

---

## EM34X FULL-FEATURE REMOTE DEVELOPMENT KIT QUICK-START GUIDE

---

### Unpacking the Contents



**ATTENTION:** Observe precautions for handling electrostatic sensitive devices.

Remove components from their packaging:

Silicon Labs EM341 Full-Feature Remote Control (1)	Packet Trace Port Cable (1)
Silicon Labs EM35x breakout board (1)	Packet Trace Header Connector (1)
EM341-MOD-ANT-C (1)	DEI (Data Emulation Interface) Cable (1)
EM341-MOD-RF-C (1)	Ethernet Cable (1)
EM346-MOD-ANT-C (1) (Installed on EM35x breakout board)	UMCC RF Adapter Cable (1)
EM346-MOD-RF-C (1)	USB Cable (1)
Ember® Debug Adapter (ISA3) (1)	USB Power Brick (1)
Telegesis USB Stick	AA Batteries (2)

Software Serial Number

# QSG103

---

The EM34x Full-Feature Remote Development kit provides the hardware and software necessary to demonstrate and develop ZRC (ZigBee Remote Control) applications for use in an RF4CE network. RF4CE networks consist of controller nodes and target nodes. Targets may create their own networks while controllers can only join existing networks using a discovery and pairing process.

## Kit Use Options

The EM34x Full-Feature Remote Development Kit offers you three ways of using and testing the Full-Feature remote in an RF4CE network:

- **Full-Feature Remote Control Demonstration:** An out-of-the-box demonstration of the remote's features that you can run without setting up the development environment. See section 1, Running the Full Feature Remote Control Demonstration, for more information. Only the remote control, batteries, and USB stick are required for the demonstration.
- **Controller and Target Applications with Ember Desktop:** Pre-compiled controller and target applications that you can load onto the remote and development kit hardware. See section 2, Using the Controller and Target Applications with Ember Desktop, to set up your kit and load and run the pre-compiled applications.
- **Custom Application Development:** The ability to customize, compile, load, and run your own controller and target applications, based on Silicon Labs reference designs. See QSG105, *Getting Started with Silicon Labs Wireless Networking Software*, for information on how to configure and compile your own applications. See AN906, *RF4CE ZigBee Remote Control Firmware Guide*, for details on the reference designs. You can find these documents on [www.silabs.com](http://www.silabs.com) by searching for the document number.

## 1 Running the Full Feature Remote Control Demonstration

The EM34x Full Feature Remote Evaluation Kit comes with the tools and software needed to test the remote's functionality out of the box. The Full Feature Remote comes pre-programmed with an example ZigBee Remote Control (ZRC) controller application. The USB stick contains an EM3588 chip preprogrammed with an example ZRC target application designed to show some of the remote's functionality. Demonstration software allows you to see packet transfer data from the controller to the target, button presses, and to hear voice recordings transmitted from the remote.

1. Download the RF4CE\_Demo\_Release.zip file from the [www.silabs.com/zrctraining](http://www.silabs.com/zrctraining) page.
2. Unzip the file to a location of your choice.
3. Install the USB stick driver from the RF4CE\_Demo\_Release\Windows\Driver\EM3588CDCDriverInstaller folder created in step 2.
4. Plug the USB stick into a port on your computer.
5. Insert the batteries into the remote.
6. Launch the RF4CE\_Remote\_Demo application from the RF4CE\_Demo\_Release\Windows directory created in step 2.



7. In the **Select Remote** drop down list, select **[Universal Electronics]**.
8. Select the USB stick's port. It will be assigned to a COM port.
9. Click **[Pair]** to initiate the pairing process.
10. On the remote, press and hold both the **[SET]** (small button on the upper left) and **[STB]** buttons. Release both buttons when the LED on the remote turns red. The LED will remain red while the remote is searching for a target device.
11. Once pairing is completed, the LED on the remote will turn off.
12. To verify the devices paired successfully, press a button on the remote and the corresponding button on the application remote graphic will turn green.

# QSG103

---

## To demonstrate the remote locator functionality:

1. In the demonstration application, click **[Find Me]**. The remote will beep and the lights will flash for a period of time. There may be a delay between clicking **[Find Me]** in the application and the remote acknowledgement due to the polling time of the remote.

## To demonstrate voice functionality:

1. In the demonstration application, make sure the **Audio Data** drop down is set to **[Hardware Codec Settings]**.
2. On the remote, press and hold the **[VOICE]** button and speak. Release the **[VOICE]** button when you are done.  
The remote wireless streams your voice to the USB device, where it is processed and stored as a .WAV file. All .WAV files on the USB device are listed under Audio Data.
3. To hear your recorded audio as it streamed to the target, in the application check **[Play Audio Real Time Over Speakers]**.
4. To play a file, click the file in the list and click **[Play Selected]**.
5. To clear all files from the USB device, click **[Clear Audio]**.

## 2 Using the Controller and Target Applications with Ember Desktop

**Note:** It is recommended you watch the EM34x Development Kit training video at [www.silabs.com/zrctraining](http://www.silabs.com/zrctraining) before proceeding with the setup of the EM34x Development Kit.

### 2.1 Register the Kit on the Support Portal

You must be a registered user of the Silicon Labs Technical Support Portal and the EM34x Full-Feature Remote Development Kit must be registered to obtain support and download the latest Silicon Labs development software and stacks. Go to [www.silabs.com/zrctraining](http://www.silabs.com/zrctraining) and follow the instructions to register your kit.

**Note:** Your software serial number will be in the form xxxx-xxxx-xxxx-xxxx-xxxx and can be found on the first page of this document.

### 2.2 Download and Install the Software

To download the development software, after you have completed registration and are logged into the Silicon Labs Salesforce page click the **Software Releases** tab, select **[latest EmberZNet Software]** from the drop-down menu, and sort by Release Date.

Download and install the latest version of the following tools. The release notes installed with the EmberZNet stack software include more detailed installation instructions and required version numbers.

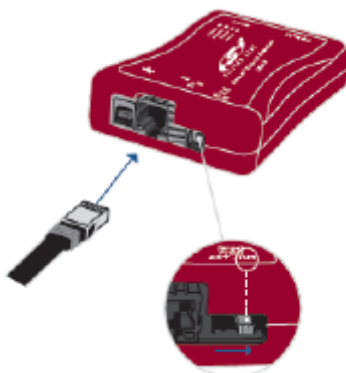
- EmberZNet - version 5.4.3 or greater
- Ember Desktop
- ISA3 Utilities
- IAR Embedded Workbench for ARM (IAR-EWARM), installed through the IAR website

Licenses and support for IAR are provided separately and can be obtained from IAR Systems at <http://www.iar.com>.

An evaluation version of IAR can be downloaded directly at:  
<ftp://files.iar.com/pub/silabs/EWARM-7301.exe>

## 2.3 Connect the Ember® Debug Adapter (ISA3)

1. Insert one end of the Ethernet cable into the Ethernet port of the debug adapter.



2. Confirm the Target Power select switch is set to the INT position.

**Note:** The debug adapter needs power over Ethernet (PoE) or an external source via the USB connector. If your Ethernet connection is not PoE, you must connect both the Ethernet and USB cables to the adapter. To power via USB, you can connect the USB to the PC or use the included USB Power Brick.

3. Insert the other end of the Ethernet cable into an Ethernet port on the network.

**Note:** If connecting directly to a PC, you must set a static IP address. See 2.4. Configure Static IP Addresses (optional). It is recommended that you connect the debug adapter to a DHCP port to simplify setup and development.

4. Insert one end of the Packet Trace Port cable into the debug adapter's Packet Trace Port.
5. Insert one end of the DEI (data emulation interface) cable into the debug adapter's DEI port.



## 2.4 Configure Static IP Addresses (optional)

By default, the debug adapters are configured to get IP addresses using DHCP. If you are unable to use DHCP, configure the adapter as follows:

1. Disconnect the Ethernet connection from the debug adapter.
2. Connect one end of the USB cable to the adapter.
3. Connect other end of the USB cable to the PC.
4. Run `em3xx_isa.exe` in a command window with these parameters to configure static IP settings.

```
em3xx_isa.exe --admin "ip static IPADDR NETMASK GATEWAY"
```

Replace IPADDR, NETMASK, and GATEWAY with your desired settings.

Example: The following command line changes settings to a static IP address of 192.168.1.100 with a netmask of 255.255.255.0 and gateway of 192.168.1.1

```
em3xx_isa --admin "ip static 192.168.1.100 255.255.255.0 192.168.1.1"
```

**Result:** Success:IP:after reboot Static 192.168.100 255.255.255.0 192.168.1.1

5. Run em3xx\_isa.exe one more time with these parameters to disable DHCP:

```
em3xx_isa.exe --admin "ip dhcp off"
```

**Result:** Success:IP: (after reboot) DHCP off

6. Reset the adapter after this configuration change either by power-cycling the device or with the reset command.

## 2.5 Run the Full-Feature Remote Control Sample Applications

Pre-compiled sample applications for both the remote control (ZRC Controller) and the EM35x breakout board (ZRC Target) are supplied. This section describes how to load the sample applications onto the controller and target devices, and how to observe communications between the devices. The sample applications demonstrate basic RF4CE network and ZRC application functionality. The remote application acts as a generic remote control while the EM35x breakout board acts as a target device. Both devices utilize the ZRC Profile plugin to provide core application-level functionality and the GDP and ZRC plugins to provide ZRC2.0 specific behavior.

The target device will automatically start the network. The controller device is responsible for initiating pairing to an existing network. The controller application will disable its receiver automatically to conserve power. This is representative of a sleepy device that is generally a transmit-only device that acts when directed by the user (i.e., a button press). Pressing a button on the controller will result in a command being sent to the target device. The target device will receive the command and send an acknowledgment back to the controller.

Applications are loaded onto their devices through Ember Desktop.

1. Launch Ember Desktop Software.  
Start>All Programs>Ember>Ember Desktop>Ember Desktop
2. Enter the Ember ZigBee support portal username obtained from Silicon Labs support and click **[Save username]** and **[Continue]**. If you don't have a username, click **[Continue]** without registration. Once you have a user name, you can register with Help>Register. If prompted to start the First-Time Setup Wizard, click **[Continue to Ember Desktop]**.

### 2.5.1 Program the remote control with the full-feature controller application

1. Remove the battery cover and install the batteries in the remote control.
2. Change the debug adapter's Target Power select switch to the EXT position.
3. Insert the Packet Trace Port cable from the debug adapter into the packet trace port on the remote control.
4. Right-click on the **[EM-ISA3-00 adapter]** shown in the Adapters window and select **[Connect]**.
5. Right-click on the **[EM-ISA3-00 adapter]** and select **[Upload application]**.
6. Click on the folder to browse for the application.
7. Browse to **<znet-install-directory>\app\rf4ce\sample-app\full-featured-controller\**; select **[full-featured-controller.s37]**. Note: **<znet-install-directory>** default location is C:\Users\[user name]\Ember\EmberZNET5.4.3-GA
8. Click **[Bootloader]**; browse to **<znet-install-directory>\tool\bootloader-em341\app-bootloader\**; select **[app-bootloader.s37]**.
9. Click the **[Erase chip]** option and click **[OK]**.

10. Wait until application upload is complete, then click **[OK]**.
11. Disconnect the Packet Trace Port cable from the remote control and replace the battery cover.

### 2.5.2 Program the EM35x breakout board with the target-zrc20 application

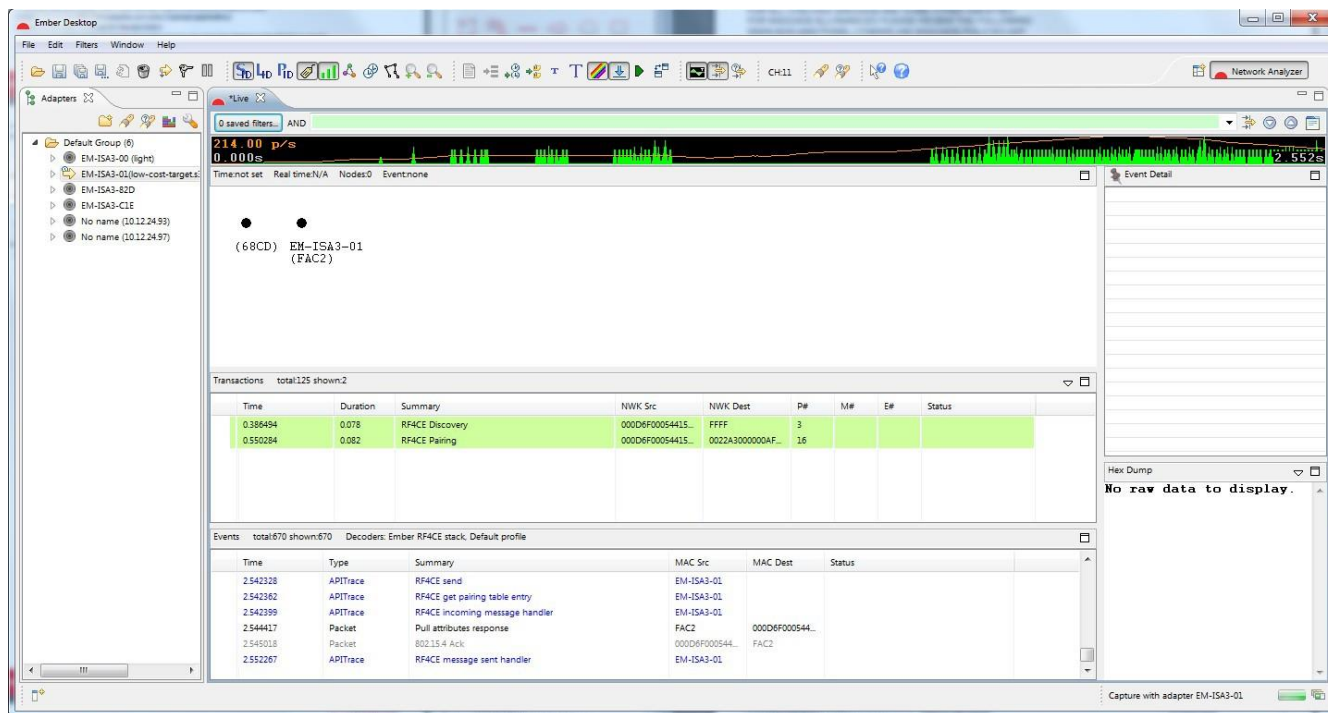
1. Make sure the EM346-MOD-ANT-C module is plugged into the EM35x breakout board.
2. Change the debug adapter's Target Power select switch to the INT position.

**Note:** If providing USB power from a PC/Laptop USB port, it may not provide enough current to power both the adapter and the EM35x breakout board. Power the adapter through the power brick instead.

3. Connect both the Packet Trace Port cable and DEI cable to the EM35x breakout board.
4. Right-click on the **[EM-ISA3-00 adapter]** and select **[Upload application]**.
5. Click on the folder to browse for the application.
6. Browse to `<znet-install-directory>\app\rf4ce\sample-app\full-featured-target\`; select **[full-featured-target.s37]**.
7. Click **[Bootloader]**; browse to `<znet-install-directory>\tool\bootloader-em346\app-bootloader\`; select **[app-bootloader.s37]**.
8. Click the **[Erase chip]** option and click **[OK]**.
9. Wait until application upload is complete, then click **[OK]**.

### 2.5.3 View capture activity

1. Set up the Capture session to decode ZRC packets.
  - a. Select **[File>Preferences]** and then select the **>** next to **[Network Analyzer]** to expand the menu.
  - b. Select the **>** next to **[Decoding]**.
  - c. Select the option **[Stack Versions]**.
  - d. Select **[Ember RF4CE stack]** and click **[Apply]** and **[OK]**.
2. To start the capture session, right click the **[EM-ISA3-00 adapter]** and select **[Start capture]**.
3. Pair the devices.
  - a. Press and hold down both the **[SET]** and **[STB]** buttons on the remote. If a Packet Trace Port cable is attached to the remote, the **[SET]** button cannot be used; the **[SETUP]** button must be used instead. The LED should turn red while the remote is searching for a target device. Release both buttons.
  - b. Press **[Button1]** on the EM35x breakout board to accept the pairing. An LED on the breakout board turns on and the breakout board beeps once.
  - c. Once pairing is completed, the LEDs on the remote and breakout board turn off. The breakout board beeps twice in an ascending pattern. If pairing has failed, it beeps twice in a descending pattern.
4. View capture activity. Press buttons on the remote to see the packet information sent over the air with the Ack from the breakout board.



### 3 For More Information

To better understand Ember Desktop and the network capture activity, refer to [www.silabs.com/zrcrtraining](http://www.silabs.com/zrcrtraining). For more information on the development hardware, refer to UG113, *EM34x Development Kit User's Guide*. It and other useful documents are installed with the stack software. You can also use the Silicon Labs Technical Support Portal at [www.silabs.com/support](http://www.silabs.com/support).



## CONTACT INFORMATION

### Silicon Laboratories Inc.

400 West Cesar Chavez

Austin, TX 78701

Tel: 1+(512) 416-8500

Fax: 1+(512) 416-9669

Toll Free: 1+(877) 444-3032

For additional information please visit the Silicon Labs Technical Support page: <http://www.silabs.com/support>

### Patent Notice

Silicon Labs invests in research and development to help our customers differentiate in the market with innovative low-power, small size, analog-intensive mixed-signal solutions. Silicon Labs' extensive patent portfolio is a testament to our unique approach and world-class engineering team.

The information in this document is believed to be accurate in all respects at the time of publication but is subject to change without notice. Silicon Laboratories assumes no responsibility for errors and omissions, and disclaims responsibility for any consequences resulting from the use of information included herein. Additionally, Silicon Laboratories assumes no responsibility for the functioning of undescribed features or parameters. Silicon Laboratories reserves the right to make changes without further notice. Silicon Laboratories makes no warranty, representation or guarantee regarding the suitability of its products for any particular purpose, nor does Silicon Laboratories assume any liability arising out of the application or use of any product or circuit, and specifically disclaims any and all liability, including without limitation consequential or incidental damages. Silicon Laboratories products are not designed, intended, or authorized for use in applications intended to support or sustain life, or for any other application in which the failure of the Silicon Laboratories product could create a situation where personal injury or death may occur. Should Buyer purchase or use Silicon Laboratories products for any such unintended or unauthorized application, Buyer shall indemnify and hold Silicon Laboratories harmless against all claims and damages.

Silicon Laboratories, Silicon Labs, and Ember are registered trademarks of Silicon Laboratories Inc.

Other products or brandnames mentioned herein are trademarks or registered trademarks of their respective holders.