



Quick Start Guide

# BeeStack Consumer™

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# About This Guide

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This guide provides a brief description of how to program the boards and run the BeeStack Consumer demonstration application including the Virtual Remote application. The Virtual Remote application provides a demonstration of the BeeStack Consumer protocol stack using the MC1321x transceiver.

For more detailed information about BeeStack Consumer, visit [www.freescale.com/802154](http://www.freescale.com/802154) and see the following documents:

- BeeStack Consumer User's Guide
- BeeStack Consumer Reference Manual
- BeeStack Consumer Black Box User's Guide

For more information on BeeKit, see the *BeeKit Wireless Connectivity ToolKit Quick Start Guide* (BKWCTKQSG) and the *BeeKit Wireless Connectivity ToolKit User's Guide* (BKWCTKUG).

For more information on Freescale Test Tool, see the *Freescale Test Tool User's Guide*.

## Audience

This document is intended for BeeStack Consumer software and application developers.

## Revision History

Current document revision number: 0.0

The following table summarizes revisions to this document since the previous release (Rev 1.0).

**Revision History**

Location	Revision

## Conventions

This document uses the following notational conventions:

- `Courier monospaced type` indicate commands, command parameters, code examples, expressions, datatypes, and directives.
- *Italic type* indicates replaceable command parameters.
- All source code examples are in C.

## Definitions, Acronyms, and Abbreviations

The following list defines the abbreviations used in this document.

BDM	Background Debug Module
EVK	Evaluation Kit
GUI	Graphical User Interface
LED	Light Emitting Diode
MCU	MicroController Unit
NCB	MC1321x Network Controller Board with S08GT60 MCU
PC	Personal Computer
PCB	Printed Circuit Board
SRB	MC1321x Sensor Reference Board with S08GT60 MCU
USB	Universal Serial Bus
WPAN	Wireless Personal Area Network

# BeeStack Consumer Introduction

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## System Overview

Freescale's BeeStack Consumer Protocol is a lightweight networking stack built on top of the IEEE™, 802.15.4 Standard. BeeStack Consumer controls, monitors and automates consumer electronic products including televisions, DVD players and recorders, set top boxes, audio video receivers, remote controls and more. BeeStack Consumer overcomes various technology challenges that today's consumer electronic products face with 30 year old infrared (IR) technology by removing the line of sight and field of vision issues while providing a fast bi-directional link that enhances the user experience. Freescale's BeeStack Consumer starts with the 802.15.4 Standard, but incorporates improvements in interference avoidance by adding channel agility and low latency transmissions to address the specific needs of consumer electronics.

There are two ways to develop a BeeStack Consumer application:

**BeeStack Consumer API:**

Allows for application development using the embedded processor running the BeeStack Consumer protocol. This is the lowest cost solution.

**BeeStack Consumer BlackBox:**

Provides access to the complete BeeStack Consumer API through a serial command set. This alternative allows for application development on a separate processor which enables a more flexible system definition to meet the specific needs of end products.

## Hardware and Software Requirements

The following is a list of the minimum software and hardware requirements for BeeStack Consumer as shown in this guide:

- A PC running Microsoft Windows 7<sup>®</sup>, Microsoft Windows XP<sup>®</sup>, Microsoft Windows Vista<sup>®</sup> or Microsoft Windows 2000<sup>®</sup>,
- BeeKit Wireless Connectivity Toolkit, with the Virtual Remote option selected, the BeeStack Consumer Codebase and Test Tool installed
- One 1321x-SRB and one 1321x-NCB Freescale evaluation board
- One USB cable
- Two AA batteries for the boards
- One P&E USB Multilink from P&E Microcomputer Systems, Inc

# Programming the Boards and Running the Virtual Remote Application

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## Programming the Boards

Use the Freescale Test Tool to load the binary embedded image files that come with the BeeStack Consumer Codebase to each of the following development boards. (Program the 1321x-SRB first):

- Load the MC1321x\_SRB\_BlackBox.s19 to a 1321x-SRB
- Load the MC1321x\_NCB\_SimpleTV.s19 image to a 1321x-NCB

1. Install the batteries or plug the power adapter supplied with the kit into the 1321x-NCB and 1321x-SRB. Do not connect either board to the PC at this time.
2. To start the loading process, power on the board and connect the USB cable from the PC to the USB Multilink BDM. Do not use a hub. The boards each have a 6 pin BDM port marked on the PCB. The BDM connector must be inserted into the BDM port on the boards with the red wire from the BDM connector on the same side as the number 1 pin of the BDM port on the board.

After powering on the board, the blue and the yellow LEDs on the BDM turn on. This means that the BDM is properly connected to the board. If the blue and the yellow LEDs are not on, check the connections and try again.

User must now register the BDM as one of the communication devices used by Test Tool. To do this, perform the following tasks:

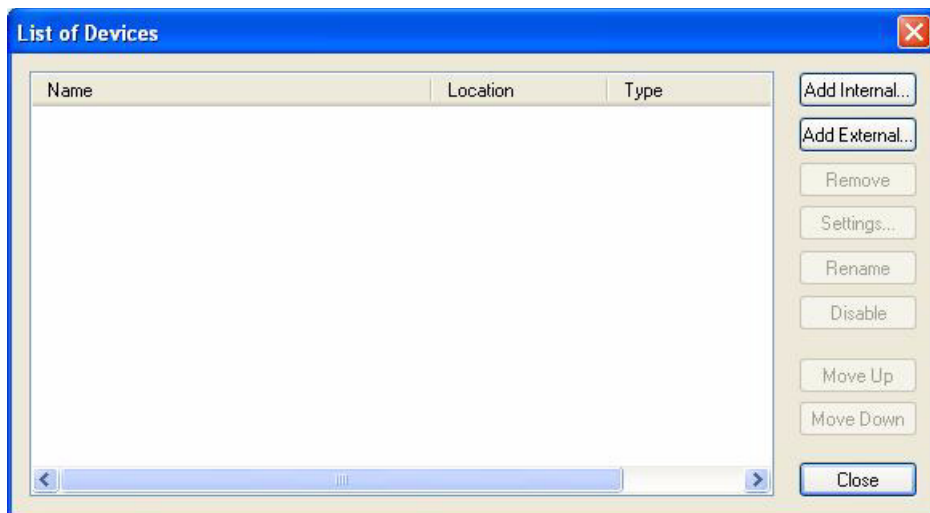
3. Launch the Freescale Test Tool application. From Windows, click on Start -> All Programs -> Freescale Test Tool-> Test Tool.

The Test Tool main window appears as shown in [Figure 1](#).



**Figure 1. Test Tool Main Window**

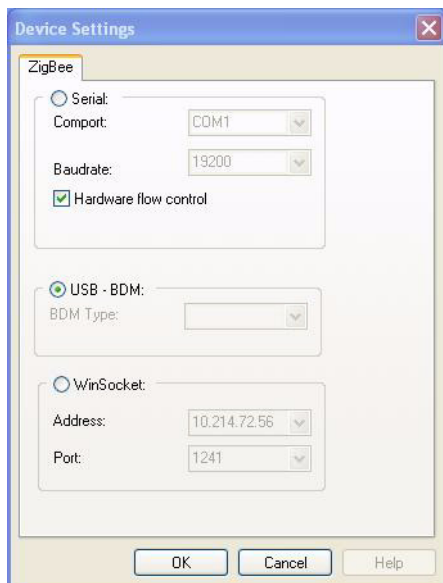
4. From the Test Tool main menu bar, click on Tools -> Communication Settings. The List of Devices window appears as shown in [Figure 2](#).



**Figure 2. Device Selection List**

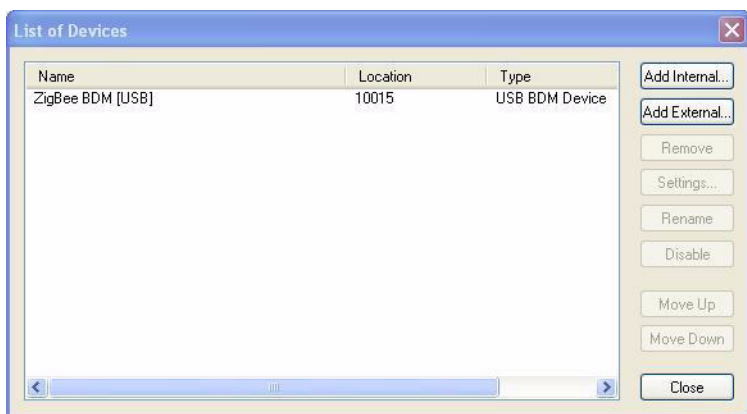


5. Click on the Add Internal button. The Device Settings window appears as shown in [Figure 3](#).



**Figure 3. Registering the USB BDM using Test Tool**

6. Check the USB BDM radio button and click on the OK button. A new device titled, ZigBee BDM (USB) appears in the List of Devices window as shown in [Figure 4](#).



**Figure 4. Device Selection List**

7. In the List of Devices window, click the Close button.

8. From the Test Tool menu bar, click on View -> Firmware Loader -> HCS08 Firmware Loader.

The Select Device window appears again and users are required to select a communication device from the list. The list displays the registered USB BDM Multilink device.

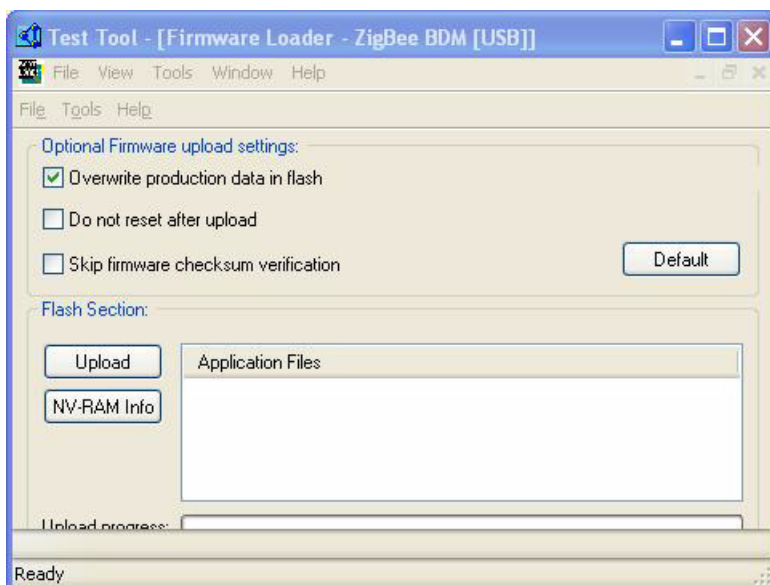
9. Select the device from the list and click on the OK button. The Firmware Loader main window appears as shown in [Figure 6](#).

## NOTE

If the USB Multilink device was left unconnected or the board was not powered up before starting the Firmware Loader, an error message appears that asks users to check the condition of the board and/or the BDM.



**Figure 5. Firmware Loader Error Message**



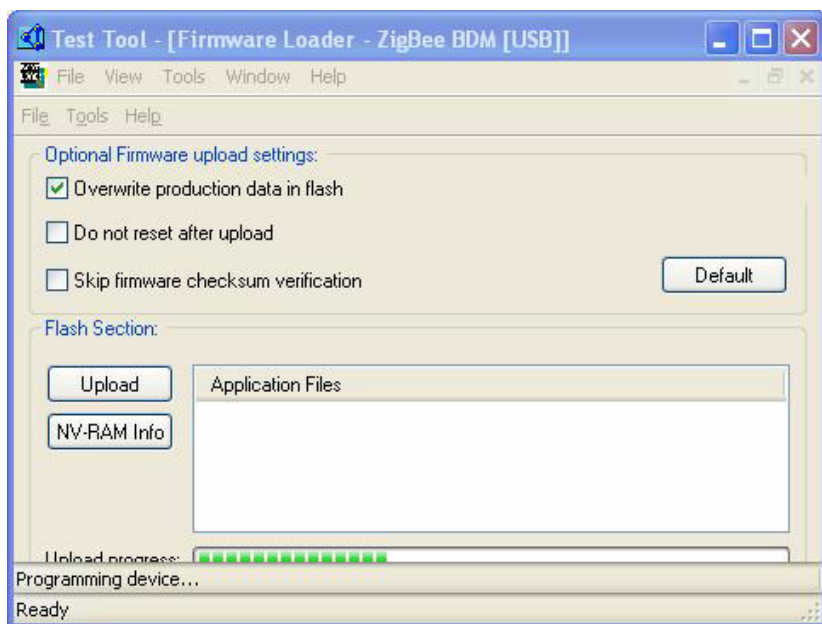
**Figure 6. Firmware Loader Main Window**

10. From the Firmware Loader's menu bar, click on Tools -> Upload Image...

A standard Windows Open file window appears that allows users to search for and select the appropriate S19 file. Navigate to the following directory and select the appropriate S19 file for the board being programmed:

```
Program Files\Freescale\Virtual Remote\Embedded
images\BeeStackConsumer\
```

The upload operation starts immediately when the file selection window is closed as shown in [Figure 7](#).



**Figure 7. Firmware Being Loaded to the Board**

11. Confirm that the board's FLASH is being programmed and wait until image loading is complete.
12. Disconnect the BDM from the 1321x-SRB and then program the 1321x-NCB.

## Running the Virtual Remote Application

After programming both of the boards, run the Virtual Remote application by performing the following tasks:

1. Connect the 1321x-SRB to the PC using a USB cable.
2. Power on the 1321x-SRB and follow the installation instructions as displayed in the Found New Hardware wizard on the PC. If the drivers do not automatically load, they can be found in the following directory:

```
C:\Program Files\Freescale\Drivers
```

3. Power on the 1321x-NCB.
4. Press the Reset button on both boards.
5. When the initialization of the 1321x-NCB is complete, the text “TV off” appears on the 1321x-NCB LCD. This shows that the TV application is started and that the TV is in standby mode and waiting for remote commands.
6. Launch the Virtual Remote PC application by clicking on Start -> Programs -> Freescale BeeKit -> Virtual Remote -> Virtual Remote. The Virtual Remote PC application appears.
7. Users must first pair the Virtual Remote application with the TV application that is running on the 1321x-NCB. Click on any of the soft keys of the Virtual Remote PC application as shown in [Figure 8](#).



**Figure 8. Virtual Remote Start Window**

After pairing is complete, the TV menu appears on the Virtual Remote displaying the current status of the TV (TV off) as shown in [Figure 9](#).



**Figure 9. Virtual Remote (TV Off)**

8. Click on the power button on the Virtual Remote application.

The 1321x-NCB displays the volume level and channel while the Virtual Remote PC application displays the TV status (On) and the volume level and channel as shown in [Figure 10](#).



**Figure 10. Virtual Remote (TV On)**

9. On the Virtual Remote application, click any of the volume, channel or number buttons and watch their status change as displayed on the 1321x-NCB LCD and the Virtual Remote PC application display.

Pressing the buttons on the 1321x-NCB controls the TV functions as follows:

- SW1 decreases volume
- SW2 increases volume
- SW3 decreases channel number
- SW4 increases channel number
- If the TV is off, any switch press turns it on
- If the TV is on, a long press of SW1 turns it off

10. On the remote as shown in [Figure 11](#), users have the following options:

- Press the Menu key to access the SimpleTV's menu over the air.
- Browse through the TV menu using the following keys:
  - Menu Up
  - Menu Down
  - Menu Left
  - Menu Right
- Press the 'Exit' key to exit the TV menu. The TV menu will automatically exit if not accessed for 30 seconds.





**Figure 11. Menu Navigation**

# Learn More:

For more information about  
Freescale products, please visit  
[www.freescale.com/zigbee](http://www.freescale.com/zigbee)

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