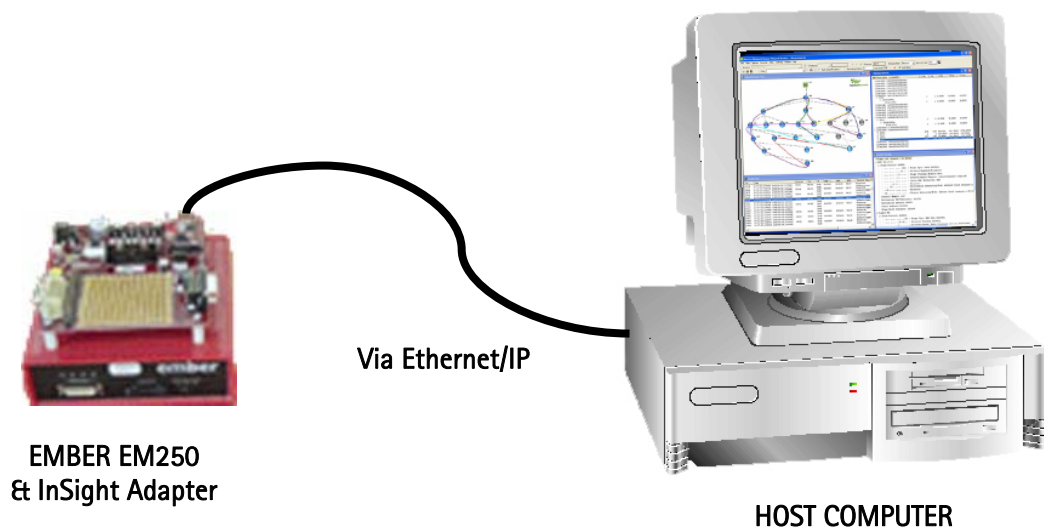


Using the Ember EM250 Development Kit with the Daintree Networks Sensor Network Analyzer

Application Note AN020



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Sensor Network Analyzer Release 2.3 (2008-07-31)

About the Sensor Network Analyzer

The Daintree Networks Sensor Network Analyzer (SNA) combines a powerful protocol analyzer with network visualization, measurements and diagnostics for IEEE 802.15.4™ and ZigBee® applications. It provides automatic display of network formation, topology changes, and router and coordinator state changes allowing rapid detection of incorrect network behavior and identification of device or network failures.

The SNA works in conjunction with Daintree's 2400E Sensor Network Adapter to provide analysis for small and large networks. With multi-node capture, analysis of large networks across wide areas (such as multiple rooms within a facility) is possible.

You can use boards from the Ember EM250 ZigBee Development Kit with the SNA as capture devices, and also as "active" devices to actively interact with live networks and devices. When in active mode, the Ember EM250 boards can be used for tasks such as polling devices to gain information not available through passive "sniffing" alone, and send and receive ZigBee standard and proprietary messages.

This application note describes how to use the SNA software with the EM250 Developer Kit. You can find out more about the SNA software in general, refer to the following:

- **Quick Start Guide:** Included with the SNA application. From the SNA **Help** menu, select **Quick Start Guide**, or else from the Windows **Start** menu, select **Daintree Networks > Documentation > SNA Quick Start Guide**.
- **User Guide:** Included with the SNA application. From the SNA **Help** menu, select **User Guide**, or else from the Windows **Start** menu, select **Daintree Networks > Documentation > SNA User Guide**.
- **"Active" Analysis and Configuration using the SNA:** Available from the Daintree Networks web site at <http://www.daintree.net/support/appnotes.php>
- **FAQs and other support resources:** These are available from the Daintree Networks web site at www.daintree.net/support

To find out more about the Ember 250 Developer Kit in general, refer to the following information provided on Ember's web site:

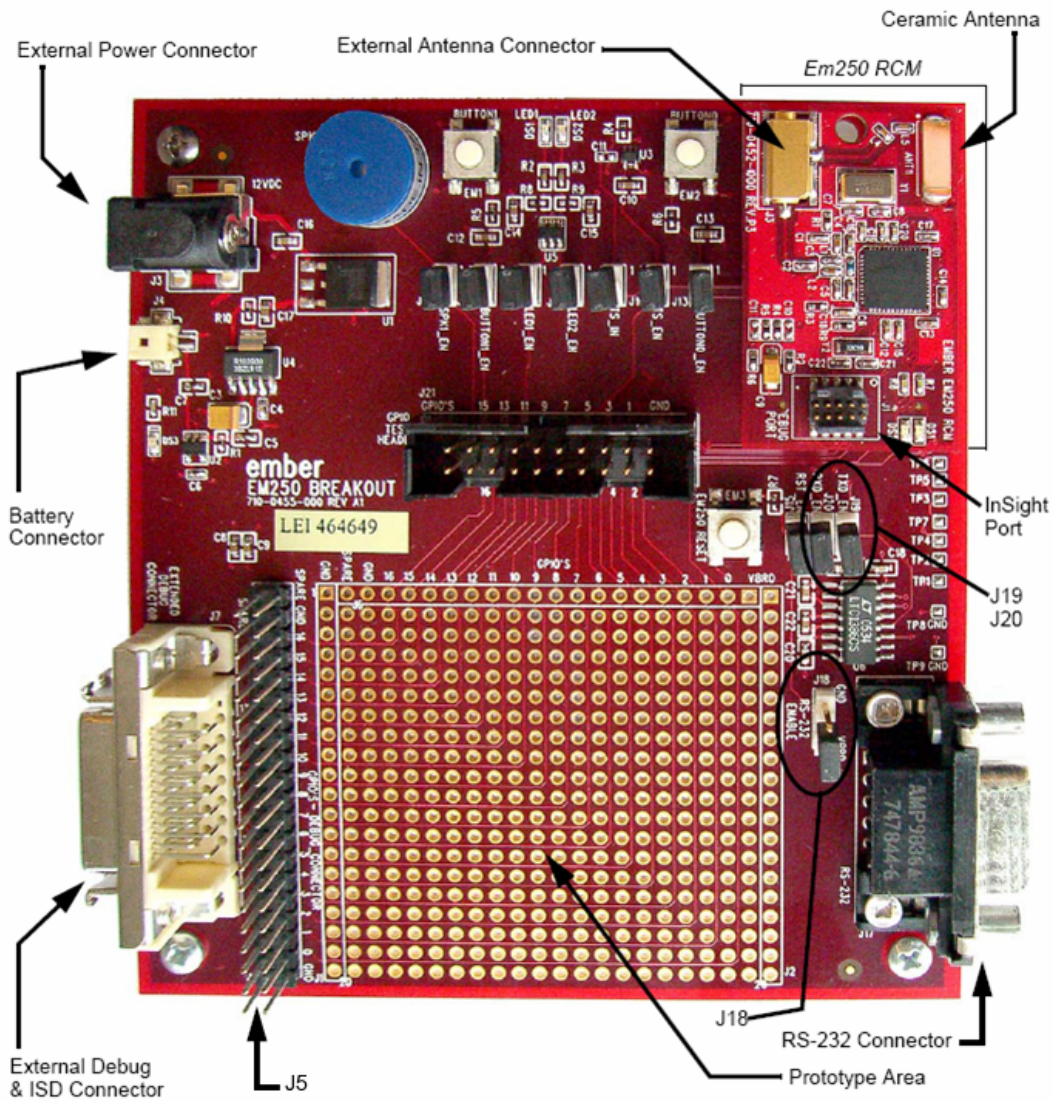
- Product Documentation: www.ember.com/products_documentation.html
- EM250 (and other) Developer Kits: www.ember.com/products_zigbee_development_tools_kits.html

Getting started

In summary, getting started involves the following steps, each of which is described in detail in the following sections:

1. Install the Sensor Network Analyzer software.
2. Connect and power the Ember EM250 board and InSight Adapter.
3. Install the EZSP firmware for the Ember board.
4. Add the Ember board to the SNA as capture device.
5. Select the Ember EM250 as the current SNA capture device.

Once connected and configured, you can use the Ember EM250 board as a capture and active device with the Sensor Network Analyzer.



1. Installing the SNA software

This software contains the firmware driver you need for the Ember EM250 board, so you need to install it before connecting the board to your PC.

1. Go to www.daintree.net/register to register your software and download the latest release.
2. Enter your email address together with the 15-digit alpha-numeric registration code from the software CD case. After you click Next, an activation code will be emailed to the address you supply.
3. Follow the link provided to download the latest release of the SNA software, plus the *Sensor Network Analyzer Quick Start Guide*. Daintree **strongly** recommends that you download the latest version of the software to ensure you have the latest functionality and fixes.
4. Follow the instructions in the *Quick Start Guide* to install and activate the software.

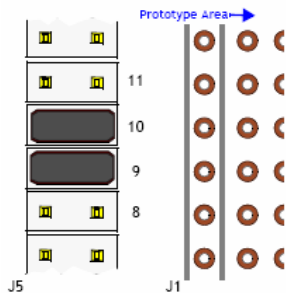
2. Connect and power the Ember board

The EM250 breakout board enables TTL-compatible communication with the EM250 SC1 UART. Pin 2 of peripheral headers J19 and J20 expose the TXD and RXD signals from SC1 UART.

1. Make sure the InSight Adapter is disconnected from power and remove any power source that is directly connected to the EM250 breakout board. (Power for the breakout board will be supplied by the InSight Adapter.)
2. If required, disconnect the InSight serial data emulation interface cable from the InSight Adapter.
3. On the EM250 breakout board, remove the jumpers at J19 and J20. (The picture on the previous page shows the locations for these jumpers.)



4. Ensure jumpers are placed on header J5 pins at 9 and 10 as shown. This allows the ISA to communicate with the breakout board's serial port.



5. Use the InSight serial data emulation interface cable to connect the InSight Adapter to the breakout board.
6. Connect the Adapter's InSight Port to the EM250 RCM board with the ribbon cable.
7. Connect power to the InSight Adapter.

8. Move the InSight Adapter voltage toggle switch to the **INT** position.




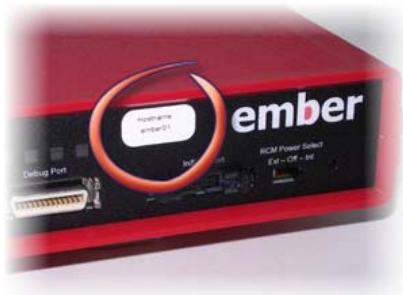
9. Connect the InSight Adapter to your network via Ethernet.

Note that because the InSight data emulation interface is not buffered, the InSight Adapter must provide power for the EM250 breakout board and the EM250 RCM when using this interface.

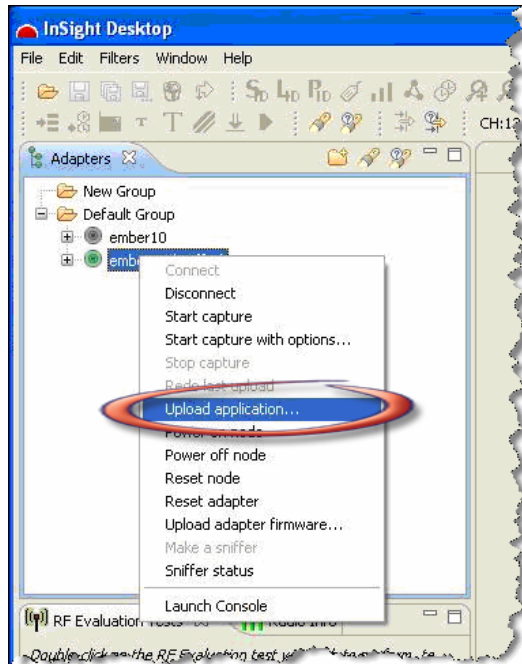
3. Installing the EZSP firmware

If you need more information about any of the following steps, please refer to the InSight documentation that came with your Ember kit.

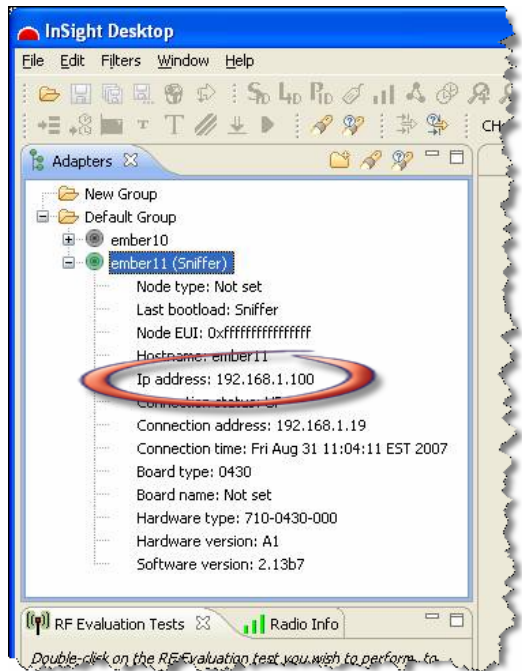
1. If you have not already done so, install the Ember InSight Desktop software.
2. Start the InSight Desktop software.
3. Click  (Discover Adapters) to see a list of all available adapters.
4. In the list of Adapters, right-click your Adapter and then select **Connect**. (You can find the name of each Adapter on the label affixed to its front panel.)



5. Right-click your Adapter again, and then select **Upload application**.



6. Select to upload the **EZSP-UART_EM250_WITH_BOOTLOADER.HEX** file, and then click **OK**. This firmware file is included with the SNA application, and can be found in the **Daintree Networks\Firmware\Ember** directory
7. When the upload is complete, click the + next to the Adapter name to display its details, and make a note of the Adapter's IP address.




8. Right-click your Adapter, and then select **Disconnect**.
9. Close the InSight Desktop application.

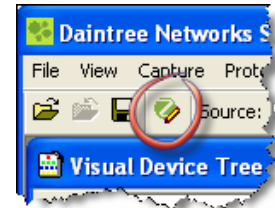
EM250 application tokens

Note that you may need to clear your application tokens for the EM250. If you update from one version of the software to another, the token area of flash may have some strange values that the new version of software may misinterpret, which can cause the SNA not to be able to connect to the EM250, start as an active device, or start to capture data.

To clear the tokens, upload the **rangetest** application and issue a **TOKSCRUB** command. The rangetest application is located in `STACK/app/rangetest`. See your Ember documentation or visit the dev.ember.com web site for detailed instructions.

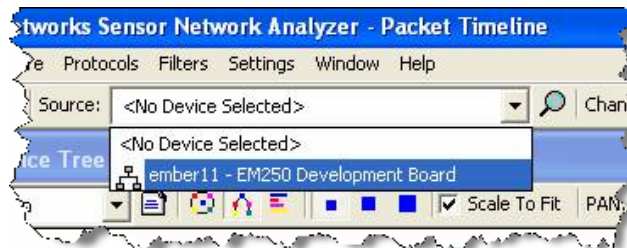
4. Adding the Ember board as an SNA capture device


1. If you have not already done so, start the SNA software.
2. From the **Settings** menu, select **Device Manager**, or click the Device Manager icon from the main SNA toolbar (as shown).
3. On the Device Manager **Summary** tab, click  and then select **Add Ethernet**.
4. On the Add Ethernet dialog box **Ethernet Settings** tab, enter the following values:
 - o **Type:** EM250 Development Board
 - o **Hostname\IP Address:** Enter the Adapter's name or the IP address that you set in step 6 of the "Installing the sniffer firmware" process above.
5. Click the **User Settings** tab, and then enter the following values:
 - o **User Label:** Enter the name by which you want to identify this device
 - o **Image:** Not required
6. Click **OK** to save the new definition. When you return to the Device Manager Summary tab, you'll notice that the Ember board has been added to your list of devices.
7. Close the Device Manager.



5. Selecting the Ember board as the current capture device

1. In the SNA main window, select the Ember board from the **Source** list.



If the Ember board is not available from the list, click  to get the SNA software to search/scan for capture devices and refresh the Source list.

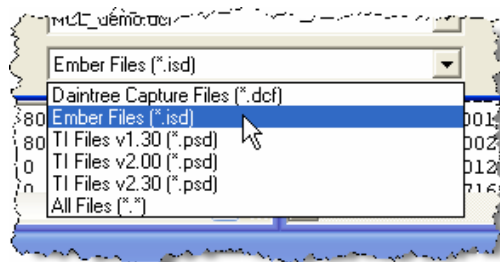
2. Select the **Channel** on which you want to capture traffic.

Click  to start the capture.

Replaying capture files

Note that in addition to replaying capture files created using Daintree's SNA application, you can also use the SNA to replay files captured using the Ember InSight Desktop application (.isd format):

1. From the SNA **File** menu, select **Open Capture File**.
2. On the Open Capture File dialog box, select **Ember Files (*.isd)** from the **Files of Type** list.



3. Browse to the directory in which your InSight capture files are stored, and then select the file you want to open.
4. Refer to the SNA online help for instructions on how to play back and analyze the capture file.

Where to next?

We recommend that you start exploring the SNA menus to get an understanding of the full capabilities of this product.

Detailed descriptions of all options are available in the SNA's online help, which you can open from the SNA **Help** menu and the Windows **Start** menu. You can also find FAQs and other supporting information on the Daintree web site at www.daintree.net/support

The Daintree web site includes other useful information, such as

- www.daintree.net/solutions for product information including data sheets and an animated tour
- www.daintree.net/purchase to purchase Daintree products online
- www.daintree.net/contact to contact the Daintree sales or support teams

Known limitations

If the Ember 250 board is in use by the SNA application, it cannot be used concurrently by any other application.