

Connecting to a MultiTech[®] Conduit[™] Gateway

RM1xx Series

Application Note

v2.0

INTRODUCTION

The RM1xx series of LoRa/BLE modules adhere to the LoRa standard and are compatible with all LoRa gateways that are also adherent. For this example, we use one gateway, provided by MultiTech, to connect the RM1xx and transmit data over the LoRa protocol.

REQUIREMENTS

To complete this setup, you need the following:

- DVK-RM186 or DVK-RM191 board loaded with latest firmware (available from the Software Downloads tab at <http://www.lairdtech.com/products/rm1xx-lora-modules>)
- MultiTech Conduit LoRa gateway (AEP version with Node-RED software)
- [UwTerminalX](#) – Available from Laird (we recommend v1.03 or later)
- `cmd.loramac.rm1xx.sb` script – Available from the [RM1xx GitHub sample applications page](#)
- `RM1xx-defs.h` (H file) – Specific to each firmware version from the [RM1xx GitHub sample applications page](#)

MULTITECH GATEWAY SETUP

For the purposes of this guide, we assume that you have completed the initial hardware setup of the MultiTech Conduit gateway, the required LoRa mCard and the Ethernet connection as explained by MultiTech in their supporting materials.

When this is complete, you must configure the MultiTech gateway network server as follows:

1. Log in to the LoRa Network Server Configuration panel (**Setup > LoRa network server**).
2. Configure the server by doing the following:
 - Tick **Public**.
 - Set the Network EUI to **0123456789abcdef**.
 - Set the Network Key dropdown to **Key**.
 - Set the Key text field to **0123456789abcdef0123456789abcdef**.

These settings are illustrated in [Figure 1](#). Note that Figure 1 below shows the setup page for the 915MHz radio and so would be only relevant to the RM191 module. For the RM186/868MHz option the setup page is different, mostly relating to the frequency channels configuration. However, for the purpose of this document only the 3 settings above need be applied.

The screenshot displays the MultiConnect® Conduit web interface. The browser address bar shows <https://192.168.1.14/loranetwork.html>. The page title is "MultiConnect® Conduit - Application Execution Platform" with firmware "MTCOT-H5-210A Firmware 1.3.2". The user is logged in as "admin".

Left Menu:

- Home
- Save and Restart
- Setup
 - Network Interfaces
 - WAN
 - DDNS
 - DHCP
 - LoRa Network Server**
 - Time
 - Cellular
 - Firewall
 - Administration
 - Status & Logs
 - Commands
 - Apps
 - Help

LoRa Network Server Configuration (Reset To Default)

LoRa Configuration (Show Advanced Settings)

Enabled	<input checked="" type="checkbox"/>	Mode	NETWORK SERVER
Frequency Band	915	Public	<input checked="" type="checkbox"/>
Channel Plan	US915	Lease Time	60-00-00 dd-hh-mm
Frequency Sub-Band	1	Network ID	EUI
Tx Power (dBm)	26	EUI	0123456789abcdef
Antenna Gain	3	Network Key	Key
Rx 1 DR Offset	0	Key	0123456789abcdef01
Rx 2 Datarate	12	NetID	000000
Address Range Start	00:00:00:01	Duty Cycle Period	60
Address Range End	FF:FF:FF:FE	Adr Step	30
Queue Size	16	Min Datarate	0
		Max Datarate	4

Network Server Logging

Log Destination	SYSLOG
Path	/var/log/
Log Level	MAXIMUM

Network Server Testing

Disable Join Rx1	<input type="checkbox"/>
Disable Join Rx2	<input type="checkbox"/>
Disable Rx1	<input type="checkbox"/>
Disable Rx2	<input type="checkbox"/>
Disable Duty Cycle	<input type="checkbox"/>

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Submit

Figure 1: LoRa Network server settings

With these settings configured, you must next set up the application server using Node-RED. Select **Apps** in the left menu to launch the Node-RED application. Configure Node-RED to send the message payload to the Debug window and also to echo the payload back to the end device. The following image (Figure 2) shows these settings configured in Node-RED.

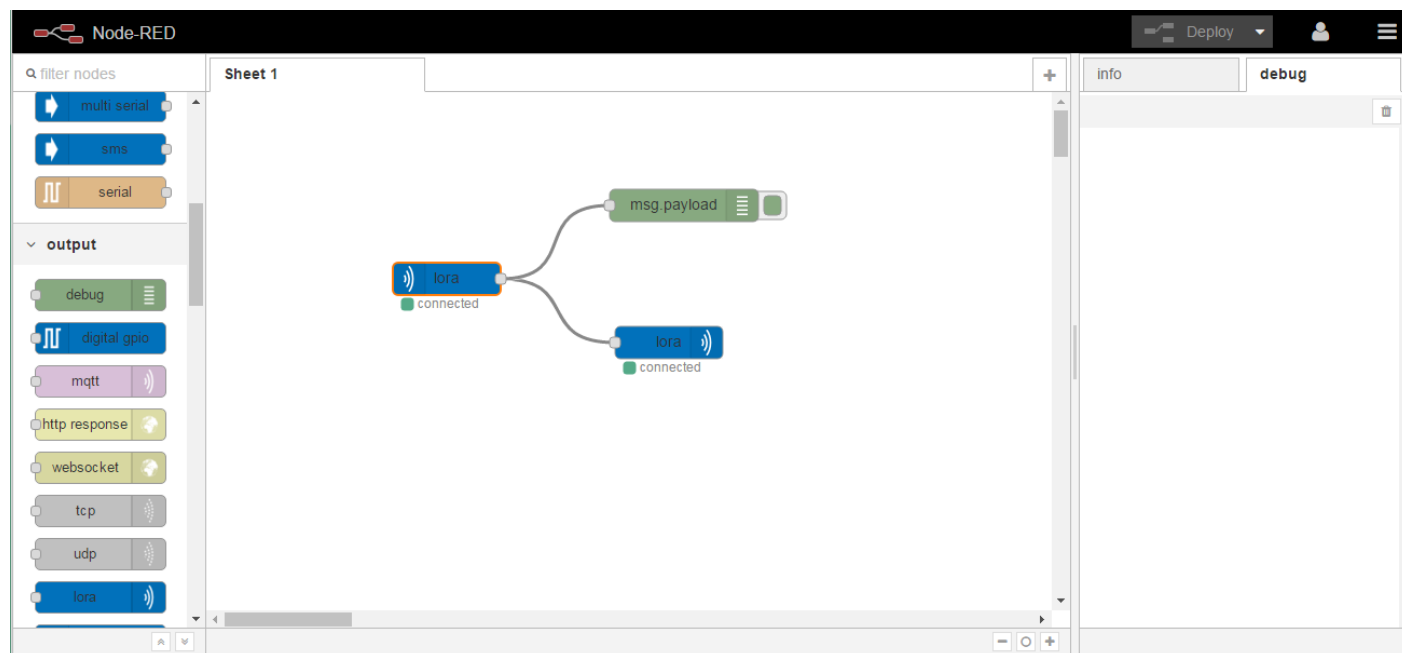


Figure 2: Payload echoed to debug windows and end device in Node-RED

RM1xx SETUP

With the gateway configured, you must configure the RM1xx device to send data to the gateway.

First, set the Network ID, Device EUI, and Network Key. The Network ID and Network Key must match the settings we configured on the gateway in [Multitech Gateway Setup](#).

Notes: Different companies use different names for the various LoRa IDs and Keys. In this instance, Multitech have used the terms Network ID and Network Key for what the LoRaWAN specification refers to as the Application Eui (AppEui) and the Application Key (AppKey) respectively.

To complete this setup, you need the following:

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- [UwTerminalX](#) – Available from Laird (we recommend v1.03 or later)
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The Device EUI will be set by Laird in future revisions of the RM1xx. If you wish to use a custom device EUI, you may set the device EUI in *smartBASIC* with the *at+cfgex* command.

To configure the Network EUI, Device EUI, and Network key (in this order), complete the following:

1. Connect the RM1xx development board to your PC via the included USB micro-cable.
2. Power your development board.
3. Open *UwTerminalX*.
4. From the *UwTerminalX*'s Update tab, click **Check for Updates** to ensure you're using the latest version of *UwTerminalX* with support for the RM1xx series.

5. Click the **Config** tab.
6. In the Device drop-down menu, select either **RM186** or **RM191** based on your setup.
7. Select the correct port to which your development board is connected.
8. Click **OK** to advance to the Terminal tab.
9. Hit **Enter** on your keyboard. If you see the return 00, you are connected successfully.
10. Enter the following commands, one at a time (this method is for an OTAA connection):

at+cfgex 1010 "0123456789abcdef" (For firmware versions prior to 17/18.4.1.0 the Network Id id is 1000, so the command would be at+cfgex 1000 xxxx.)	To set the Network ID
at+cfgex 1011 "00000000000000033" (For firmware versions prior to 17/18.4.1.0 the Device Eui id is 1001, so the command would be at+cfgex 1001 xxxx.)	To set the Device EUI (if you wish to change from the Laird default EUI already set)
at+cfgex 1012 "0123456789abcdef0123456789abcdef" (For firmware versions prior to 17/18.4.1.0 the Network Key id is 1002, so the command would be: at+cfgex 1002 xxxx.)	To set the Network Key This value is now write only and cannot be read back by the user.
atz	To reset the module

Now that the RM1xx module is configured correctly to connect to the MultiTech Conduit gateway, you must compile and run the *cmd.loramac.rm1xx.sb* script, which connects to the gateway and begins sending data packets.

Notes: These steps are for an OTAA (over-the-air activation) connection.

To compile and load the script, complete the following:

1. Right-click in the terminal window and click **XCompile + Load** in the context menu.
2. In the file selector window, select **cmd.loramac.rm1xx.sb** and click **Open**.
3. When the terminal displays 00 the compiler is successfully finished.
4. Type at+dir and press **Enter**. You should see cmd in the file list.
5. To run the GPS script, type cmd and press **Enter**.

The script begins running. To connect to the MultiTech Conduit gateway, type *lora join* and press Enter. The terminal confirms that the RM1xx has joined the network as shown in the following figure (Figure 3).

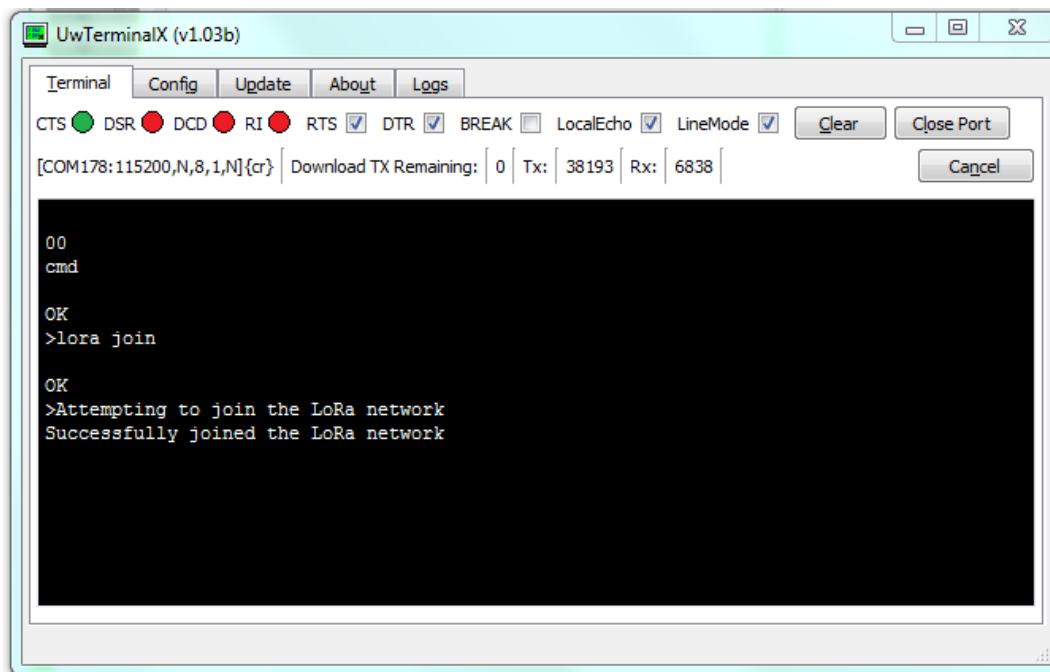


Figure 3: RM1xx successfully joining the network

6. Once the RM1xx is connected to the network, type **lora send** and press enter. This sends a confirmed upstream packet on Port 1. The terminal reflects this as shown in the following image (Figure 4).

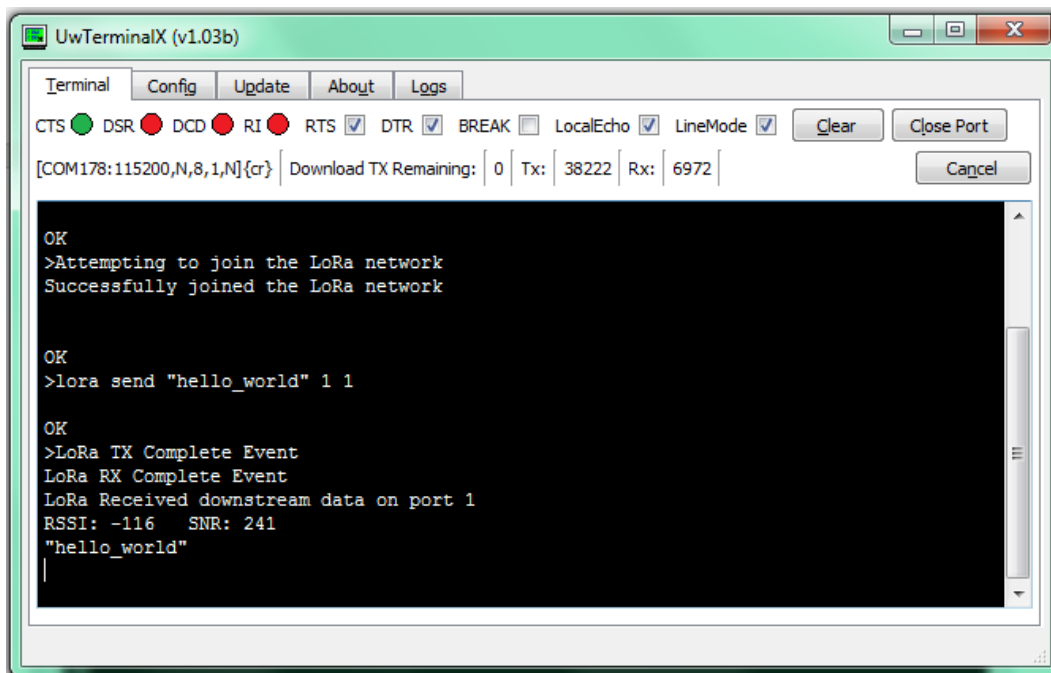


Figure 4: Sending "hello world" packet upstream to gateway

7. To send a Link Check request to the gateway, type **lora check** and press enter. The terminal displays the results as shown in the following figure (Figure 5).

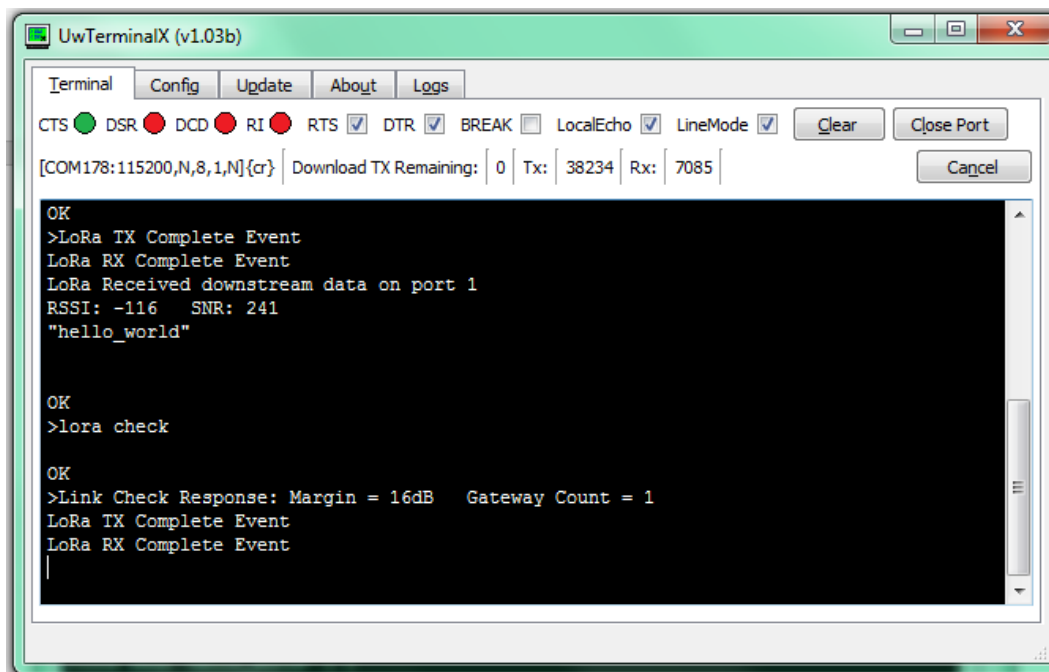


Figure 5: Successful link check request

REFERENCES

- [Lora Alliance - LoRaWAN Specification version V1.0](#)
- User Guide – RM1xx Series *smartBASIC* Extensions (documentation tab of [RM1xx product page](#))
- User Guide - *smartBASIC* Core Functionality (documentation tab of [RM1xx product page](#))
- Application Note – Connecting to Multitech Conduit Gateway (documentation tab of [RM1xx product page](#))
- <http://www.multitech.net/developer/software/lora/conduit-mlinux-lora-communication/conduit-mlinux-lora-use-third-party-devices/>

REVISION HISTORY

Version	Date	Notes	Approver
1.0	20 May 2016	Initial Release	Jonathan Kaye
1.1	26 Sept 2016	Updates to Requirements section	Jonathan Kaye
2.0	17 Nov 2016	Firmware version 17.4.1.0 and 18.4.1.0	Jonathan Kaye

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