



# Programming Options

## For the EM250 SoC Platform and EM260 Co-Processor

The Ember EM250 and EM260 chips are delivered to customers with only a minimal amount of chip identification data programmed into their embedded flash contents. Before these chips can be used in a ZigBee network, the application and stack software must be programmed into the embedded flash.

This application note describes the various programming options available to Ember's EM250 and EM260 customers—the InSight Adapter for the developer environment, the InSight USB Link for the prototype and low-volume production environment, and gang programmers for the high-volume production environment.

### New in this Revision

Added a note that gang programming is not supported at this time for SE applications.

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## General Programming Notes

Even though the EM250 and EM260 embedded flash is fully tested during production test, the flash contents are not set to a known state prior to shipment. Therefore, the flash contents should be erased prior to programming an application. During manufacturing test, Ember recommends erasing the flash contents prior to test or retest of a DUT to ensure that calibration data is erased and proper channel calibration will execute prior to testing of the device.

## Developer Environment Programming

The InSight Adapter is included as part of Ember's Developer and JumpStart Kits to allow for debugging and programming of Ember's EM250 and EM260 devices during the development stage. Figure 1 shows the InSight Adapter with a connection to an EM250 Radio Communication Module.



Figure 1. InSight Adapter connection to RCM

The InSight Adapter interfaces to either the InSight Desktop PC tool or command line executable utilities to program Ember's devices. A snapshot of InSight Desktop is shown in Figure 2, while Figure 3 shows a snapshot of the `em2xx_load` command line utility.

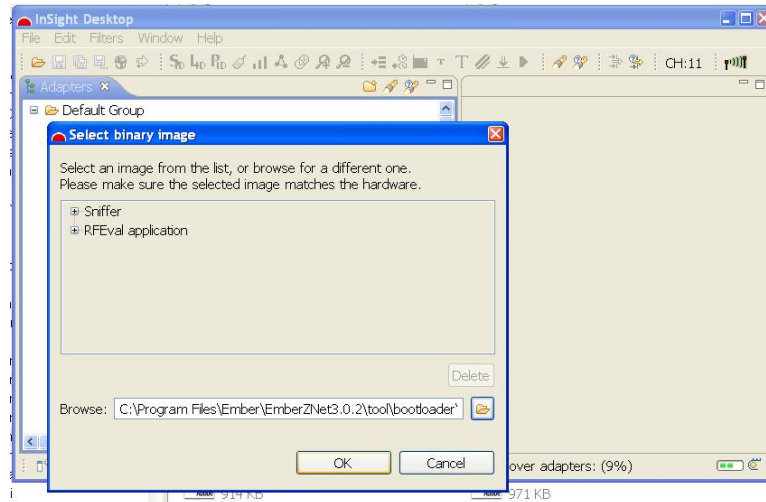


Figure 2. InSight Desktop snapshot

```

C:\WINDOWS\system32\cmd.exe - em2xx_load -sid1 "C:\Program Files\Ember\EmberZNet3.0.2\app\rangetest\em250-rangetest.xdv" -Run
Loading code file C:\Program Files\Ember\EmberZNet3.0.2\tool\bootloader\standalone-bootloader-standalone-bootloader-em250-noLED.xpv...
// ROM START ADDRESS 0
// WORDSIZE 16
Loading data file C:\Program Files\Ember\EmberZNet3.0.2\tool\bootloader\standalone-bootloader-standalone-bootloader-em250-noLED.xdv...
// ROM START ADDRESS 28
// WORDSIZE 8
SIF Slave id already set to 1 (pod 4294967295)
XAP2= DbgEna performed
XAP2= Stop performed
XAP2= DbgEna performed
XAP2= Reset performed
Programming FLASH...
XAP2= Run performed
BOOT1 0000-0013 (0014)
BOOTC 0014-0149 (0136)
BOOTL 014a-1285 (113c)
Total Flash Used=1286 words
XAP2= Stop performed
Verifying FLASH...

****Verification: SUCCESS****
XAP2= Stop performed
XAP2= Reset performed
XAP2= Issuing SW_RESET

C:\Program Files\Ember\EmberZNet3.0.2\tool>em2xx_load -sid1 "C:\Program Files\Ember\EmberZNet3.0.2\app\rangetest\em250-rangetest.xdv" -Run
em2xx_load Rev 1.8 b1 (Jul 21 2006 17:26:21)
Loading code file C:\Program Files\Ember\EmberZNet3.0.2\app\rangetest\em250-rangetest.xpv...
// ROM START ADDRESS 0
// WORDSIZE 16
Loading data file C:\Program Files\Ember\EmberZNet3.0.2\app\rangetest\em250-rangetest.xdv...
// ROM START ADDRESS 0
// WORDSIZE 8
SIF Slave id already set to 1 (pod 4294967295)
XAP2= DbgEna performed
XAP2= Stop performed
XAP2= DbgEna performed
XAP2= Reset performed
Programming FLASH...
XAP2= Run performed
STKIC 1400-141c (001d)
CODE 1440-6000

```

Figure 3. Command line utility snapshot

The typical programming time when using the InSight Adapter is 30 seconds.

For more information on the InSight Adapter, refer to Ember document 120-2002-000, *InSight Adapter Technical Specification*. For more information on InSight Desktop, refer to Ember document 120-4036-000, *InSight Desktop User's Guide*. For more information on the EM2XX command line tools, refer to Ember document 120-4020-000, *EM2xx Utilities Guide: For the EM250 SoC Platform and EM260 Co-Processor*.

## Prototype and Low-Volume Production Programming

The InSight USB Link is a stand-alone USB programmer that allows for programming Ember's EM250 and EM260 devices during prototype and low volume production. While the InSight USB Link can be used for parallel programming, customers should not use it for volume, production programming as it has not been tested and proven in a demanding, cost-sensitive environment. This programmer plugs into a USB port and connects to Ember's standard InSight Port connector on either an Ember radio communication module or a customer board. Unlike the InSight Adapter, the USB Link programmer provides no debug interface. It is important to note that the InSight USB Link does not supply power to the device that is being programmed. Power must be provided to the device externally. A scriptable command line interface allows a low-cost solution for low-volume production programming. However, please note that parallel programming should not be done with the InSight USB Link during production. Figure 4 shows a picture of the InSight USB Link.



Figure 4. InSight USB Link

The InSight USB Link interfaces to command line executables in order to program Ember's devices. Figure 5 shows a snapshot of the EM2USBLoad command line utility.

```

C:\WINDOWS\system32\cmd.exe - EM2USBLoad "C:\Program Files\Ember\EmberZNet3.0.2\...
ne-bootloader\standalone-bootloader-em250-noLED.xdv...
// ROM START ADDRESS 28
// WORDSIZE 8
Opening first InSight USB Link device...
InSight USB Link Firmware version: 30007100
XAP2= DbgEna performed
XAP2= Stop performed
XAP2= DbgEna performed
XAP2= Reset performed
Programming FLASH...
XAP2= Run performed
BOOT1 0000-0013 <0014>
BOOTC 0014-0149 <0136>
BOOTL 014a-1285 <113c>
Total Flash Used=1286 words
XAP2= Stop performed
Verifying FLASH...

****Application load: SUCCESS****
****Verification: SUCCESS****

XAP2= Stop performed
XAP2= Reset performed
XAP2= Issuing SW_RESET

C:\Program Files\Ember\InSight USB Link>EM2USBLoad "C:\Program Files\Ember\Ember
ZNet3.0.2\app\rangetest\em250-rangetest.xdv" -Run
EM2USBLoad Version 2.0 Build 9
Ensis Library Version 1.0.6
Loading code file C:\Program Files\Ember\EmberZNet3.0.2\app\rangetest\em250-rang
etest.xdv...
// ROM START ADDRESS 0
// WORDSIZE 16
Loading data file C:\Program Files\Ember\EmberZNet3.0.2\app\rangetest\em250-rang
etest.xdv...
// ROM START ADDRESS 0
// WORDSIZE 8
Opening first InSight USB Link device...
InSight USB Link Firmware version: 30007100
XAP2= DbgEna performed
XAP2= Stop performed
XAP2= DbgEna performed
XAP2= Reset performed
Programming FLASH...
XAP2= Run performed
STKIC 1400-141c <001d>
CODE 1440-5a00

```

Figure 5. EM2USB tool snapshot

The typical programming time when using the InSight USB Link is 12 seconds.

## High-Volume Production Programming

Ember has worked with programming partners to provide gang programming solutions to customers in high-volume production. These gang programmers allow for EM250 or EM260 ICs to be programmed prior to placement onto boards.

**Note:** Gang programmers do not support certificate programming for Smart Energy (SE) ZigBee Application Profile at this time. Please contact Ember or the programming solutions provider for more information.

### Partner Gang Programmer Offerings

Ember has partnered with BP Microsystems and Hi-Lo Systems to provide gang programming options. Each partner offers different options for programming, as discussed in the following sections.

#### BPM Microsystems

BPM Microsystems offers gang programming options for the EM250 and EM260 on all of their engineering, manual production, and automated programmers. The EM250 is supported with an SM48QFAM socket module, while the EM260 is supported with an SM40QFNA socket module. Figure 6 and Figure 7 illustrate examples of BPM Microsystems programmers.



Figure 6. BPM Microsystems Multi-Site Automated Programmer



Figure 7. BPM Microsystems Single-Site Manual Programmer

For programming EM250s, the typical time is 8.5 seconds, with up to 4 devices in parallel on each socket module. For programming EM260s, the typical time is 9 seconds

for erase/program/verify steps, but only 1 device per socket module due to socket restrictions. The number of devices that can be programmed at once depends on the number of sites supported by programmer. BPM Microsystems programmers have between 1 and 11 sites. Therefore, a 1-site programmer will program 4 EM250s or 1 EM260 per operation, while an 11-site programmer will program 44 EM250s or 11 EM260s per operation.

Using the 4710 line of programmers, for example, throughput capacity capabilities are as high as 1400 devices per hour.

For more information on these programmers and support for the EM250 and EM260 devices, please see the BPM Microsystems web site at [www.bpmicro.com](http://www.bpmicro.com). The BPM Microsystems direct contact for Ember EM250 and EM260 support is:

Mani Srivatsan  
Device Support Supervisor  
5373 W Sam Houston Pkwy N, Suite 250  
Houston, Texas 77041 USA  
Telephone: 713-688-4600 x5454  
Fax: 713-688-0920  
Email: [Srivatsan\\_Mani@bpmicro.com](mailto:Srivatsan_Mani@bpmicro.com)

### Hi-Lo Systems

Hi-Lo Systems offers support on the ALL-100 family of programmers. The EM250 is supported with module M4-EM250-QN48, while the EM260 is supported with module M4-EM260-QN40. Software for the programmers can be downloaded from [www.hilosystems.com.tw](http://www.hilosystems.com.tw). Figure 8 shows the manufacturer selection from the programming software application, while Figure 9 shows the device selection.

A single ALL-100G programs 4 devices in parallel. At most 8 sets of ALL-100G can be connected to program 32 devices in parallel. Programming of each device takes about 25-30 seconds. Factoring 30 seconds per device, a single ALL-100G programs 120 chips per hour. Connecting 8 sets of programmers achieves a theoretical maximum throughput capacity of approximately 3840 devices per hour. This assumes there is no operator time factored in to insert and remove devices from the sockets. 960 devices per hour is considered a realistic minimum throughput based on operator insert/removal timing. This throughput can be improved by adding more operators to the assembly line.

For more information on this programmer, please see Hi-Lo Systems' website at <http://www.hilosystems.com.tw/en/index.aspx>.

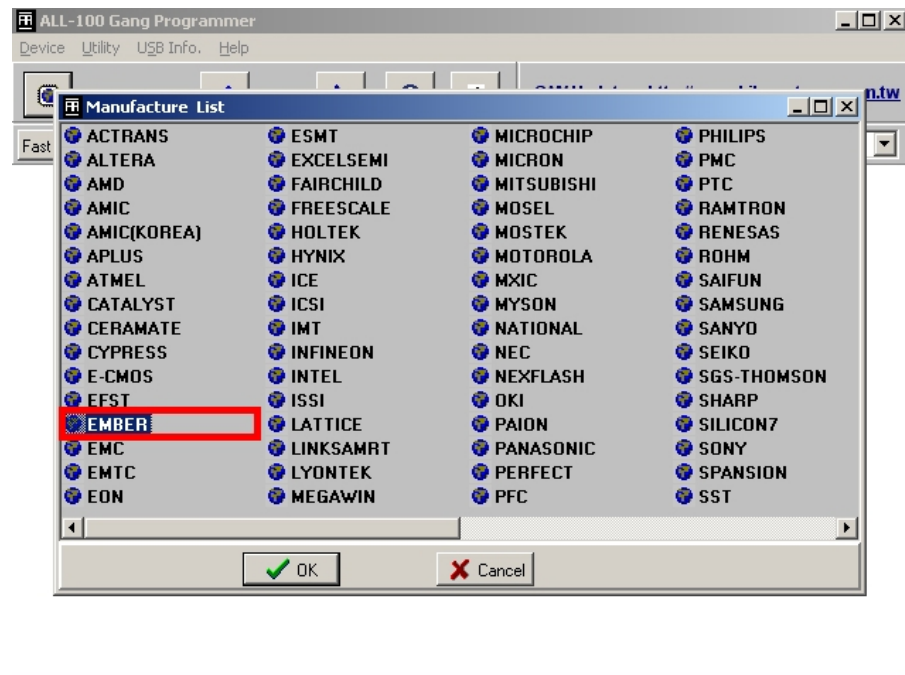


Figure 8. ALL-100 gang programmer manufacturer selection

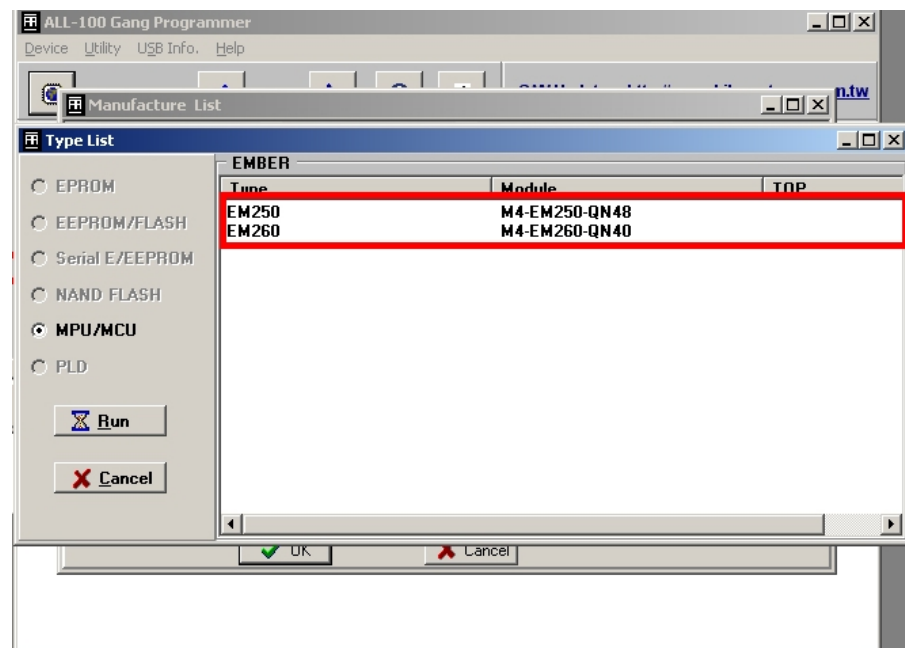


Figure 9. ALL-100 gang programmer device type selection

### After Reading This Document

If you have questions or require assistance with the procedures described in this document, please contact an Ember support representative at [http://www.ember.com/support\\_index.html](http://www.ember.com/support_index.html).

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