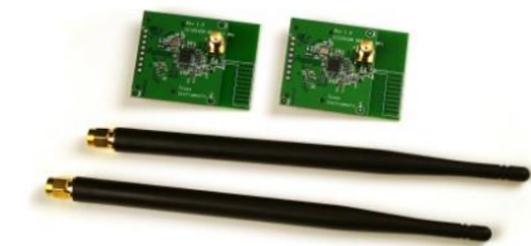


# CC120x Evaluation Module Kit Quick Start Guide

## Opening the Box and Running the Packet Error Rate Test

### 1. Kit Contents



2 x CC1200 or CC1201 Evaluation Modules  
2 x Antennas (type depending on frequency)

#### Antenna types:

868-930 MHz: Pulse W5017, 2 dBi  
420-470 MHz: Pulse SPWH24433TI, 0 dBi

### 2. How to use the Modules

The EMK is an add-on kit to supplement the CC1200DK with evaluation boards supporting additional frequency bands. This document covers the CC1200EMK and CC1201EMK.

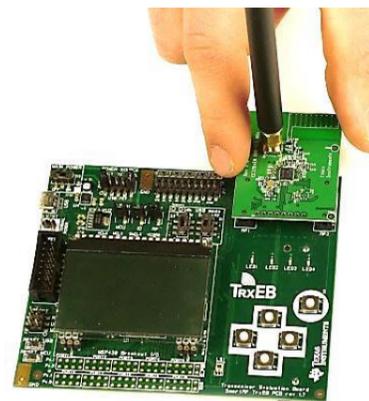
The CC120xEM boards can be plugged into several development boards from Texas Instruments. Most notably, you can use the SmartRF Transceiver EB, which is included in the CC1200DK. This board lets you run a packet error rate (PER) test, control the device from SmartRF™ Studio and it can be used as a development platform.

It is also possible to connect the EM to other TI development boards with the appropriate connectors or to the basic “SoC Battery Board”. The latter can be used as a carrier board for the EM to simplify the connection to other boards with a microcontroller. See:

<http://www.ti.com/tool/soc-bb>

This guide will show how to use the modules together with SmartRF Transceiver EB (TrxEB).

### 3. Plug the EM into the TrxEB



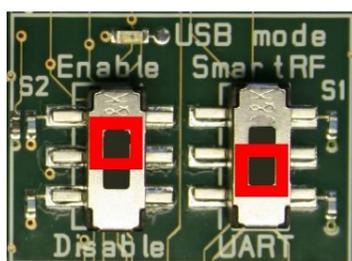
Insert a CC120xEM board into the TrxEB as shown above. Connect the antenna to the SMA connector on the EM.



**Caution!** The kit contains ESD sensitive components. Handle with care to prevent permanent damage.

### 4. Select Board Mode

Use the switches S1 and S2 to select the operating mode of the board. For the sake of this quick start guide, please select “Enable” and “UART”. This configuration will make it possible to communicate directly with the MSP430 over a virtual COM port on the PC.



### 5. Power Options

There are several ways of applying power to the TrxEB.

- 2 x 1.5V AA Non-Rechargeable Alkaline Batteries
- USB (5V through USB plug)
- External Power Supply (requirements below)
- MSP430 Debugger

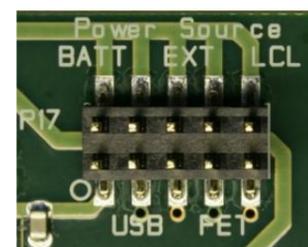
When the power source is batteries or USB, the voltage regulators on the TrxEB will set the on-board supply voltage to 3.3VDC.

#### External Power Supply Requirements:

Nom Voltage: 3.3VDC  
Max Current: 800 mA  
Efficiency Level V

**Warning!** To minimize risk of personal injury or property damage, never use rechargeable batteries to power the board.

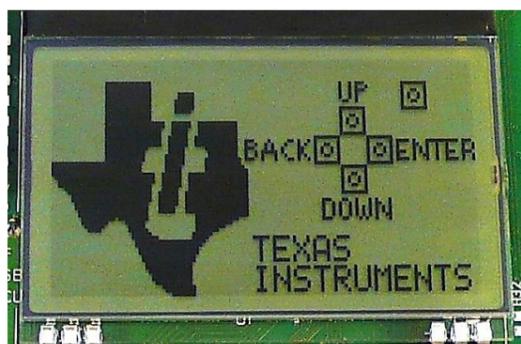
### 6. Select Power Source



Depending on the power source, make sure you connect jumpers to the appropriate pins on the “Power Source” header. For instance, if you use batteries, use a jumper to short-circuit pin 1 and 2 on the header. The last jumper in the row (pin 9-10) should always be mounted, unless the MSP430 FET is used as the power source.

**Note that there should only be one active power source at any one time. Do not leave the board powered when unattended.**

### 7. Welcome Screen



Turn on power with the Main Power switch. You should now see the Texas Instruments logo and a short description of the buttons on the LCD. Pushing any of the five buttons on the board will take you to the main menu.

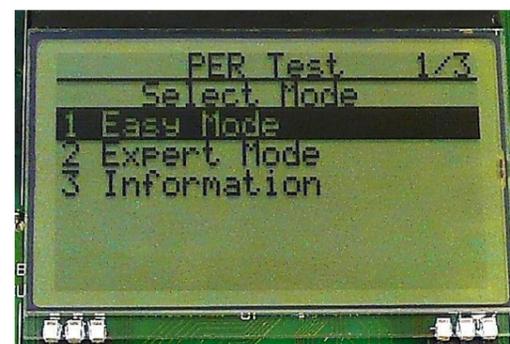
**NB!** If you don't see anything on the screen make sure the mode switches are in the correct positions (see step 4 above).

### 8. Packet Error Rate Test



Select the PER (Packet Error Rate) test by highlighting the selection using the up/down buttons. Confirm your selection by pressing Enter (right button).

### 9. Select Test Mode

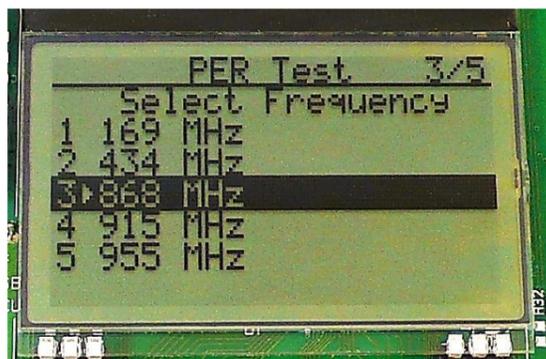


The PER test can be run in several modes. Easy Mode sets up a one-way test and uses default settings. This test is convenient for practical range testing.

The other test modes are described in the “TrxEB RF PER Test Software Example User's Guide”, available on the kit web page.

To proceed, highlight “Easy Mode” and press Enter (right button).

## 10. Select Frequency



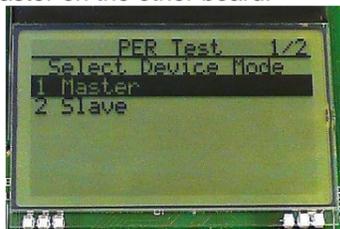
Select which frequency to use for the test. Make sure that the evaluation modules you have match the selected frequency.

## 11. Select Mode

One of the boards must operate as the slave (transmitter) and the other as master (receiver). Select Slave on one board...



...and Master on the other board.

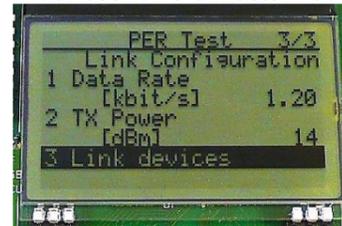


## 12. Establish Link

The slave node will now wait for a configuration package from the Master. The configuration contains the parameters used for the PER test.



The configuration package will be sent when you select "link devices" on the master node.



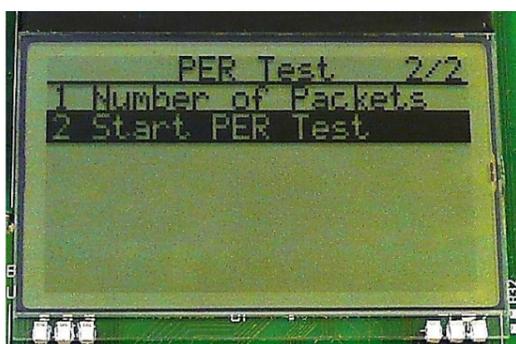
## 13. Link Established

When the initial linking has completed, the slave node will start the test by continuously transmitting packets to the master.



## 14. Start the Receiver (master)

On the master node, you can select the number of packets you want to receive in order to calculate the packet error.



When selecting "Start PER Test", the master (receiver) will begin to count the number of received packets and provide some statistics.

## 15. PER Test Results

The master will display a window that plots the received signal strength (RSSI) for each packet.



Press the "Up" button to go to the detailed statistical window.

## 16. PER Test Results

The statistics window will show the error rate based on the number of lost or erroneous packets divided by the total number of packets that should have been received.



## 17. Troubleshooting

If you are experiencing problems with this test, please check the following:

- Nothing is shown in the display! Make sure the mode switches are in the correct positions (see step 4 above).
- Please visit the kit web page and check for updated SW and documentation. Updated SW can be downloaded to the device using IAR EW430 or SmartRF Flash Programmer.
- If you get poor PER results at short distances, try to move the transmitter and receiver further apart. The CC1200/CC1201 receiver may be saturated if it is too close to the other CC1200/CC1201 transmitting at full output power.

## 18. References

Please visit [www.ti.com](http://www.ti.com) and

<http://www.ti.com/tool/cc1200emk-420-470>

<http://www.ti.com/tool/cc1200emk-868-930>

<http://www.ti.com/tool/cc1201emk-868-930>

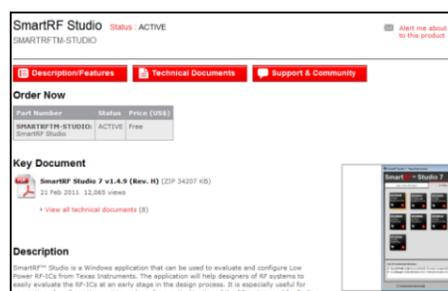
On the kit product page, you will find additional documentation, links to other related kits and devices, updated software examples and software tools like SmartRF Studio.

You will also find a lot of information on the TI E2E forum at <http://e2e.ti.com>

We hope that you will enjoy working with the CC1200 and CC1201 devices.

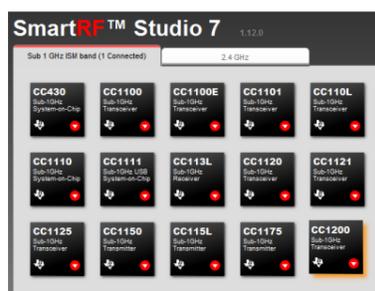
# SmartRF™ Studio

## 1. Download and Install



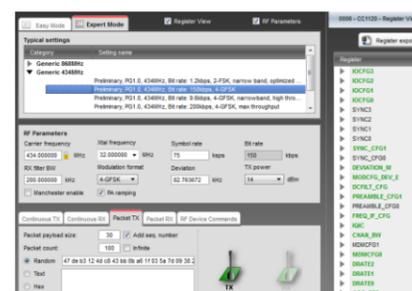
Before connecting SmartRF TrxEB to your PC, download and install SmartRF Studio from [www.ti.com/smartrfstudio](http://www.ti.com/smartrfstudio).

## 2. Launch SmartRF Studio



After installing the tool, connect the EB to the PC using the USB cable and start SmartRF Studio. Select the "Sub 1 GHz" tab and double click the highlighted CC1200 device icon.

## 3. Test the Radio



You can now configure the radio, run performance tests, export register settings and run link tests with another CC1200 or CC1201 on a SmartRF TrxEB connected to the PC.

<sup>1</sup> When using an external power supply, make sure it meets the listed requirements in addition to complying with applicable regional product regulatory and safety certification requirements such as UL, CSA, VDE, CCC, and PSE.

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This kit is designed to allow product developers to evaluate electronic components, circuitry, or software associated with the kit to determine whether to incorporate such items in a finished product and software developers to write software applications for use with the end product. This kit is not a finished product and when assembled may not be resold or otherwise marketed unless all required FCC equipment authorizations are first obtained. Operation is subject to the condition that this product not cause harmful interference to licensed radio stations and that this product accept harmful interference. Unless the assembled kit is designed to operate under part 15, part 18 or part 95 of this chapter, the operator of the kit must operate under the authority of an FCC license holder or must secure an experimental authorization under part 5 of this chapter.
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### CAUTION

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

Changes or modifications not expressly approved by the party responsible for compliance could void the user's authority to operate the equipment.

### FCC Interference Statement for Class A EVM devices

*NOTE: This equipment has been tested and found to comply with the limits for a Class A digital device, pursuant to part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference when the equipment is operated in a commercial environment. This equipment generates, uses, and can radiate radio frequency energy and, if not installed and used in accordance with the instruction manual, may cause harmful interference to radio communications. Operation of this equipment in a residential area is likely to cause harmful interference in which case the user will be required to correct the interference at his own expense.*

## FCC Interference Statement for Class B EVM devices

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- Reorient or relocate the receiving antenna.
- Increase the separation between the equipment and receiver.
- Connect the equipment into an outlet on a circuit different from that to which the receiver is connected.
- Consult the dealer or an experienced radio/TV technician for help.

### 3.2 Canada

3.2.1 For EVMs issued with an Industry Canada Certificate of Conformance to RSS-210

#### Concerning EVMs Including Radio Transmitters:

This device complies with Industry Canada license-exempt RSS standard(s). Operation is subject to the following two conditions: (1) this device may not cause interference, and (2) this device must accept any interference, including interference that may cause undesired operation of the device.

#### Concernant les EVMs avec appareils radio:

Le présent appareil est conforme aux CNR d'Industrie Canada applicables aux appareils radio exempts de licence. L'exploitation est autorisée aux deux conditions suivantes: (1) l'appareil ne doit pas produire de brouillage, et (2) l'utilisateur de l'appareil doit accepter tout brouillage radioélectrique subi, même si le brouillage est susceptible d'en compromettre le fonctionnement.

#### Concerning EVMs Including Detachable Antennas:

Under Industry Canada regulations, this radio transmitter may only operate using an antenna of a type and maximum (or lesser) gain approved for the transmitter by Industry Canada. To reduce potential radio interference to other users, the antenna type and its gain should be so chosen that the equivalent isotropically radiated power (e.i.r.p.) is not more than that necessary for successful communication. This radio transmitter has been approved by Industry Canada to operate with the antenna types listed in the user guide with the maximum permissible gain and required antenna impedance for each antenna type indicated. Antenna types not included in this list, having a gain greater than the maximum gain indicated for that type, are strictly prohibited for use with this device.

#### Concernant les EVMs avec antennes détachables

Conformément à la réglementation d'Industrie Canada, le présent émetteur radio peut fonctionner avec une antenne d'un type et d'un gain maximal (ou inférieur) approuvé pour l'émetteur par Industrie Canada. Dans le but de réduire les risques de brouillage radioélectrique à l'intention des autres utilisateurs, il faut choisir le type d'antenne et son gain de sorte que la puissance isotrope rayonnée équivalente (p.i.r.e.) ne dépasse pas l'intensité nécessaire à l'établissement d'une communication satisfaisante. Le présent émetteur radio a été approuvé par Industrie Canada pour fonctionner avec les types d'antenne énumérés dans le manuel d'usage et ayant un gain admissible maximal et l'impédance requise pour chaque type d'antenne. Les types d'antenne non inclus dans cette liste, ou dont le gain est supérieur au gain maximal indiqué, sont strictement interdits pour l'exploitation de l'émetteur.

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[http://www.tij.co.jp/lstds/ti\\_ja/general/eStore/notice\\_01.page](http://www.tij.co.jp/lstds/ti_ja/general/eStore/notice_01.page)

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If User uses EVMs in Japan, not certified to Technical Regulations of Radio Law of Japan, User is required by Radio Law of Japan to follow the instructions below with respect to EVMs:

1. Use EVMs in a shielded room or any other test facility as defined in the notification #173 issued by Ministry of Internal Affairs and Communications on March 28, 2006, based on Sub-section 1.1 of Article 6 of the Ministry's Rule for Enforcement of Radio Law of Japan,
2. Use EVMs only after User obtains the license of Test Radio Station as provided in Radio Law of Japan with respect to EVMs, or
3. Use of EVMs only after User obtains the Technical Regulations Conformity Certification as provided in Radio Law of Japan with respect to EVMs. Also, do not transfer EVMs, unless User gives the same notice above to the transferee. Please note that if User does not follow the instructions above, User will be subject to penalties of Radio Law of Japan.

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