

# Wireless Devices

## • Long Range



### Prepackaged Long Range Wireless I/O Boards

Model #	UL	Protocol	Enclosure	Transformer	I/O Board	Radio	Antenna	Notes
RIBWLC	•	LonWorks				Client	ANTRD5	
RIBWLS	•	LonWorks				Server	ANTRD5	
RIBWP1LC	•	LonWorks	PE6000			Client	ANTRD5	
RIBWP1LS	•	LonWorks	PE6000			Server	ANTRD5	
RIBWE2LS	•	LonWorks	MH1200			Server	ANTRD5	
RIBWE150LC	•	LonWorks	MH1000	50VA		Client	ANTRD5	
RIBWE150LS	•	LonWorks	MH1000	50VA		Server	ANTRD5	
RIBWE1L4C	•	LonWorks	MH1000		RIBMNX2401SB-LN	Client	ANTRD5	
RIBWE150L4C	•	LonWorks	MH1000	50VA	RIBMNX2401SB-LN	Client	ANTRD5	
RIBWE4LS	•	LonWorks	MH2204-N4			Server	ANTRD5	
RIBWE650LS	•	LonWorks	MH3204-N4	50VA		Server	ANTRD5	
RIBWE650LC	•	LonWorks	MH3204-N4	50VA		Client	ANTRD5	
RIBWE6L4C	•	LonWorks	MH3204-N4		RIBMNX2401SB-LN	Client	ANTRD5	
RIBWE650L4C	•	LonWorks	MH3204-N4	50VA	RIBMNX2401SB-LN	Client	ANTRD5	
RIBWE1L1C	•	LonWorks	MH1000		RIBM245B-LNAI	Client	ANTRD5	
RIBWE150L1C	•	LonWorks	MH1000	50VA	RIBM245B-LNAI	Client	ANTRD5	
RIBWE6L1C	•	LonWorks	MH3204-N4		RIBM245B-LNAI	Client	ANTRD5	
RIBWE650L1C	•	LonWorks	MH3204-N4	50VA	RIBM245B-LNAI	Client	ANTRD5	
RIBWE1L2C	•	LonWorks	MH1000		RIBM245B-LNT2	Client	ANTRD5	
RIBWE150L2C	•	LonWorks	MH1000	50VA	RIBM245B-LNT2	Client	ANTRD5	
RIBWE6L2C	•	LonWorks	MH3204-N4		RIBM245B-LNT2	Client	ANTRD5	
RIBWE650L2C	•	LonWorks	MH3204-N4	50VA	RIBM245B-LNT2	Client	ANTRD5	
RIBWE150L7C	•	LonWorks	MH1000	50VA	RIBM245B-LNAI-P2	Client	ANTRD5	
RIBWE150L7S	•	LonWorks	MH1000	50VA	RIBM245B-LNAI-P2	Server	ANTRD5	
RIBWE650L7C	•	LonWorks	MH3204-N4	50VA	RIBM245B-LNAI-P2	Client	ANTRD5	
RIBWE650L7S	•	LonWorks	MH3204-N4	50VA	RIBM245B-LNAI-P2	Server	ANTRD5	
RIBWBC	•	BACnet				Client	ANTRD5	
RIBWBS	•	BACnet				Server	ANTRD5	
RIBWP1BC	•	BACnet	PE6000			Client	ANTRD5	
RIBWP1BS	•	BACnet	PE6000			Server	ANTRD5	
RIBWE2BS	•	BACnet	MH1200			Server	ANTRD5	
RIBWE150BC	•	BACnet	MH1000	50VA		Client	ANTRD5	
RIBWE150BS	•	BACnet	MH1000	50VA		Server	ANTRD5	
RIBWE1B3C	•	BACnet	MH1000		RIBMNX2401B-BC	Client	ANTRD5	
RIBWE150B3C	•	BACnet	MH1000	50VA	RIBMNX2401B-BC	Client	ANTRD5	
RIBWE4BS	•	BACnet	MH2204-N4			Server	ANTRD5	
RIBWE650BS	•	BACnet	MH3204-N4	50VA		Server	ANTRD5	
RIBWE6B3C	•	BACnet	MH3204-N4		RIBMNX2401B-BC	Client	ANTRD5	
RIBWE650B3C	•	BACnet	MH3204-N4	50VA	RIBMNX2401B-BC	Client	ANTRD5	
RIBWE1B6C	•	BACnet	MH1000		RIBMNX24B-BCAI	Client	ANTRD5	
RIBWE150B6C	•	BACnet	MH1000	50VA	RIBMNX24B-BCAI	Client	ANTRD5	
RIBWE6B6C	•	BACnet	MH3204-N4		RIBMNX24B-BCAI	Client	ANTRD5	
RIBWE650B6C	•	BACnet	MH3204-N4	50VA	RIBMNX24B-BCAI	Client	ANTRD5	

UL = UL Listed ; UL916 Energy Management ; USA & Canada

Consult factory for special programming needs or situations where it is desired not to involve an entire network (stand alone operation).

### Antennas (Sold separately)

Does not meet "Buy American" of ARRA 2009

Model #	UL	Gain	Style	Mounting	Max Line-of-Sight <sup>2</sup>	Max Non-Line-of-Sight <sup>2</sup>	Notes
ANTRD3		3 dBi (1 dB)	Rubber Duck	Direct	.25 mile	5 walls / 300 feet	
ANTRD5		5 dBi (3 dB)	Rubber Duck	Direct	.50 mile	6 walls / 500 feet	
ANTLOR3		3 dB	Low Profile, Omni Directional	Remote	.50 mile	6 walls / 500 feet	Must use cable
ANTBOR3		3 dB	Base Station, Omni Directional	Remote	5 miles	1500 feet with trees	Must use cable
ANTBOR6		6 dB	Base Station, Omni Directional	Remote	20 miles	2000 feet with trees	Must use cable
ANTPDR10 <sup>1</sup>		10.5 dB	Panel, Directional	Remote	2 miles	1200 feet with trees	Must use cable
ANTPDR12		12.5 dB	Panel, Directional	Remote	5 miles	1300 feet with trees	Must use cable
ANTYDR11		11 dBi (9 dB)	Yagi, Directional	Remote	20 miles	1200 feet with trees	Must use cable
ANTYDR15		15 dBi (11 dB)	Yagi, Directional	Remote	40 miles	1500 feet with trees	Must use cable

<sup>1</sup> = Used only with models RIBWLS & RIBWLC    <sup>2</sup> = Range may vary based on terrain and noise environment    This information is based on limited testing and is to be used as a guide in antenna selection.

### Cables & Accessories (Sold separately)

Does not meet "Buy American" of ARRA 2009

Model #	UL	Description	Notes
CAB1		Custom Cable RPSMA to N-Female Bulkhead, 12"	
CAB2		Custom Cable N-Female to N-Female, 6'	
CAB3		Custom Cable RPSMA to N-Male, 12"	
CAB4		Custom Cable RPSMA Male to RPSMA Female Bulkhead, 8"	
CABANT30		LMR600 antenna cable, 30'	
CABANT15		LMR600 antenna cable, 15'	
ANTADP		RP-SMA Female to N-Male Adapter	

# Construct the Perfect Prepackaged Unit to Fit Your Specific Application

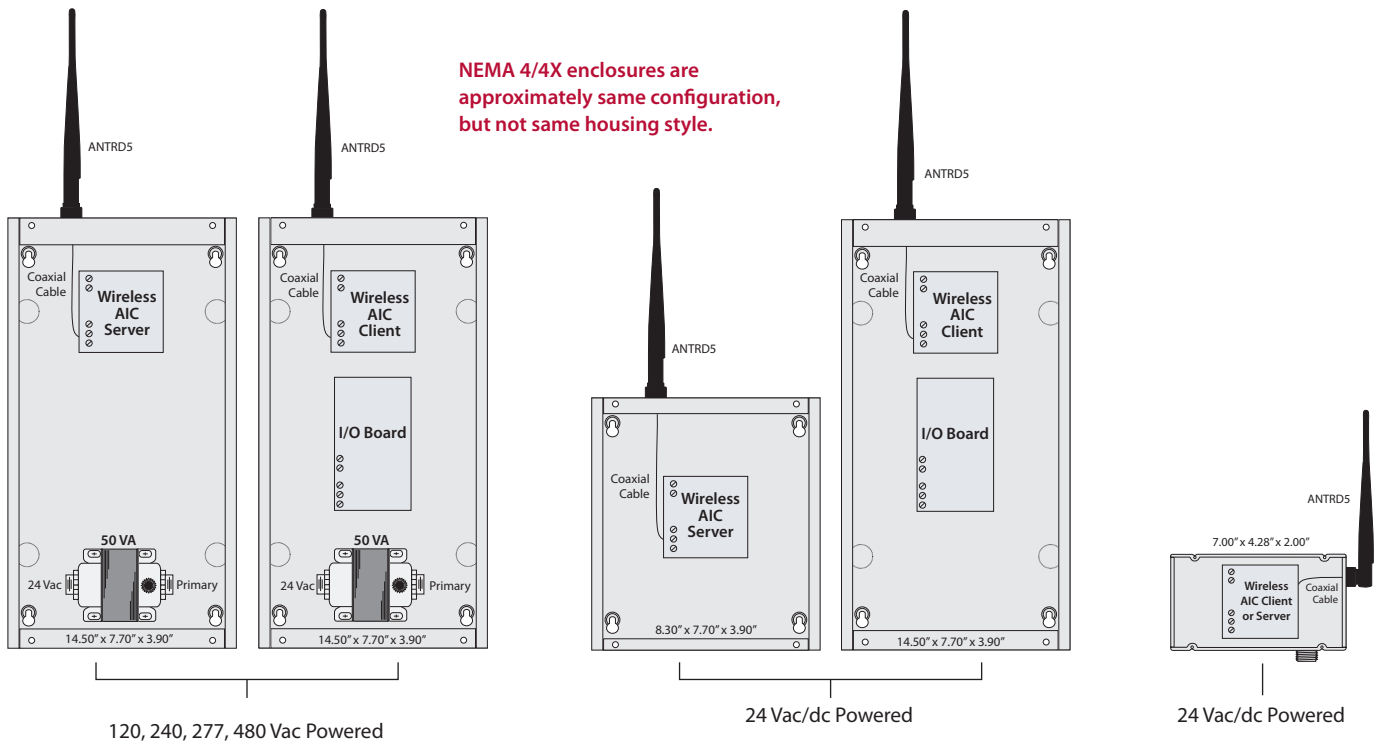
## Model Number Key

	<b>RIBW</b>	<b>E2</b>	<b>50</b>	<b>B3</b>	<b>C</b>
<p><b>RIBW Series</b> "Network Relay"</p>					
<p><b>Enclosure</b>                  E1 = MH1000 Large                  E2 = MH1200 Small                  E4 = MH2204-N4 Small                  E6 = MH3204-N4 Large                  P1 = PE6000</p>					
<p><b>Transformer</b>                  50 = TR50VA004</p>					
<p><b>I/O Board</b> (See spec pages for more information.)                  L = RIBWLC or RIBWLS                  B = RIBWBC or RIBWBS                  L1 = RIBMW24SB-LNAI                  L2 = RIBMW24SB-LNT2                  B3 = RIBMNWX2401B-BC                  L4 = RIBMNWX2401SB-LN                  B6 = RIBMNW24B-BCAI                  L7 = RIBMW24SB-LNAI-P2 (For use when no control network exists)</p>					
<p><b>Radio Board</b>                  S = Server (Transmitter)                  C = Client (Receiver)</p>					

Functional Devices' prepackaged short to extended range wireless models can be ordered in many configurations. Whether your application calls for extending your network wirelessly using just a single server and client transceiver configuration or if your application demands entire networks, Functional Devices can supply your needs with the perfect combinations to provide seamless plug-and-play wireless communication.

This chart will better help determine the proper model numbers of the wireless device that will best fit your application. Choose the separate parts to construct your specific model number and then note the physical configuration below. Devices will always be shipped with the ANTRD5 antenna. Consult the factory if a different antenna is needed. An additional order can be placed for a different antenna.

- Refer to pages 154-155 for client/server radio information.



**RIBWP1LC** (Client) or  
**RIBWP1LS** (Server)

**RIBWLC** (Client) or  
**RIBWLS** (Server)



**Note: Server will initially transmit signal to Client. Client will receive initial signal, and in turn, transmits signal back to Server.**

These devices are designed to transport LonWorks® communication data over short to extended ranges using the 900MHz frequency (902-928). The RIBWP1LC and RIBWP1LS are designed to be plug-and-play, requiring no special programming tools. Using a simple software tool (provided) radios can be addressed to one another in the field. See below for installation instructions and configuration.

**Specifications**

- Frequency:** 902-928 MHz (Direct Sequence Spread Spectrum - DSSS)
- RF Transmission Rate:** 1.536 Mb/s
- Data Throughput:** 935 Kb/s
- Output Power:** +21 dBm (4 Watts EIRP when used with 15 dBi antenna)
- Receive Sensitivity:** -97 dBm at 10e-4 BER (-112 dBm with 15 dBi antenna)
- Radio Link Budget:** 148 dB with 15 dBi antenna
- Range:** 40 Miles LOS with 15 dBi antenna
- Radio Channels:** 12 non-overlapping
- Connector Types:** RPSMA, 2/3 Pin Plug Connector, USB-B
- Power Consumption:** Transmit: 2.4 W, Receive: 1.7 W (100ma @ 24 Vac/dc)
- Voltage:** 12-24 Vac/dc (isolated power supply required)
- Temperature Range:** -20° C to 70° C (-4° F to 158° F)
- Dimensions:** 7.00" x 4.28" x 2.00"
- Approvals:** UL Listed, UL916, C-UL, CE
- Housing Rating:** UL Listed, NEMA 1, C-UL, CE Approved, UL Accepted for Use in Plenum, Also available NEMA 4 / 4X
- Weight:** Approximately 1.015 lbs.
- Certifications:** FCC: R4N-AW900M ; IC: 5303A-AW900M
- Communication Protocol:** LonWorks® FT-10

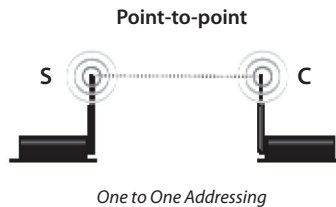
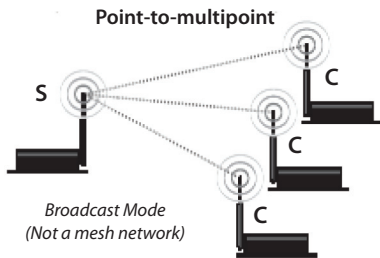
**Installation Instructions:**

1. Connect LonWorks® bus to terminals labeled LON A and LON B.
2. Connect 12-24 Vac/dc power as labeled. **\*\***
3. Digital display sequence should begin, "AIC", "LON", "revision number".
4. RIBWLC / RIBWLS will begin searching for paired unit(s). *Note: For radios configured as a server, the digital display channel numbers will descend from 12 to 0, and reverse for client radios.*
5. Perform a local download on the remote LonWorks® site.
6. Verify the RF network communication with the Channel, Link Quality "LQ", RFTX, RFRX, Bridge, and Lon LEDs.
7. Lastly, perform a network commission at the base station site to establish the link with the remote location.

**\*\* WARNING: If using AC power option, an isolation transformer must be used! Ensure neither of the two secondaries are bonded.**

*Note: As with any RF network, plan ahead for proper antenna selection and placement. It is the intention of Functional Devices, Inc. to provide a reliable wireless communication device for existing LonWorks® networks. However, in some conditions, reliability is determined largely by correct antenna placement, which is the responsibility of the installer. This product is NOT TO BE USED in situations where life safety issues may arise. Functional Devices, Inc. makes no claims, expressed or implied, of the products usefulness with regard to specific applications. Determination of the product's suitability for a particular application is the sole responsibility of the purchasing parties. In any installation, ensure the devices are properly protected from the elements by installing in an appropriate enclosure.*

**Possible Network Illustrations:**

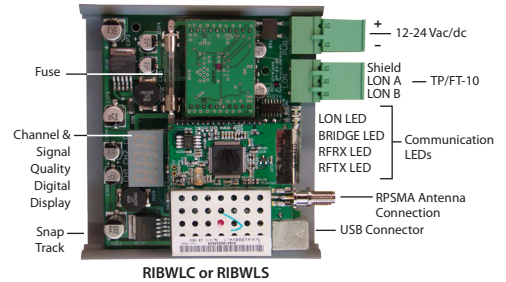
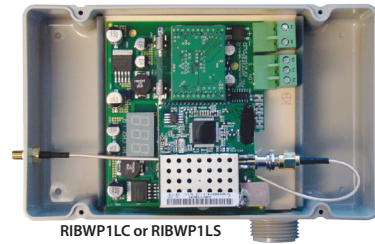


• For extending ethernet networks wirelessly, consult factory.

FCC: KQL-AC4490  
IC: 2268C44901000

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  
(2) This device must accept any interference received, including interference that may cause undesired operation.

**AIC Wireless® LonWorks® Server and Client Transceivers**



**Note:**

• Client can be combined with LonWorks® I/O Boards, Enclosures, and Transformers for complete "Wireless Solution" Package.

**RIBWP1BC** (Client) or  
**RIBWP1BS** (Server)

**RIBWBC** (Client) or  
**RIBWBS** (Server)



**Note: Server will initially transmit signal to Client. Client will receive initial signal, and in turn, transmits signal back to Server.**

These devices are designed to transport BACnet® MSTP communication data over short to extended ranges using the 900 MHz frequency (902-928). The RIBWP1BC and RIBWP1BS are designed to be plug-and-play, requiring no special programming tools. Using a simple software tool (provided) radios can be addressed to one another in the field. See below for installation instructions and configuration.

**Specifications**

- Frequency:** 902-928 MHz (Direct Sequence Spread Spectrum - DSSS)
- RF Transmission Rate:** 1.536 Mb/s
- Data Throughput:** 935 Kb/s
- Output Power:** +21 dBm (4 Watts EIRP when used with 15 dBi antenna)
- Receive Sensitivity:** -97 dBm at 10e-4 BER (-112 dBm with 15 dBi antenna)
- Radio Link Budget:** 148 dB with 15 dBi antenna
- Range:** 40 Miles LOS with 15 dBi antenna
- Radio Channels:** 12 non-overlapping
- Connector Types:** RPSMA, 2/3 Pin Plug Connector, USB-B
- Power Consumption:** Transmit: 2.4 W, Receive: 1.7 W (100ma @ 24 Vac/dc)
- Voltage:** 12-24 Vac/dc (isolated power supply required)
- Temperature Range:** -20° C to 70° C (-4° F to 158° F)
- Dimensions:** 7.00" x 4.28" x 2.00"
- Approvals:** UL Listed, UL916, C-UL, CE
- Housing Rating:** UL Listed, NEMA 1, C-UL, CE Approved, UL Accepted for Use in Plenum, Also available NEMA 4 / 4X
- Weight:** Approximately 1.015 lbs.
- Certifications:** FCC: R4N-AW900M ; IC: 5303A-AW900M
- Communication Protocol:** BACnet® MSTP

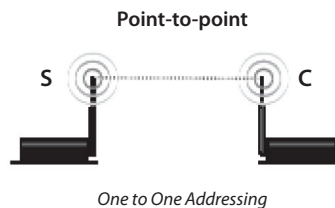
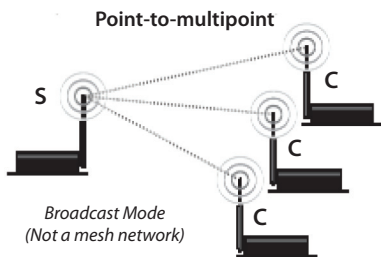
**Installation Instructions:**

1. Connect BACnet® bus to terminals labeled A +, B - and S (Shield).
2. Connect 12-24 Vac/dc power as labeled. **\*\***
3. Digital display sequence should begin, "AIC", "BAC", "revision number".
4. RIBWBC / RIBWBS will begin searching for paired unit(s). *Note: For radios configured as a server, the digital display channel numbers will descend from 12 to 0, and reverse for client radios.*
5. Perform a local download on the remote BACnet® site.
6. Verify the RF network communication with the Channel, Link Quality "LQ", RFTX, RFRX, SER TX, and SER RX LEDs.
7. Lastly, perform a network commission at the base station site to establish the link with the remote location.

**\*\* WARNING: If using AC power option, an isolation transformer must be used! Ensure neither of the two secondaries are bonded.**

*Note: As with any RF network, plan ahead for proper antenna selection and placement. It is the intention of Functional Devices, Inc. to provide a reliable wireless communication device for existing BACnet® networks. However, in some conditions, reliability is determined largely by correct antenna placement, which is the responsibility of the installer. This product is NOT TO BE USED in situations where life safety issues may arise. Functional Devices, Inc. makes no claims, expressed or implied, of the products usefulness with regard to specific applications. Determination of the product's suitability for a particular application is the sole responsibility of the purchasing parties. In any installation, ensure the devices are properly protected from the elements by installing in an appropriate enclosure.*

**Possible Network Illustrations:**

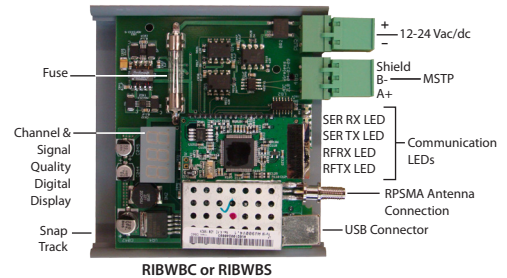
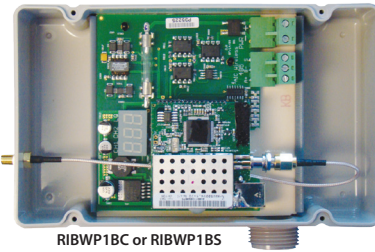


• For extending ethernet networks wirelessly, consult factory.

FCC: R4N-AW900M  
IC: 5303A-AW900M

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  
(2) This device must accept any interference received, including interference that may cause undesired operation.

**AIC Wireless® BACnet® Server and Client Transceivers**



**Note:**  
• Client can be combined with BACnet® I/O Boards, Enclosures, and Transformers for complete "Wireless Solution" Package.

## Device should be preprogrammed from factory. If not, refer to information below.

### Step 1: Loading Device Drivers

1. If drivers were obtained in a zip format, unzip them to a place that you can find on your computer such as Desktop or My Documents.
2. Connect the WxT900 device via USB-B cable to your computer. Power should not be applied at this time.
3. The Found New Hardware wizard should pop up and ask how you would like to install the drivers.
4. Select the option that allows you to search for the drivers yourself and select Next.
5. Using the Browse button, find the unzipped folder that contains the USB drivers and highlight it. The folder name convention should follow the format WxT\_USB\_LINK. Click Next.
6. You will get a pop up window stating that the drivers are not signed by Windows. Select Continue Anyway.
7. Windows will grab and install the correct drivers from the folder.
8. **DO NOT UNPLUG THE USB CABLE YET. This installation process (STEP 3-7) will be prompted TWICE AND THE PREVIOUS STEPS SHOULD BE COMPLETED AGAIN.**
9. The drivers should now be installed.

### Step 2: Loading Configuration Files

1. With the device connected via USB, adjust COM Port Settings to "115200 baud, 8 data bits, no parity, 1 stop bit, no flow control" in Device Manager (Found under Control Panel>System>Hardware Tab>Device Manager button>Port (COM & LPT)>Wxt\_USB\_LINK>Properties).
2. With **power disconnected** from the radio and **USB connected**, open Hyper Terminal and create a new connection by typing a connection name in the pop up box on the screen and hit Enter.
3. Select the COM port that the device is using along with the serial settings used for programming; 115200, 8 data bits, no parity, 1 stop bit, no flow control. Hit Enter.
4. Make sure you have a connection established by verifying the timer is counting at the bottom left corner of the window.
5. If not, click the phone with the receiver-off-the-hook icon at the top of the window.
6. Plug power into the radio.
7. A "u" (u Dieresis) should appear.
8. The text menu will pop up displaying the firmware version and a selection of <u>, <d>, or <h>
9. Type "u" and the ENTER key for upload. **NOTE:** the u will **NOT** display when typed.
10. The § "Section Symbol" will appear on the next line.
11. Select "Transfer" from the menu bar at the top of the window.
12. Select "Send File" from the drop down menu.
13. A browse window will popup and you need to select "X Modem" from the "Protocol" Dropdown menu.
14. Browse to the configuration file that you want and hit "Send".
15. When complete, hit "d" ENTER to display back to you the file you just uploaded. **NOTE:** the "d" will **NOT** display when typed.
16. Unplug USB and cycle power. The radio is now using new settings.

## LonWorks®

### Step 3: Configuration File Parameters

1. **Network:** – 6 digit number. Must be the same for all devices on the wireless network.
2. **Key:** – 32 digit number. Encryption key used by all devices on a network to securely transmit data. Must be the same for all devices on the wireless network.
3. **ID:** – Address assigned to Client radios. There may only be one Client radio per network with the same ID. This number is used by Server radios to set the maximum number of Clients on the network. On Server radios, this number should be set to the maximum number of Clients that are currently on the network. Do not set this number erroneously high. Site Survey mode may be entered to evaluate a new installation by setting the ID of both Server and Client to 63. This mode allows two radios to link and send test packets. A link quality on the devices front panel will allow the installer to make an accurate determination of the best antenna type and location.
4. **Bit Delay:** – number of bits to wait for a pad byte. Pad bytes are not used by all brands. Typically, this value will never change.
5. **MTU:** – (Maximum Transmission Units) – the number of bytes allowed to accumulate in the radios buffer before the bytes are sent. This number may be adjusted lower improve response time or higher to improve overall efficiency. MTU will vary according to baud rate. This is because different baud rates require different amounts of time to send packets to the radios buffer thereby changing the available amount of time for RF transmission.
6. **BR:** – (Baud Rate) – Serial communication speed: 6=9600, 5=19200, 4=38400, 3=57600, 2=76800, 1=115200.
7. **CH:** – (Channel) – Typically left at 00(Auto). Available channels are 01 to 12. All radios to stay on a set channel must have the same channel number. There is no intelligent channel swapping in this mode. If interference occurs data will be lost.
8. **MODE:** – Used to assign a radio to a Server or Client. 1=Server, 3=Client
9. **BT:** – (Bit Time) – used to add 95ns padding to bytes on the serial output. This number should be set to 01 unless otherwise instructed.
10. **SB:** – (Stop-Bits) – used to add stop-bit padding to bytes on the serial output. This number should be set to 1 unless otherwise instructed.
11. **TN:** – (Transmit Number) – set to 1 unless otherwise instructed.

### Example Configuration Text File

```
Network: 123456
Key: 1234 5678 9098 7654 3212 3456 7890 9876
ID: 01
Bit Delay: 07
MTU: 046
BR: 2
CH: 00
MODE: 3
BT: 01
SB: 1
TN: 1
```

## BACnet®

### Step 3: Configuration File Parameters

1. **Network:** – 6 digit number. Must be the same for all devices on the wireless network.
2. **Key:** – 32 digit number. Encryption key used by all devices on a network to securely transmit data. Must be the same for all devices on the wireless network.
3. **ID:** – Address assigned to Client radios. There may only be one Client radio per network with the same ID. This number is used by Server radios to set the maximum number of Clients on the network. On Server radios, this number should be set to the maximum number of Clients that are currently on the network. Do not set this number erroneously high. Site Survey mode may be entered to evaluate a new installation by setting the ID of both Server and Client to 63. This mode allows two radios to link and send test packets. A link quality on the devices front panel will allow the installer to make an accurate determination of the best antenna type and location.
4. **Bit Delay:** – number of bits to wait for a pad byte. Pad bytes are not used by all brands. Typically, this value will never change.
5. **MTU:** – (Maximum Transmission Units) – the number of bytes allowed to accumulate in the radios buffer before the bytes are sent. This number may be adjusted lower improve response time or higher to improve overall efficiency. MTU will vary according to baud rate. This is because different baud rates require different amounts of time to send packets to the radios buffer thereby changing the available amount of time for RF transmission.
6. **KO:** – (Knock Out) – buffer clearing mechanism expressed in bit times. If the radio loses power or is interrupted in the middle of a packet, the incomplete packet will only remain in the buffer for this amount of bit time. This number is typically left unchanged
7. **BR:** – (Baud Rate) – Serial communication speed: 6=9600, 5=19200, 4=38400, 3=57600, 2=76800, 1=115200.
8. **CH:** – (Channel) – Typically left at 00(Auto). Available channels are 01 to 12. All radios to stay on a set channel must have the same channel number. There is no intelligent channel swapping in this mode. If interference occurs data will be lost.
9. **MODE:** – Used to assign a radio to a Server or Client. 1=Server, 3=Client
10. **BT:** – (Bit Time) – used to add 95ns padding to bytes on the serial output. This number should be set to 01 unless otherwise instructed.
11. **SB:** – (Stop-Bits) – used to add stop-bit padding to bytes on the serial output. This number should be set to 1 unless otherwise instructed.
12. **TN:** – (Transmit Number) – set to 1 unless otherwise instructed.

### Example Configuration Text File

```
Network: 123456
Key: 1234 5678 9098 7654 3212 3456 7890 9876
ID: 01
Bit Delay: 07
MTU: 046
KO: 20
BR: 2
CH: 00
MODE: 3
BT: 01
SB: 1
TN: 1
```