditions are not present, the software disables this control before saving. This prevents the unit from unintentionally reverting back to a configuration file on the SD Card after resetting.</p> <ul style="list-style-type: none"><li>▪ To use the configuration file on an SD card when this control is already enabled, insert the SD card and cycle power to the radio.</li><li>▪ If this control is not enabled, enable and save the setting without the SD card inserted (click <b>APPLY CHANGES</b>), then insert the SD card, and then cycle power to the radio.</li></ul> <p><b>Note:</b> Do not enable <b>SD AUTO WRITE ENABLE</b> if you do not want the active configuration file on the SD card to be replaced when the unit loads and saves the SD card's current configuration file.</p>
Write SD Card	<p><b>Immediately writes</b> a copy of the unit's configuration file to the SD card, independent of the <b>SD AUTO WRITE ENABLE</b> setting.</p>

---

#### 4.4.5 Changing Password Settings

You use the parameters in the **CHANGE PASSWORD** group in the *Radio Configuration / Diagnostic Utility* to change the radio password to access the *Radio Configuration / Diagnostic Utility* for the RLX2-IHx series radio.



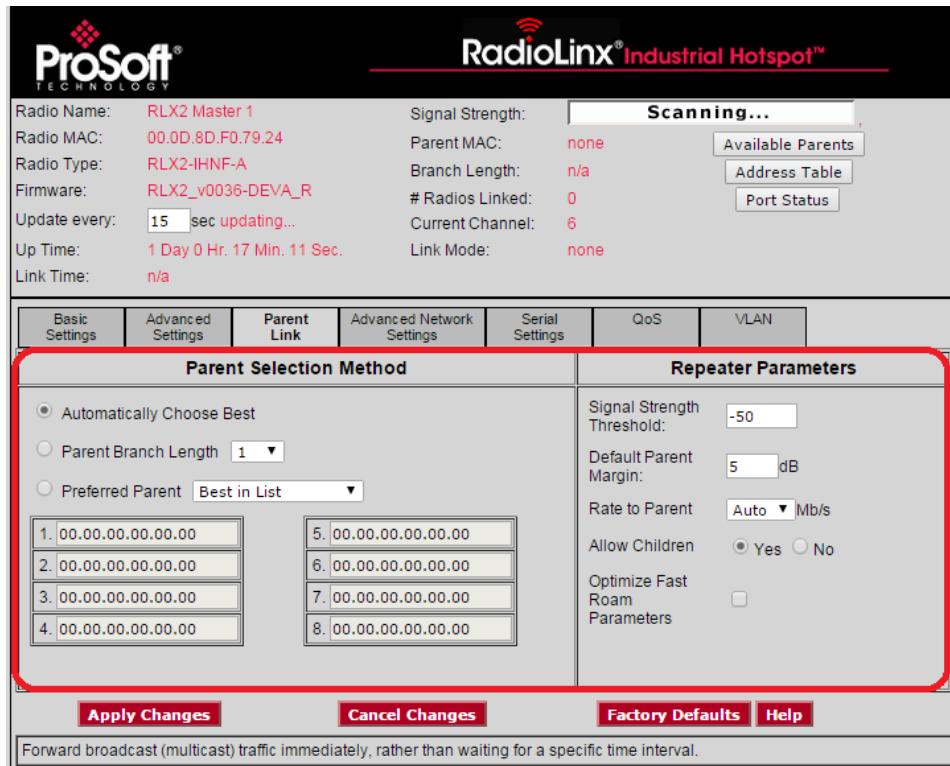
##### To change the password

- 1 Enter the old password in **OLD**.
- 2 Enter the new password in **NEW**.
- 3 Enter the new password again in **REPEAT**.
- 4 Click **APPLY CHANGES**.

## 4.5 Configuring Parent Link Settings

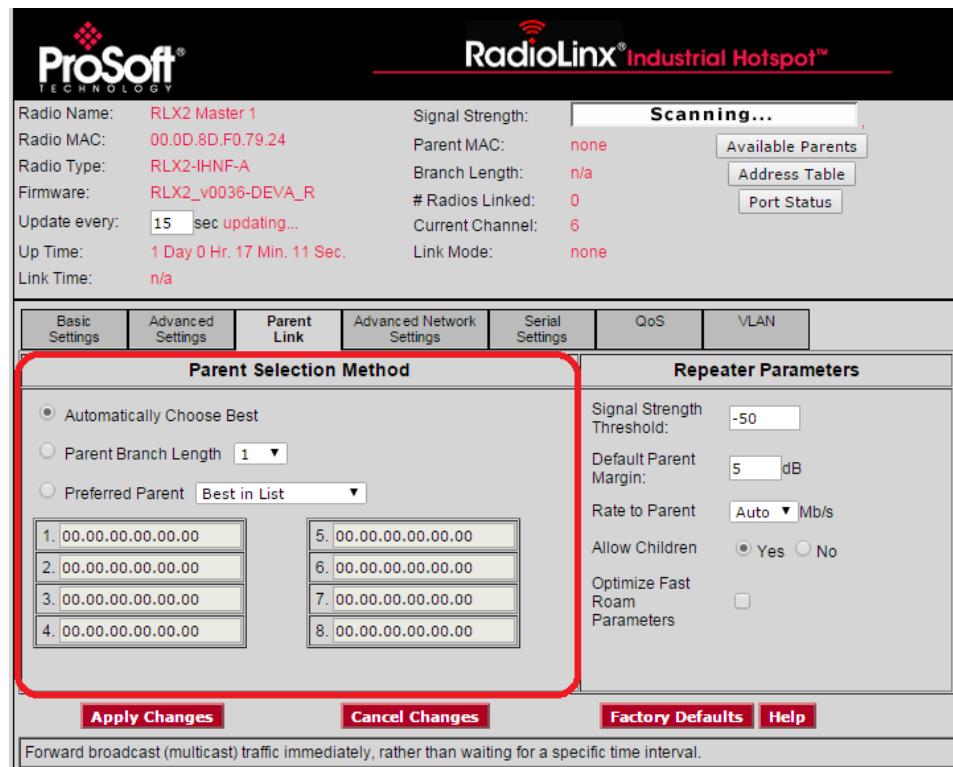
You use the **PARENT LINK** tab in the *Radio Configuration / Diagnostic Utility* to specify how a RLX2-IHx series Repeater, Bridging Client, or Client radio connects to the network. Parent Link includes two groups:

- **PARENT SELECTION METHOD**
- **REPEAT PARAMETERS**



#### 4.5.1 Parent Selection Method Settings

You use the parameters in the **PARENT SELECTION METHOD** group in the *Radio Configuration / Diagnostic Utility* to specify how the RLX2-IHx series Repeater radio chooses a Parent radio in a wireless network.

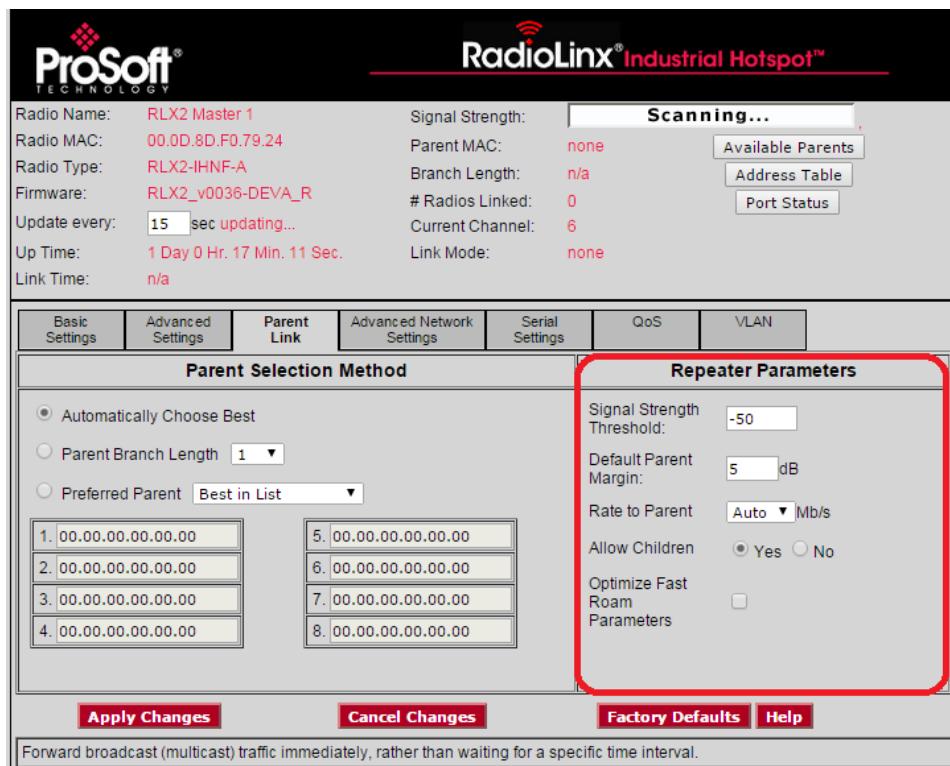


Parameter	Description
Automatically Choose Best	Calculates a "cost" metric for each possible parent radio that it detects and selects the Parent radio based on the lowest cost. The radio's calculation includes: <ul style="list-style-type: none"><li>▪ RSSI - Stronger signals receive a lower cost.</li><li>▪ Hop Count - Fewer hops from the Master radio is given preference and therefore a lower cost</li></ul>
Parent Branch Length	Calculates the branch length to other radios and chooses the Parent radio strictly by the number of Repeater radios between this radio and the Master radio. <ul style="list-style-type: none"><li>▪ If you choose a branch length of 1, the radio links only to the Master radio.</li><li>▪ If you choose a branch length of 2, the radio links only to another RLX2-IHx series radio that is linked to the Master radio, and so on.</li><li>▪ If multiple candidate radios are available at a particular hop count, the radio chooses the Parent radio that has the smallest cost as calculated by the Automatically Choose Best algorithm.</li></ul>

Parameter	Description
Preferred Parent	<p>Specifies how the radio selects a Parent radio from the list of possible Parent radios. When you select this option, you can specify a list of up to eight radios by entering the MAC addresses for each radio. The radio chooses its Parent radio based on your selection for <b>PREFERRED PARENT</b>:</p> <p><b>BEST IN LIST</b> - The radio selects its Parent radio using the Automatically Choose Best algorithm, but limits the selection to the Preferred Parent list of radios. This selects the Parent radio in the list with the lowest cost.</p> <p><b>FOLLOW LIST PRIORITY</b> - The radio selects its Parent radio from the list giving preference to the 1st entry followed by the 2nd entry and so on.</p> <p><b>2.4 GHz PARENTS ONLY</b> - The radio only selects a Parent radio from the list that is operating in the 2.4 GHz band.</p> <p><b>5 GHz PARENTS ONLY</b> - The radio only selects a Parent radio from the list that is operating in the 5 GHz band.</p>

#### 4.5.2 Repeater Parameters Settings

You use the parameters in the **REPEAT PARAMETERS** group in the *Radio Configuration / Diagnostic Utility* to specify the wireless communication parameters of a RLX2-IHx series Repeater radio.



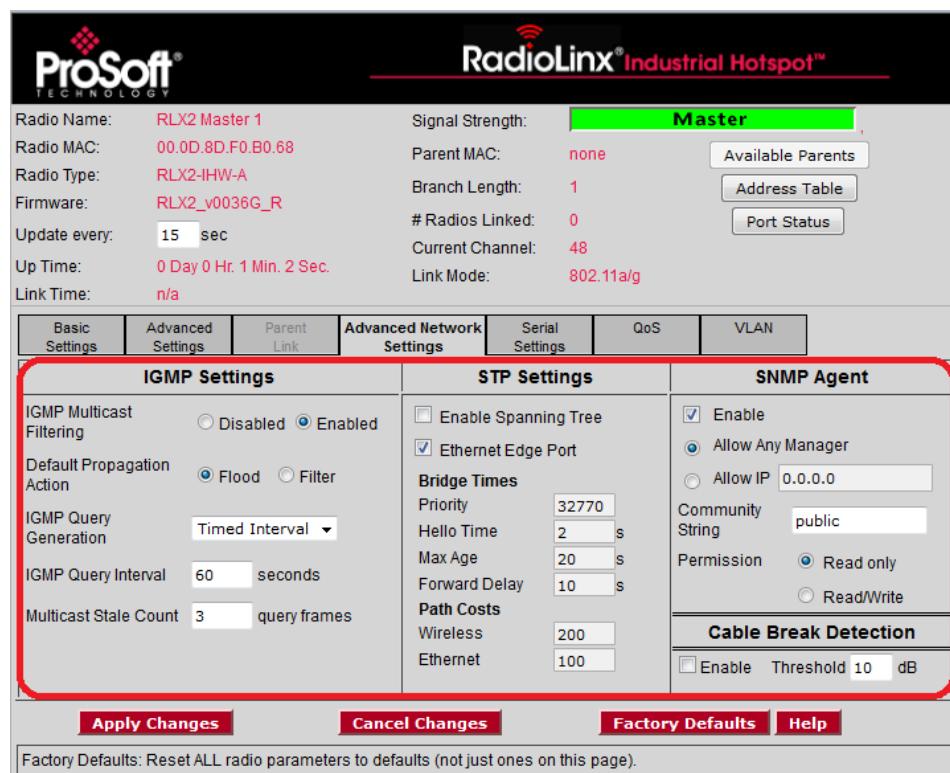
Parameter	Description
Signal Strength Threshold	<p>Specifies a signal strength above which a stronger signal does not improve the quality of the link any further. For signals that are above that threshold, the radio only gives preference to Parent radios with fewer hops from the Master radio.</p> <p>Another way to consider this in Fast Roam applications is that the radio does not Roam to a new Parent radio at the same hop count level until its current Parent radio's RSSI goes below (weaker) than this value.</p>
Default Parent Margin	<p>Specifies a signal strength below which the radio will not select a different Parent radio. You can use this in Fast Roam applications where the radio is on a mobile platform, or there is a lot of movement in the environment causing RSSI levels to fluctuate. The radio keeps its current Parent radio unless another Parent radio's RSSI is stronger than this value. The radio adds this margin value to the current Parent radio's RSSI prior to calculating its cost. It is desirable to Roam to a new Parent radio before losing the connection with the current Parent radio, since losing the connection results in data loss.</p> <ul style="list-style-type: none"><li>▪ If you enter a value that is too small, it can lead to the radio rapidly switching back and forth between two Parent radios as the RSSI levels change.</li><li>▪ If you enter a value that is too large, it can result in preventing a Roam until the radio moves out of range, even though a candidate exists that is actually better than the current Parent radio.</li></ul> <p>The default value is 5 dB.</p> <ul style="list-style-type: none"><li>▪ Use larger values (10-15 dB) to prevent false roams from occurring due to temporary RSSI inversions between the current Parent radio and another candidate.</li><li>▪ Make sure that when Roaming that the RSSI difference between the current Parent radio and the new Parent radio is greater than this value.</li></ul>
Rate to Parent	<p>Specifies how the radio selects the rate to the Parent radio.</p> <p><b>AUTO</b> - The default setting. The radio selects the best rate to use to the Parent radio, and adapt over time.</p> <p><b>FIXED RATE</b> - Fixes a lower rate to improve performance; for example if the link to the Parent radio has a low signal strength.</p> <p>The actual rate used between this radio and its Parent radio is the lower value of this setting and the Max Data Rate setting in the Parent radio. So use <b>RATE TO PARENT</b> in this radio, and <b>MAX DATA RATE</b> in the Parent radio in conjunction if you want to customize the rate of each parent link. See Advanced Wireless Settings (page 84).</p> <p><b>Note:</b> When configuring an RLX2-IHNF, this parameter is only enabled if the <b>802.11 MODE</b> parameter on the <b>BASIC SETTINGS</b> page is set to <b>802.11A/G</b> mode. See Basic Wireless Settings (page 71).</p>
Allow Children	<p>Specifies whether the Repeater radio acts as a Parent radio to other 802.11 radios.</p> <p><b>YES</b> - Allows this radio to be a Parent radio to other 802.11 radios.</p> <p><b>No</b> - Disguises the radio's SSID to prevent other 802.11 devices from finding it. This is useful in Fast Roam applications where you do not want any other devices connect to a Repeater radio that moving and roaming.</p>

Optimize Fast Roam Parameters	<p>Select this check box to optimize the radio for Fast Roaming. In typical Fast Roam applications a Repeater is installed on a mobile pallet or platform and a set of Master units forms a backbone infrastructure network, through which the Repeater must roam.</p> <ul style="list-style-type: none"><li>Selecting the check box automatically sets these parameters accordingly along with a predetermined optimum value for the cost threshold.</li><li>Clearing the check box reverts the parameters back to their previous values before the check box state was saved.</li></ul> <p><b>Repeater radio</b> - The relevant parameters that are automatically set for the Repeater radio are:</p> <ul style="list-style-type: none"><li>Do not allow Child Repeaters (<b>ALLOW CHILDREN</b>).</li><li>Use a <b>SIGNAL STRENGTH THRESHOLD</b> set high enough so that the radio uses RSSI to determine the link cost to a Parent radio.</li></ul> <p><b>Master radio</b> - The relevant parameters that you must manually set for the Master radio are:</p> <ul style="list-style-type: none"><li>Clear <b>HIDE NETWORK SSID</b> on the <b>BASIC SETTINGS</b> tab to make the Master radio SSID visible to other devices. See Wireless Security Settings (page 74).</li><li>Disable <b>SPANNING TREE</b> on the <b>ADVANCED NETWORK SETTINGS</b> tab. See STP Settings (page 101).</li></ul> <p><b>Note:</b> You must manually disable Spanning Tree and clear Hide Network SSID on all Master units, as this parameter only affects the current Repeater radio.</p> <p>You can change any of these Repeater radio parameters later. For example you can set a different value for the Signal Strength Threshold. Changing any of the related parameters in the Repeater radio clears the Optimize Fast Roam Parameters check box.</p>
-------------------------------	---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------

## 4.6 Configuring Advanced Network Settings

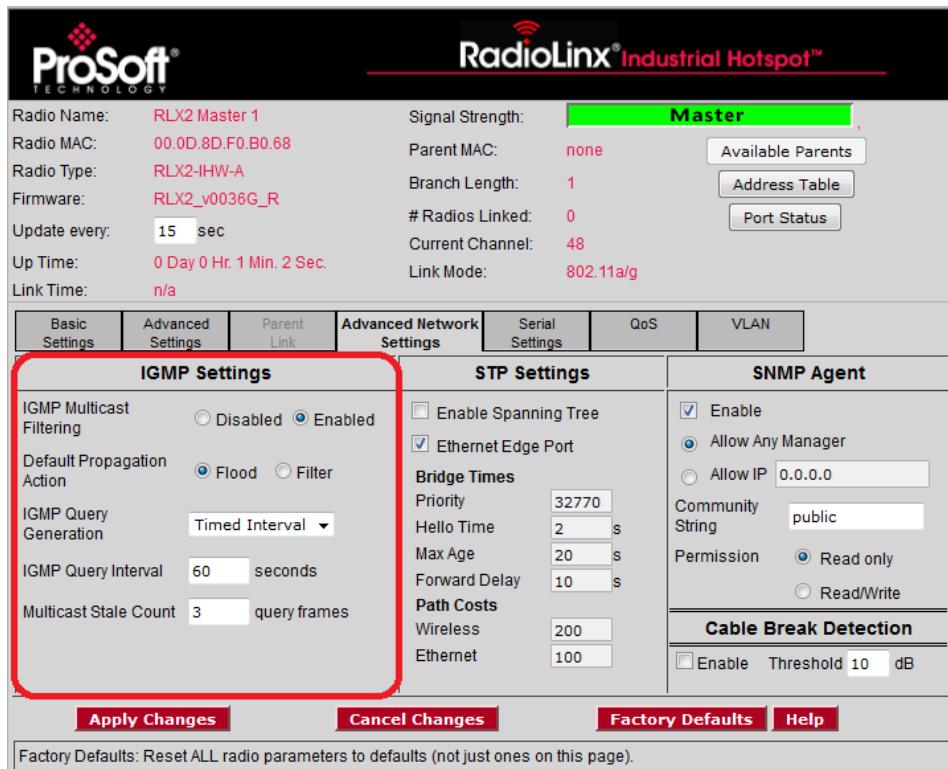
You use the **ADVANCED NETWORK SETTINGS** tab in the *Radio Configuration / Diagnostic Utility* to specify the IGMP (Internet Group Management Protocol), STP (Spanning Tree Protocol), SNMP (Simple Network Management Protocol), and Cable Break Detection parameters for a RLX2-IHx series radio. The *Advanced Network Settings* includes four groups:

- **IGMP SETTINGS**
- **STP SETTINGS**
- **SNMP AGENT**
- **CABLE BREAK DETECTION**



#### 4.6.1 IGMP Settings

You use the parameters in the **IGMP SETTING** group in the *Radio Configuration / Diagnostic Utility* to specify the Internet Group Management Protocol parameters of your RLX2-IHx series radio.



RLX2-IHx series radios support IGMP v1 and v2. The IGMP functions are enabled in the radios by default.

Parameter	Description
IGMP Multicast Filtering	Specifies the state of IGMP multicast filtering ( <b>DISABLED</b> or <b>ENABLED</b> ).
Default Propagation Action	Specifies how the radio handles multicast addresses that are not in the radio's address table. <b>FLOOD</b> - The radio sends unknown multicast packets to all ports. <b>FILTER</b> - The radio filters unknown multicast packets, and does not send them to any ports.
IGMP Query Generation	Specifies the state of IGMP query generation in the radio. <b>DISABLED</b> - Disables IGMP query generation. <b>TIMED INTERVAL</b> - Enables IGMP query generation. Use IGMP Query Interval to specify the query time interval.