

How to Use the ADI RapidNet IP ESL Demonstration Kit

DEMONSTRATION KIT CONTENTS

ESL sensor mote

MCU-Cog ([EV-COG-AD3029LZ](#))

RF-Cog ([EV-COG-ADF7023-9Z](#))

EPD-Gear ([EV-GEAR-EINK1Z](#))

CR2450 batteries to be inserted in the sensor node

ESL manager, ([EV-DNG-RFMOD-9001Z](#) USB dongle)

DOCUMENTS NEEDED

Associated development kit documentation, available from the [RapidNet IP Protocol](#) page

SOFTWARE NEEDED

[ADI RapidNet IP protocol software](#)

[ADI RapidNet IP API guide](#)

[CrossCore Serial Flash Programmer](#)

GENERAL DESCRIPTION

Analog Devices, Inc., provides hardware, software, and associated documents as part of the electronic shelf label (ESL) demonstration kit, which can be ordered from the [RapidNet IP Protocol](#) page.

The ESL demonstration kit contains two main parts:

- The ESL sensor mote, which contains four different parts connected together, as follows:
 - MCU-Cog: [EV-COG-AD3029LZ](#) evaluation board.
 - RF-Cog: [EV-COG-ADF7023-9Z](#) evaluation board.
 - EPD-Gear: [EV-GEAR-EINK1Z](#) evaluation board.
 - CR2532 batteries to be inserted into sensor node.
- ESL Manager ([EV-DNG-RFMOD-9001Z](#) USB dongle).

The ADI RapidNet IP protocol software (binary version) can be downloaded and installed from the [RapidNet IP Protocol](#) page.

The ADI RapidNet IP application programming interface (API) guide, which is part of the software package, describes the usage of the software from point of view of the developer.

The EPD-Gear board is not shown in Figure 1 because it is connected to the secondary side of MCU-Cog board.

All the parts of the sensor nodes are attached in the ESL demonstration kit. The user only needs to insert the batteries.

EVALUATION KIT DIAGRAM

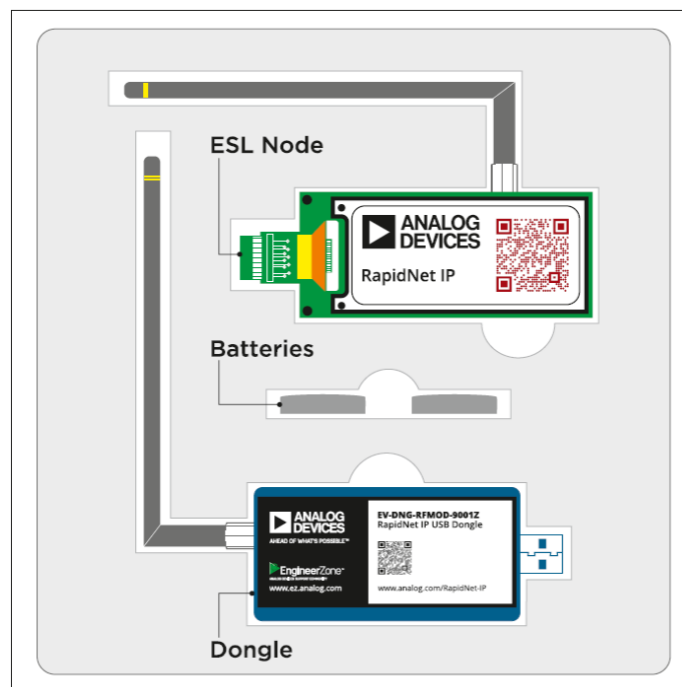


Figure 1.

TABLE OF CONTENTS

Demonstration Kit Contents.....	1	Running the ESL Demonstration	4
Documents Needed.....	1	Manager—Network Setup.....	4
Software Needed	1	Mote—Joining the Network.....	4
General Description	1	ADI RapidNet IP—EPD Image Update	4
Evaluation Kit Diagram	1	Troubleshooting.....	5
Revision History	2	Procedure to Recover Manager	5
Demonstration Setup	3	Procedure to Recover Mote.....	5
Prerequisites	3		
PC Setup—Enabling Queue Services.....	3		

REVISION HISTORY

8/2019—Rev. 0 to Rev. A

Changes to Features Section, Documents Needed Section, Software Needed Section, and General Description Section.....	1
Changes to Manage—Network Setup Section and Mote— Joining the Network Section	4
Changes to ADI RapidNet IP—EPD Image Update Section	5
Added Troubleshooting Section, Procedure to Recover Manager Section, and Procedure to Recover Mote Section	6

1/2019—Revision 0: Initial Version

DEMONSTRATION SETUP

PREREQUISITES

The prerequisites to use the ADI RapidNet IP network protocol are as follows:

- [EV-RAPID-ESL-900Z/EV-RAPID-ESL-900JZ](#). The ESL demonstration kit includes preflashed binaries and configurations.
- PC operating Windows® 10 with at least 4 GB of RAM and 2 GB of free disk space.
- ADI RapidNet IP binary installer. Download and install this software package on the PC.

PC SETUP—ENABLING QUEUE SERVICES

To run the ADI RapidNet IP demonstration application, the windows queue services must be enabled using the following steps (see Figure 2):

1. Open the **Control Panel**.
2. Click **Programs and Features** and then click **Turn Windows features on or off**.
3. Expand the Microsoft® message queue (MSMQ) server and Microsoft message queue (MSMQ) server core.
4. Select the check boxes for the following queuing features to install:
 - MSMQ active directory domain services integration
 - MSMQ HTTP support
 - MSMQ triggers
 - Multicasting support
 - MSMQ DCOM proxy
5. Click **OK**.
6. If you are prompted to restart the computer, click **OK** to complete the installation.
7. Go to **C:\Windows\System32** and check if **mqrt.dll** file exists. Then, check if the queue service is installed successfully to use the ADI RapidNet IP demonstration application.

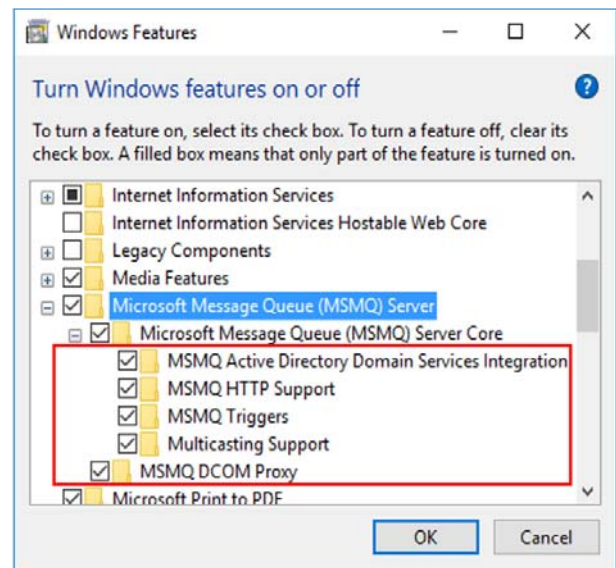


Figure 2. Enabling Queue Services

RUNNING THE ESL DEMONSTRATION MANAGER—NETWORK SETUP

To set up and use the manager, use the following procedure:

1. Connect the dongle to a USB port on the PC. A green LED blinks.
2. Open the **RapidNet-IP-Demo_App** application, which is located at <installation directory>\Analog Devices\RapidNet-IP-Binary-Rel1.x.x\Tools\RapidNet-IP-Demo_App.
3. Click **Refresh Ports** button to view the connected devices. **EV-DNG-RFMOD-9001Z** appears under **Pick device** section of the demonstration application (see Figure 3).

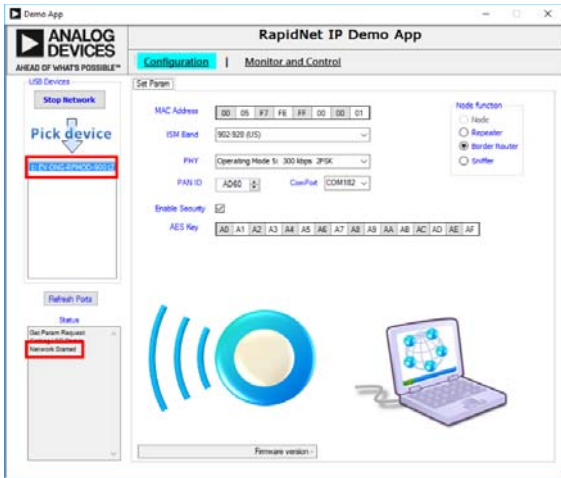


Figure 3. Starting the Network

4. Do not change any configuration. Note that the **Border Router** radio button is selected automatically.
5. Click **Start Network** in the **USB Devices** pane of the **RapidNet IP Demo App**. The **Network Started** message confirms that the ADI RapidNet IP network started successfully and is waiting for the node to join (see Figure 3).

NOTE—JOINING THE NETWORK

Ensure that the Manager is set up and running successfully before using the following procedure to set up the mote:

1. Insert the two batteries in the node as shown in Figure 4.

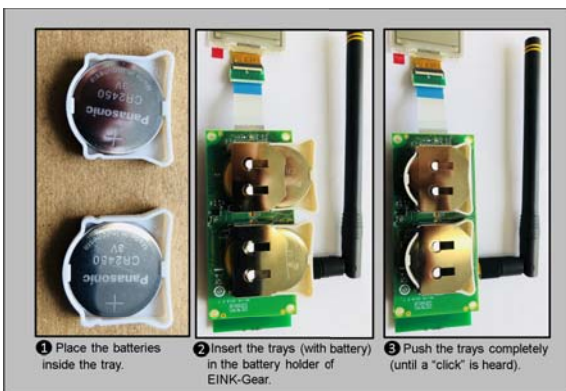


Figure 4. Battery Placement

2. Toggle the power selection switch towards **RF-Cog** as shown in Figure 5. The active LED (yellow) on the cog turns on until the node joins the network. The LED is turned off as soon as the node joins the network.

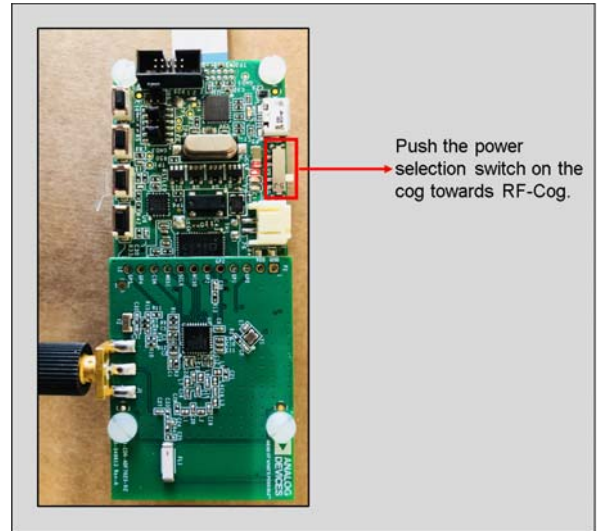


Figure 5. Toggling the Switch

3. Open the demonstration application running on the PC (on which the dongle is connected) and go to **Monitor and Control**. The connected node is visible as shown in Figure 6.



Figure 6. Monitor and Control

ADI RAPIDNET IP—EPD IMAGE UPDATE

Complete the procedure described in the Mote—Joining the Network section before using the following procedure to update the EPD image:

1. Go to the **Monitor and Control > Devices in Network** tab and click the **Upload** button next to the desired node (see Figure 6). Choose the image from one of the sample images present in <installation directory>\Analog Devices\RapidNet-IP-Binary-Rel1.x.x\Tools\RapidNet-IP-Demo_App\Sample Images.
2. Select **2.9" Display** when prompted to select the display resolution and click **OK**.
3. The image on the node updates within the next 15 sec to 20 sec.

TROUBLESHOOTING

If a fault occurs and the device (manager or mote) does not respond, take the following steps recover from the fault state.

Follow the procedures in the Procedure to Recover Manager section or the Procedure to Recover Mote section to resolve any of the following issues:

- The debug window opens and closes.
- An [06:13:28.00436] [RFM] rcvd set params confirmation with status: INVALID_DATA error is seen in the Debug window.
- The mote does not join for a long time.

PROCEDURE TO RECOVER MANAGER

1. Download and install [CrossCore Serial Flash Programmer](#).
2. In the programmer, open the command prompt and navigate to the <installation directory>\Analog Devices\RapidNet-IP-Binary-Rel1.x.x\Tools\RapidNet-IP-Demo_App\config file.
3. In the command prompt window, enter **BootResetSequence.exe COM<port Number>**.
4. Open the [CrossCore Serial Flash Programmer](#).
5. From the **Serial Port** dropdown menu, select the COM port with highest number.
6. From the **Action** dropdown menu, select **Erase**.
7. Click **Start** to erase the flash memory of the MCU on manager.
8. In command prompt, enter the **BootResetSequence.exe COM<port Number>** command shown in Step 4.
9. In the [CrossCore Serial Flash Programmer](#), set the action to **Program**.
10. In the **File to download** pane, click **Browse** and navigate to <installation directory>\RapidNet-IP-Binary-Rel1.x.x\Binaries\ and select **rfmodule.hex**.
11. Click **Start** to program the manager.
12. Unplug the manager, and then plug it into the PC.
13. Start RapidNet IP Demo application.
14. Click **Refresh ports**.
15. Set the parameters, for example, **MAC address**, **ISM Band**, **Data Rate**, and **PAN ID**.
16. Click **Start Network**.

PROCEDURE TO RECOVER MOTE

1. Connect the mote to the PC.
2. Start the [CrossCore Serial Flash Programmer](#).
3. In the programmer software, select the **COM PORT**.
4. Set the action to **Erase**.
5. Perform a boot reset sequence:
 - a. Press and hold BOOT push-button on the PCB.
 - b. Press and release RESET push-button on the PCB.
 - c. Release the BOOT push-button.
6. Click **Start** to erase the MCU on the mote. When the erase is complete, set the action to **Program**.
7. Click **File to download > Browse > <installation directory>\RapidNet-IP-Binary-Rel1.x.x\Binaries**.
8. Select the **esl.hex** file.
9. Perform a boot reset sequence:
 - a. Press and hold BOOT push-button on the PCB.
 - b. Press and release RESET push-button on the PCB.
 - c. Release BOOT push-button.
10. Click **Start** to update the firmware on the mote. When the update is complete, launch the RF module test application located at <installation directory>\RapidNet-IP-Binary-Rel1.x.x\Tools\RFMODULE_TEST_APP.
11. Click **Options** from the menu bar and select **Refresh ports**.
12. In the test application, select the **COM** port that the mote is connected to, set the Baud rate to **115200**, and then click **Connect**.
13. Navigate to the **Script Execution** tab.
14. From the **File** menu button, click **Load Script Command XML**.
15. Navigate to <installation directory>\RapidNet-IP-Binary-Rel1.x.x\Tools\RFMODULE_TEST_APP\6LoWPAN_XML_TestScripts and select the **6LN_XML_Script.xml** file to open the command lists required to configure the node.
16. Change the parameters (**MAC address**, **PAN ID**, **ISM Band**, **Data Rate**) as required. Ensure to click **SAVE** after making each change, or the new configurations do not be reflect in the application.
17. Select the first command and click **Execute All** to send all the listed commands in succession.
18. Ensure that the **0x00 [RFMODULE_SUCCESS]** message appears on the console window. This message means that the node has configured the current command. If this message does not appear, select the command that did not receive the **0x00 [RFMODULE_SUCCESS]** message, and click **Execute**. The user can be required to click **Execute** more than once because the mote can enter sleep mode and not receive the command. Reset the board to wake up the MCU from sleep mode and click **Execute**.
19. Start the network with the **RapidNet IP Demo App**. Do not configure the mote using the demo app. The mote joins when the network starts.

NOTES

**ESD Caution**

ESD (electrostatic discharge) sensitive device. Charged devices and circuit boards can discharge without detection. Although this product features patented or proprietary protection circuitry, damage may occur on devices subjected to high energy ESD. Therefore, proper ESD precautions should be taken to avoid performance degradation or loss of functionality.

Legal Terms and Conditions

By using the evaluation board discussed herein (together with any tools, components documentation or support materials, the "Evaluation Board"), you are agreeing to be bound by the terms and conditions set forth below ("Agreement") unless you have purchased the Evaluation Board, in which case the Analog Devices Standard Terms and Conditions of Sale shall govern. Do not use the Evaluation Board until you have read and agreed to the Agreement. Your use of the Evaluation Board shall signify your acceptance of the Agreement. This Agreement is made by and between you ("Customer") and Analog Devices, Inc. ("ADI"), with its principal place of business at One Technology Way, Norwood, MA 02062, USA. Subject to the terms and conditions of the Agreement, ADI hereby grants to Customer a free, limited, personal, temporary, non-exclusive, non-sublicensable, non-transferable license to use the Evaluation Board FOR EVALUATION PURPOSES ONLY. Customer understands and agrees that the Evaluation Board is provided for the sole and exclusive purpose referenced above, and agrees not to use the Evaluation Board for any other purpose. Furthermore, the license granted is expressly made subject to the following additional limitations: Customer shall not (i) rent, lease, display, sell, transfer, assign, sublicense, or distribute the Evaluation Board; and (ii) permit any Third Party to access the Evaluation Board. As used herein, the term "Third Party" includes any entity other than ADI, Customer, their employees, affiliates and in-house consultants. The Evaluation Board is NOT sold to Customer; all rights not expressly granted herein, including ownership of the Evaluation Board, are reserved by ADI. CONFIDENTIALITY. This Agreement and the Evaluation Board shall all be considered the confidential and proprietary information of ADI. Customer may not disclose or transfer any portion of the Evaluation Board to any other party for any reason. Upon discontinuation of use of the Evaluation Board or termination of this Agreement, Customer agrees to promptly return the Evaluation Board to ADI. ADDITIONAL RESTRICTIONS. Customer may not disassemble, decompile or reverse engineer chips on the Evaluation Board. Customer shall inform ADI of any occurred damages or any modifications or alterations it makes to the Evaluation Board, including but not limited to soldering or any other activity that affects the material content of the Evaluation Board. Modifications to the Evaluation Board must comply with applicable law, including but not limited to the RoHS Directive. TERMINATION. ADI may terminate this Agreement at any time upon giving written notice to Customer. Customer agrees to return to ADI the Evaluation Board at that time. LIMITATION OF LIABILITY. THE EVALUATION BOARD PROVIDED HEREUNDER IS PROVIDED "AS IS" AND ADI MAKES NO WARRANTIES OR REPRESENTATIONS OF ANY KIND WITH RESPECT TO IT. ADI SPECIFICALLY DISCLAIMS ANY REPRESENTATIONS, ENDORSEMENTS, GUARANTEES, OR WARRANTIES, EXPRESS OR IMPLIED, RELATED TO THE EVALUATION BOARD INCLUDING, BUT NOT LIMITED TO, THE IMPLIED WARRANTY OF MERCHANTABILITY, TITLE, FITNESS FOR A PARTICULAR PURPOSE OR NONINFRINGEMENT OF INTELLECTUAL PROPERTY RIGHTS. IN NO EVENT WILL ADI AND ITS LICENSORS BE LIABLE FOR ANY INCIDENTAL, SPECIAL, INDIRECT, OR CONSEQUENTIAL DAMAGES RESULTING FROM CUSTOMER'S POSSESSION OR USE OF THE EVALUATION BOARD, INCLUDING BUT NOT LIMITED TO LOST PROFITS, DELAY COSTS, LABOR COSTS OR LOSS OF GOODWILL. ADI'S TOTAL LIABILITY FROM ANY AND ALL CAUSES SHALL BE LIMITED TO THE AMOUNT OF ONE HUNDRED US DOLLARS (\$100.00). EXPORT. Customer agrees that it will not directly or indirectly export the Evaluation Board to another country, and that it will comply with all applicable United States federal laws and regulations relating to exports. GOVERNING LAW. This Agreement shall be governed by and construed in accordance with the substantive laws of the Commonwealth of Massachusetts (excluding conflict of law rules). Any legal action regarding this Agreement will be heard in the state or federal courts having jurisdiction in Suffolk County, Massachusetts, and Customer hereby submits to the personal jurisdiction and venue of such courts. The United Nations Convention on Contracts for the International Sale of Goods shall not apply to this Agreement and is expressly disclaimed.