APPLICATION NOTE

Atmel AVR2151: RTB Evaluation Application – Quick Start Guide

8-bit Atmel Microcontrollers

Features

This Quick Start Guide briefly describes how to set up and run the Ranging Tool Box Evaluation Application (RTB Eval App), available as an additional firmware package together with the Atmel® REB233SMAD-EK evaluation kit.

The REB233SMAD-EK includes Atmel Controller Base Boards (CBB) intended to serve as the microcontroller platform for the Atmel Radio Extender Board (REB) family. An REB connected to a CBB forms a battery powered, fully functional and portable wireless node. The RTB Eval App firmware is provided for evaluating the Atmel AT86RF233 radio transceiver phase difference measurement technology.

Prerequisites

To work with the RTB Eval App it is recommended to use two REB233SMAD-EKs, although only three REB-CBB assemblies will be used for the first steps.

Follow the kit instructions as given in the Atmel AVR®2160: REB233SMAD Evaluation Kit – Quick Start Guide to assemble the kits.

The RTB Eval App is available as a dedicated firmware package on the Atmel MCU Wireless web site, follow the link AT86RF233.

Download the zip file and unzip the content in an appropriate folder, e.g. `C:\Atmel`.

Program the RTB Eval App binary to all individual REB233SMAD assemblies using an appropriate programmer. The binary is found in the following location: `C:\Atmel\RTB_<ver>_Lib\Applications\RTB_Examples\RTB_Eval_App_lib\AT86RF233_ATXMEGA256A3_REB_8_1_CBB\GCC`.

Finally, update all CBB ATxmega256A3 fuse settings as shown in Table 1.

Table 1. ATxmega256A3 fuse settings.

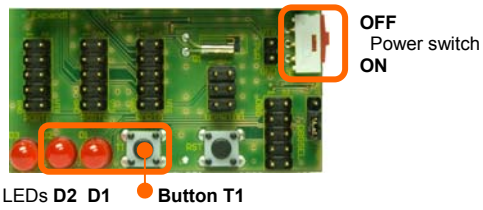
Fuse byte	Value	Fuse byte	Value
0	0xFF	4	0xFE
1	0x00	5	0xE6
2	0xFE		

1. Configuration Setup

The RTB Eval App features a distance measurement application, controlled via a host-PC terminal application. Before you start working with the application, the node addresses of the three REB-CBB assemblies have to be configured. Start with the first REB-CBB assembly, also referred to as *Initiator* (1). The other two nodes are referred to as *Reflector* (2) and *Coordinator* (3), respectively.

1.1 Power-up and Address configuration – assemblies (1), (2) and (3)

Press and hold button T1 and thereby switch on the assembly. If LED-D1 is ON, release button T1, which causes the node address set to '1'.



Repeat the 'hold-T1 and switch on procedure' with assembly (2). However, wait for LED-D2 is switched ON and LED-D1 switched OFF until button T1 is released. Now the node is configured as *Reflector* and the node address is set to '2'.

Finally, repeat the procedure with the assembly (3) and wait until LED-D1 and D2 are both ON before releasing button T1. Now the node is configured as *Coordinator* and the node address is set to '0'.

Address selections are permanently stored during this procedure. A subsequent power cycle restores the addresses, which are further indicated by LEDs D1 and/or D2 for about 10sec.

Note: Detailed information and background about REB-CBB assembly configuration, parameters and usage are given in the Atmel AVR2150 application note.

1.2 Connecting to a host-PC – assembly (3)

To control the distance measurement setup using the provided application, connect the *Coordinator*, assembly (3), to a host-PC similar to instructions given in the Atmel AVR2160 REB233SMAD Evaluation Kit – Quick Start Guide:

- Plug an USB adapter into a free USB port on your PC. Interconnect this adapter and one of both REB-CBB assemblies via the 6-pin ribbon cable so that it fits the notch on the adapter and the colored stripe of the ribbon cable connects to pin 1 of the CBB header, USARTD0
- Download the driver (www.dresden-elektronik.de/funktechnik/uploads/media/deUSBlevelshifter_2012-09-05.zip) required for the USB adapter and extract the archive to a folder of your selection. If the 'New Hardware Found' wizard prompts for drivers ignore the Windows® update search ('No, not this time'). In the next dialog, select 'Install from a list or a specific location' and point at the extraction directory. Confirm installation, ignore warnings that the driver is not digitally signed or did not pass the Windows driver certification. If no wizard pops up, install drivers manually via the device manager. The driver installation needs to be performed twice

Finally, start a host-PC terminal application and configure the assigned COM port accordingly:

Baud rate: 38400, Parity: None, Data Bits: 8, Stop Bits: 1, Flow Control: OFF

Note: Appropriate terminal applications are for instance HyperTerminal, PuTTY or Tera Term.

2. Distance Measurement

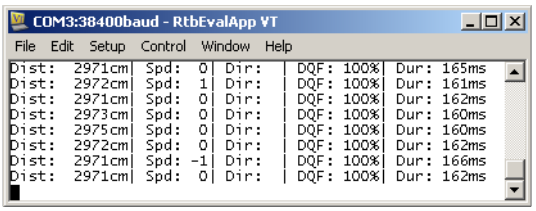
To perform distance measurements, the following prerequisites are required:

- All REB-CBB assemblies are powered on, see Section 1.1, and
- *Initiator*, *Reflector* and *Coordinator* addresses are configured, see Section 1.1, and
- *Initiator* and *Reflector* are placed in an appropriate environment and position, and
- *Coordinator* assembly (3) connects to a host-PC serial port, see Section 1.2, and
- A terminal application is started, configured and connected to the correct serial port
- Ensure optimal antenna configuration

Important: It is strongly recommended to ensure a 90° angle between the two swivel antennas.

2.1 Get help

Press character '***h***' in the host-PC terminal application to get help on the RTB Eval App command set. Further details are given in the Atmel AVR2150 and AVR2152 application notes.



2.2 Remote continuous ranging

Press character '**M**' in the host-PC terminal application to initiate the remote continuous ranging procedure between *Initiator* (0x1) and *Reflector* (0x2) node. Remote continuous ranging is the default measurement mode; the *Coordinator* controls the two remote nodes and collects measurement results. The continuous ranging procedure starts a permanent ranging, post-processing and result print out.

Beside the distance ('Dist: <…>') between *Initiator* and *Reflector*, some additional information is provided. Details are given in the AVR2150 application note. The procedure is stopped by pressing the character '**M**' again.

To perform a single measurement only, refer to the AVR2150 application note.

Note: RTB distance value calculations are calibrated for this specific hardware configuration. Any hardware modification, e.g. usage of different antenna types, may affect the measured distance. However, since this is a static offset for a given setup, it can be handled by the application firmware.

2.3 Local continuous ranging

Local continuous ranging, initiated by the character '**m**', is a second, optional ranging measurement between *Coordinator* and *Reflector* or *Initiator*.

3. Further Reading

A more detailed description of the RTB Eval App and its usage is given in the application note Atmel AVR2150: RTB Evaluation Application - User's Guide. An in-depth description of the ranging toolbox (RTB) software package is provided with the Atmel AVR2152: RTB Evaluation Application - Software User's Guide.

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