

# Model 2241 Series Wireless Transmitter Addendum

to Model 2241 Series manuals

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## Overview

The Model 2241 series wireless transmitter modification option (Part #: 4408-302) provides a method whereby instruments in this series from Ludlum Measurements may wirelessly connect and run the Model 2241 PC Calibrator or PC Logger software. In addition, parameters may continue to be programmed either manually, or by computer through the RS-232 port. Free PC Data Logging Software and a Data Logging Data Sheet are available online.

The wireless option is compatible with any of Ludlum Measurements Model 2241 series of ratemeter/scaler instruments.

Instruments already in service may be upgraded with wireless function. Please contact your sales representative and ask for Part Number 4408-302-R.

The default pin code for pairing is: **1234**

## Firmware

While all firmware versions will work with the wireless modification, the following firmware versions have been verified to work with RadResponder, currently for the Model 2241-3 only:

Firmware Version	Description
<b>40810N12</b>	Standard firmware with binary output
<b>40810N21</b>	ASCII firmware with 2 second output.
<b>40810N43</b>	Binary output firmware with Series Constant Correction. Output same as 40810N12

## Status LEDs

The wireless transmitter adapter adds several LED indicators. The green LED shows the wireless transmitter connection status and the adapter's operational mode:

- When booting, the LED blinks two times per second.
- In configuration mode, it blinks ten times per second.

- When the module is in discoverable or idle mode, it blinks one time per second.
- When the module is connected, the green LED is on solid.

The yellow LED blinks when data is sent or received on the serial interface. This blinking does not indicate that data was sent over the wireless connection. If the yellow LED is not blinking when your device sends data to the serial port, the connection or flow control may be set incorrectly.

Some versions of the modification may have a red LED. This LED blinks when data is received over the RF link in low-speed data mode.

## Operating Modes

The wireless transmitter adapter has several operating modes, which you set using the SM command in command mode:

- Slave (SM,1)—Default mode, whereby other wireless devices can discover and connect to the adapter.
- Master (SM,1)—In this low-speed connection mode, the adapter makes connections when a connect command (C), is received. This command can also contain the wireless transmitter address of the remote device. If a device is not specified, the adapter uses the stored remote address. The connection can be broken if the special break character or string is sent (use the SO command to set the break character).
- Trigger (SM,2)—In this low-speed connection mode, the adapter makes connections automatically when a character is received on the serial port. The connection continues as long as characters are received on either end. The adapter has a configurable timeout (which you set using the ST command) that disconnects the adapter after the specified number of seconds (1 to 254) of inactivity.
- Auto Master (SM,3)—In this mode, the adapter makes connections automatically on power-up, and re-connects when the connection is lost. You can also enable this mode using switch 2. This mode is a high-speed connection mode, and cannot be broken by software break characters.

**NOTE:** In all master modes, the device cannot be discovered or configured remotely over the wireless connection.

## Configuration

The wireless transmitter adapter operates in two modes: data mode (default) and command mode. While in data mode, the module is essentially a data pipe. When the module receives data, it strips the wireless transmitter headers and trailers and passes the user data to the UART. When data is written to the UART, the module constructs the wireless transmitter packet and sends it out over the wireless connection. Thus, the entire process of sending/receiving data to the host is transparent to the end microprocessor.

The default configuration for the wireless transmitter adapter is:

- Slave mode
- Pin code 1234
- Serial port 9,600 Kbps baud rate, 8 bits, no parity, 1 stop bit

- Serial port flow control enabled
- Low power mode off

You configure the adapter by putting it into command mode and sending ASCII commands over a serial port or the wireless link. Once you change the configuration parameters, they persist until changed or you perform a factory reset. There are two ways to configure the wireless transmitter module:

- Local configuration using your computer’s serial port
- Via your wireless transmitter connection

You need a terminal emulator to complete the setup.

**NOTE:** LMI suggests using either the TeraTerm (Windows OS) or CoolTerm (Mac OS-X) terminal emulator program.

### Local Configuration Using a Serial Port

Connect the wireless transmitter adapter to your computer’s serial port. (The RN-240M may require a null-modem cable, i.e., with DB9 pins 2 and 3 swapped; the RN-240F requires a straight cable). If your computer does not have a serial port, you can use a USB-to-serial cable such as the RN-USB-SERIAL to connect the adapter to your computer.

With the wireless transmitter adapter connected and powered on, run a terminal emulator and open the COM port to which the serial interface or serial USB is connected.

The terminal emulator’s communication settings should be the default serial port settings of the adapter:

9,600 Kbps, 8 bits, no parity, 1 stop bit.

### Remote Configuration using a Wireless Transmitter

Before performing remote configuration using a wireless transmitter, you must first pair the wireless-capable device with your computer. For PCs running Windows, click **Bluetooth devices** in the system tray at the bottom right of your computer screen. Select **Add a Bluetooth device** and follow the on-screen instructions. For Mac OS-X, click the wireless transmitter icon, select **Set up Bluetooth device**, and follow the on-screen instructions.

**NOTE:** You can only configure remotely if the boot-up configuration timer (default 60 seconds) has not expired. This timer is set to 0 (remote configuration disabled) for master mode and auto-connect slave mode so that data can immediately flow between 2 adapters for cable replacement.

### Enter Command Mode

Launch a terminal emulator and make sure that the adapter’s default settings are selected. Open the serial port settings dialog box by choosing Setup > Serial Port. The settings should be:

Setting	Value
<b>Port</b>	Bluetooth COM port
<b>Baud rate</b>	9,600
<b>Data</b>	8 bit
<b>Parity</b>	None

<b>Stop</b>	1 stop
<b>Flow control</b>	hardware

Type **\$\$\$** into the terminal emulator. It should return the string **CMD**, which indicates that your connection and terminal settings are correct.

When you enter a valid command, the adapter returns **AOK**. It returns **ERR** for an invalid command and **?** for unrecognized commands. Type **h** <cr> to see a list of commands, and **d** <cr> to view a summary of the adapter's current settings. To return to data mode, type **---** <cr> or reset the device and re-connect.

## Command Summary

Once you have paired successfully and connected via a terminal program, the following commands provide for basic setup.

**Note:** Please use all caps for commands. Some of them are case sensitive.

### **\$\$\$<Ret>**

This command sequence sets the device in the Command Mode. You will notice a faster blink rate on the green or blue Status LED.

### **SU,9600<Ret>**

This command sets the UART Baud rate. 9600 is the default baud rate for the Model 2241. Make sure that your Model 2241 is set to 9600 (Switch position "F"), or if desired, use any of the other settings you prefer.

### **SN,123456<Ret>**

This command sets a "friendly" name for the wireless device to report back. We normally set the name to the LMI Serial number of the instrument it will be used with.

### **D<Ret>**

This provides the settings of the device, including the pending settings that are in cue. You may want to print the settings to provide a hard copy to be placed in the files for the customer.

### **R,1<Ret>**

This reboots the unit and causes it to update the settings that were selected above. It also causes the device to disconnect from Command mode. If you need to check or change anything, you will need to start over with step 1 above. When attempting to reconnect and use command mode, be sure you use the current most baud rate setting (9600 for Model 2241, 19,200 for Model 4404-16).

**Note:** Remember to change switch setting to "D" position to start the wireless transmitted radio and use the data output dump mode on your Model 2241.

**Note:** If you plug a valid RS-232 device to the 9-pin port, the wireless radio will be powered OFF.

**Note:** Remember to change your baud rate to the new value (9600) if you are going to connect using the serial port! The baud rate setting is not applicable to the rF side of the module.

## Comments

The MicroChip RN-41 and -42 modules used on the -354 and -683 boards are identical functionally except the -41 has a surface mounted antenna for improved range.

The first few boards built in 2014 had the short range unit (RN-42) installed and used green Status LED indicators. The improved range units (RN-41) were built having blue Status LEDs.

Refer to the Command Reference manual (bluetooth\_cr\_UG-v1.0r.pdf) for detailed instructions on the use of these modules. The old wireless transmitter to RS-232 module (RN-240M) used similar modules. Its manual may also be used, as the commands are the same. The LMI RS-232 to wireless transmitter module will replace the RN-240M and will use the same commands as listed in the text above.

If you have tried all baud rate settings and can't gain access to the command mode, there is a way to force 9600 baud by shorting across R10 (9600 Baud) on the back of the wireless transmitter board. Short out R10 and then power the instrument ON. 9600 baud will be in effect.

## Making a Wireless Transmitter Connection

By default, the wireless transmitter adapter acts as a slave, and the PC is the master. You connect to the adapter using your computer's wireless transmitter device manager, which varies depending on the operating system. Regardless of the operating system, the process is the same: discovery, pairing, and connecting.

### Discovery

When you turn on the wireless transmitter adapter, the green LED should blink and the adapter should be discoverable. Open your PC's wireless transmitter device manager and choose to add a new device. The wireless transmitter device manager's icon is located in the bottom right corner of your screen in the taskbar for Windows and in the upper right corner for Mac OS-X. The wireless transmitter device manager displays a list of discoverable wireless devices. The wireless transmitter adapter displays as:

XXXXXX where XXXXXX is the serial number of the Model 2241.

### Pairing

To pair with the adapter, double-click the adapter's name (i.e., XXXXXX) in the list. Choose to enter the device's pairing code and enter the default pin code, **1234**. When the wireless device manager completes pairing, it issues a message that the wireless device is installed on COMX where COMX is unique to your computer. In some cases, the wireless device manager creates two COM ports; in this situation, only use the COM port labeled "outgoing."

### Security Modes

The wireless transmitter adapter supports authentication. If the local or remote wireless device has authentication enabled, a pin code is required the first time a connection is attempted. The pin code is a series of numbers or characters.

**NOTE:** The default pin code for Roving Networks wireless adapters and modules is 1234.

After you enter the pin code, the wireless devices compare them. If they match, a link key is generated and stored. Usually, but not always, the remote device stores the link key. For subsequent connections, the devices compare link keys. If they are correct, you do not need to re-enter the pin code.

If the remote device is a PC or PDA, the user generally is prompted to enter this pin code. To remove the stored link key on the remote device, you typically “unpair” or remove the device from the wireless transmitter manager. You can change the pin code to remove the link key on the wireless transmitter adapter, forcing a new pin code exchange to occur upon subsequent connection attempts.

**NOTE:** Only one master can connect to the wireless transmitter adapter at a time.