RSL10 USB Dongle User Guide

When developing Bluetooth low energy applications, you often need to establish a connection between a peripheral that is being developed and a central device that can help verify and diagnose the behavior of the peripheral.

To serve this purpose, ON Semiconductor developed the combination of the RSL10 USB Dongle and the Bluetooth® Low Energy Explorer. The Dongle is plugged into a computer that has the Bluetooth Low Energy Explorer software installed. The Dongle can then act as a generic central device on which a software developer can do anything that a typical central application would do, such as advertising scanning, establish a connection, and list services and characteristics.

1. RSL10 USB DONGLE

1.1 Key Features

- Bluetooth v.5.0, single (Bluetooth low energy) mode compliant
  - Supports Master and Slave Modes
  - Supports up to four connections

- Integrated Bluetooth low energy stack
- Radio performance
  - Transmit power: +6 dBm to -17 dBm
  - Receiver sensitivity: -94 dBm

- Host interfaces
  - USB (virtual COM port emulation)

- Bluetooth Low Energy Explorer software to diagnose Bluetooth low energy connections during application development
- Bluetooth 5, CE, FCC, IC and Japan certified

1.2 Electrical Characteristics

NOTE: The ratings in Table 1 are absolute maximum ratings beyond which the module can be permanently damaged. These are not maximum operating conditions. The maximum recommended operating conditions are in Table 2.

Table 1. Absolute Maximum Ratings

Rating	Min	Max	Unit
Storage Temperature	-40	+85	°C
VBUS	-0.3	6.5	V

Table 2. Recommended Operating Conditions

Rating	Min	Max	Unit
Operating Temperature Range	-40	+85	°C
VBUS	3.6	5.5	V

1.3 Certifications

1.3.1 Bluetooth

The RSL10 USB Dongle is Bluetooth qualified and listed as an End Product.

1.3.2 FCC

FCC ID: 2APD9-RSL10USB1

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.

NOTE: This equipment has been tested and found to comply with the limits for a Class B digital device, pursuant to part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference in a residential installation. This equipment generates, uses and can radiate radio frequency energy and, if not installed and used in accordance with the instructions, may cause harmful interference to radio communications. However, there is no guarantee that interference will not occur in a particular installation. If this equipment does cause harmful interference to radio or television reception, which can be determined by turning the equipment off and on, the user is encouraged to try to correct the interference by one or more of the following measures:

- 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.

1.3.3 ISED

IC: 23763-RSL10USB1

HVIN: RSL10V1.02

This device complies with Industry Canada’s licence-exempt RSSs. 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.

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.

CAN ICES-3 (B)/NMB-3(B) – This Class B Digital Apparatus Complies with Canadian ICES-003.

Cet Appareil numerique de la classe (B) est conforme a la norme NMB-003 du Canada.

1.3.4 Japan

The RSL10 USB Dongle has the Japanese certification number R209-J00300.

2. Bluetooth Low Energy Explorer Software

2.1 Introduction

Bluetooth Low Energy Explorer is a desktop application run on Windows®, developed to work with the RSL10 USB Dongle. The application allows developers to quickly become familiar with developing, testing, and evaluating Bluetooth low energy devices. Bluetooth Low Energy Explorer lets you scan for your device, read advertising data, connect, and discover services. You can then pair and bond to your device, read and write to characteristics, subscribe to notifications, and receive characteristics updates. The application also features a logging section, which displays the details of processes in the underlying structure, allowing for easier troubleshooting.

List of software features:

1. Scanning and reading advertising data
2. Connecting, pairing, and bonding
3. Service and characteristic discovery
4. Reading and writing of characteristics
5. Support for notifications and indications
6. Listing paired/bonded devices
7. Radio transmission power selection
8. Local device firmware updates
9. An external script for updating the dongle firmware

2.2 Before Using Bluetooth Low Energy Explorer

1. Plug the RSL10 USB Dongle into a USB port. You might be prompted to install device driver software. You can either:
   - Follow the link in the error dialog to obtain the driver from the web.
   - Find the driver in *ON Semiconductor /Driver /CP210x_windowa_Drivers.zip* where you installed the Bluetooth Low Energy Explorer. Unzip and install the appropriate *.exe* file.

2. Open the windows Device Manager and check which com port has been assigned (see Figure 1, below).

Now you can start Bluetooth Low Energy Explorer.

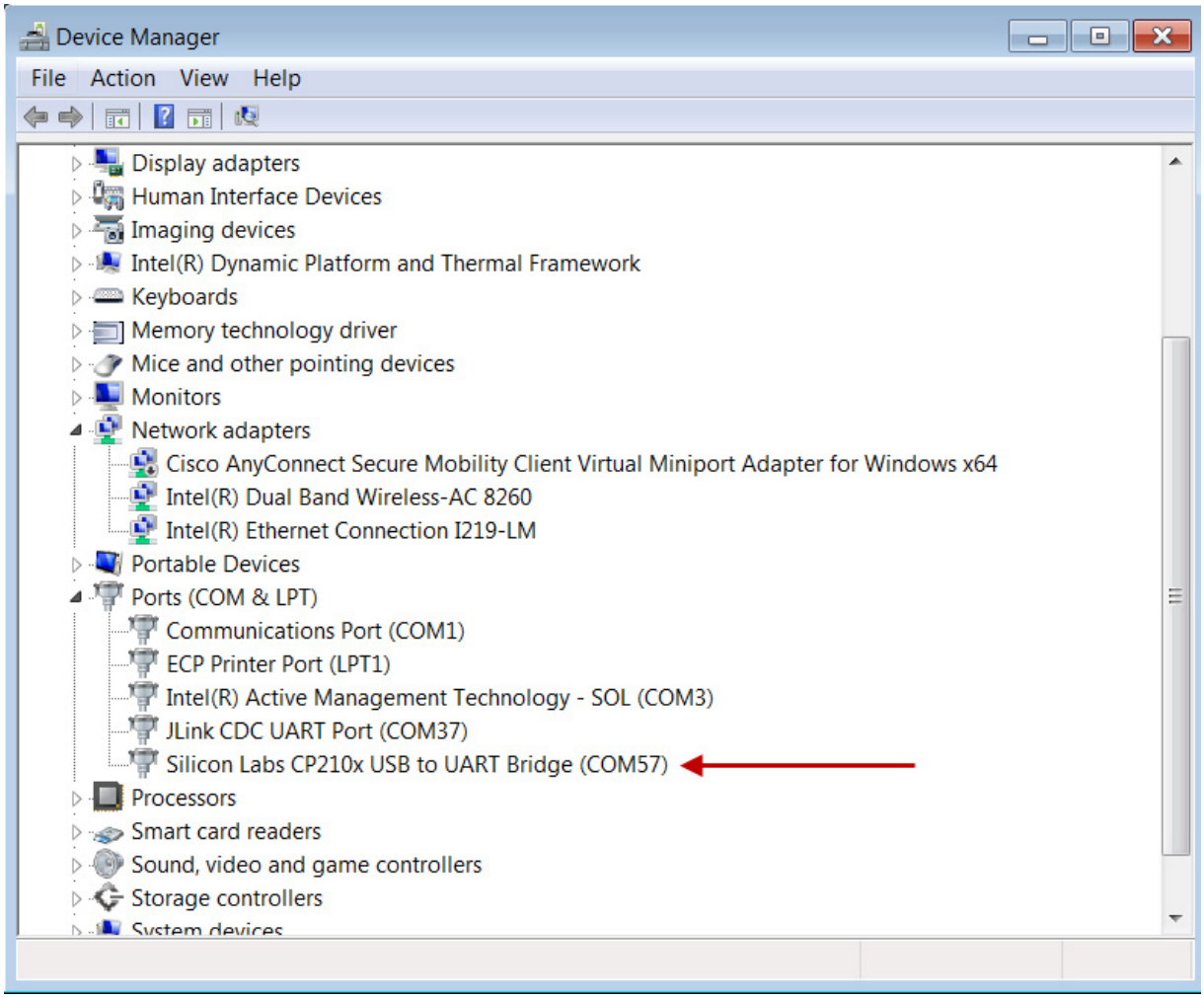

Figure 1. Assigned COM Port

2.3 Using Bluetooth Low Energy Explorer

In the Start Menu, browse to:

- **All Programs** > **ON Semiconductor** > **RSL10 dongle** > **Bluetooth Low Energy Explorer.exe**
- If you are running Windows 10: **ON Semiconductor** > **RSL10 dongle** > **Bluetooth Low Energy Explorer.exe**

Select the Com Port which has been assigned during installation (see Figure 2 on page 5, and Section 2.2, “Before Using Bluetooth Low Energy Explorer”).

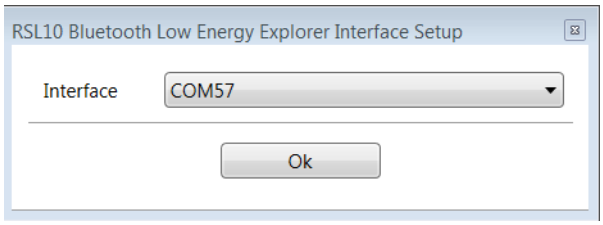

Figure 2. Select COM Port

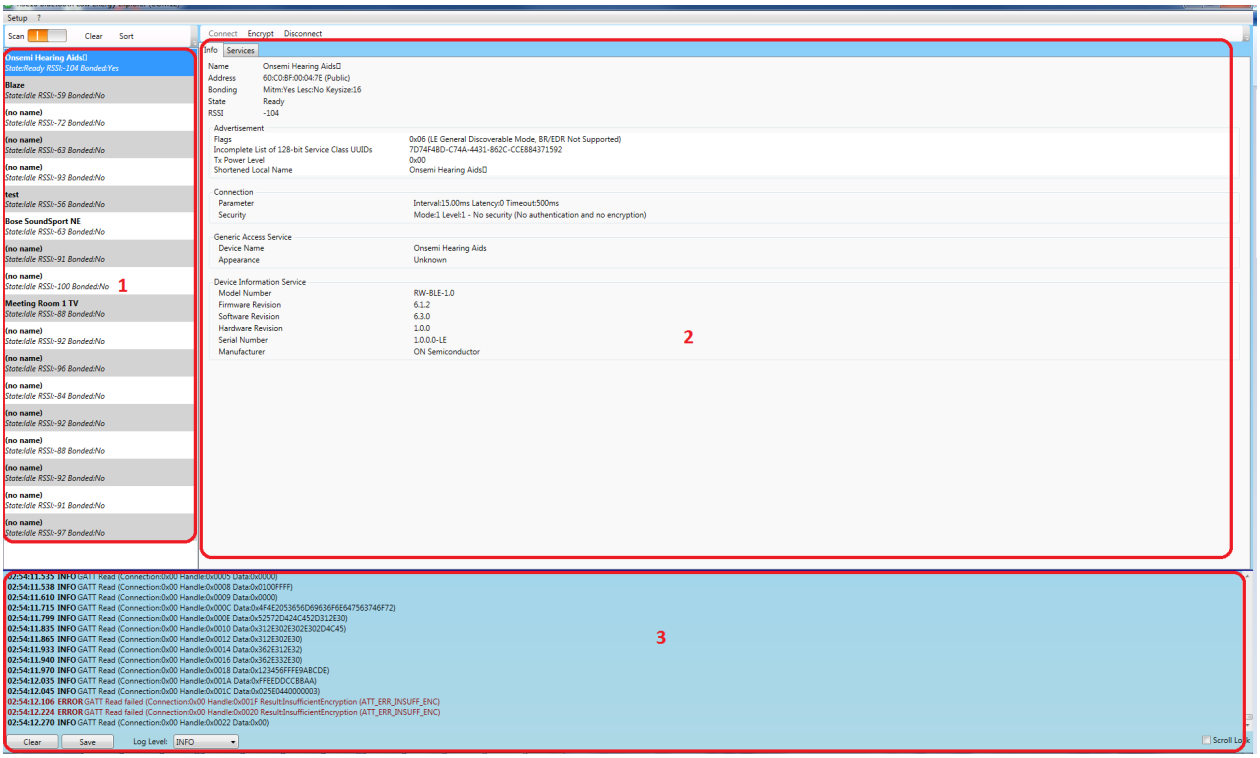

Figure 3. Bluetooth Low Energy Explorer Window Areas

The Bluetooth Low Energy Explorer window is split into four main areas, as shown in Figure 3, above:

1. List of visible Bluetooth low energy technology devices
2. Details of the selected device
3. Log information
4. User action area (not shown in Figure 3; visible only when needed, e.g.: for bonding data)

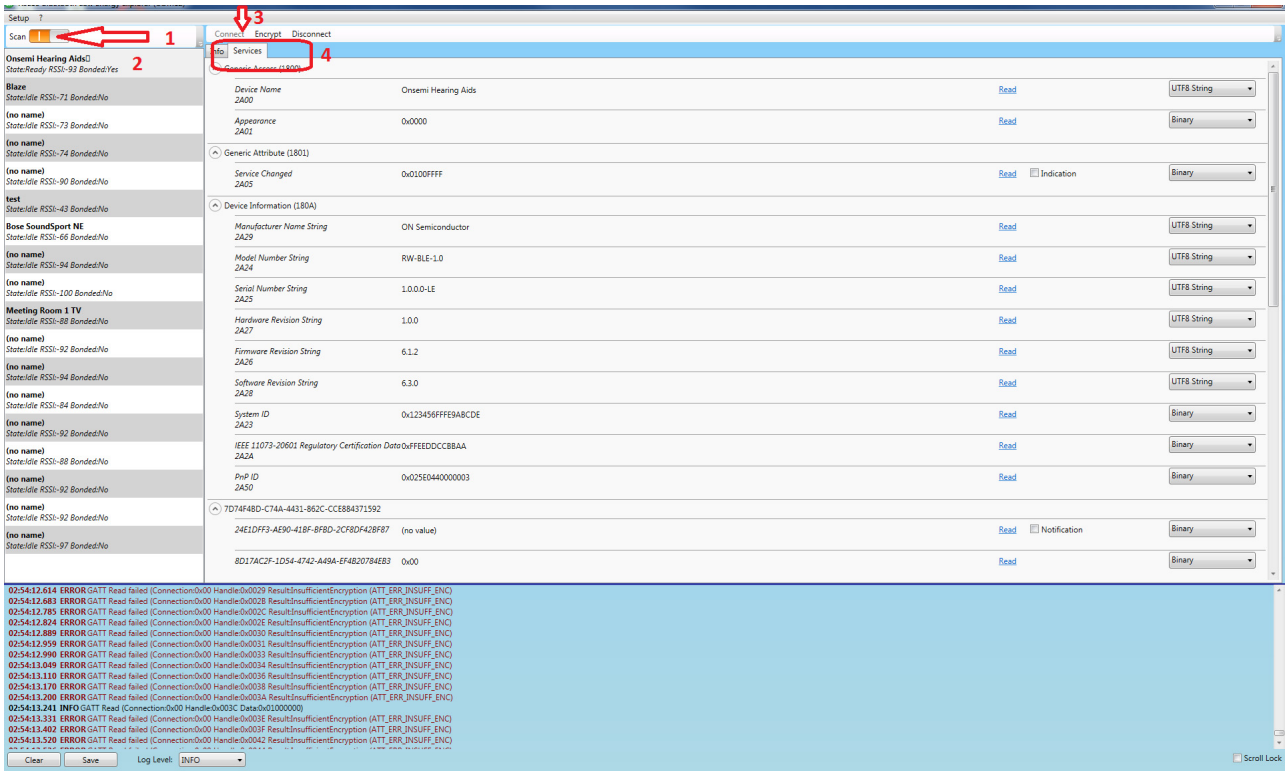

Figure 4. Establish Connection

General working procedure (see Figure 4, above):

1. Start Scanning by toggling the switch.
2. Select your device.
3. Make a connection to the device => service discovery takes place.
4. Switch to the new tab **Services.**
5. Depending on the services and characteristics offered by the connected device, values can be read and/or modified.

2.3.1 The Services Tab

The content of the **Services** tab depends on the services and characteristics offered by the connected device.

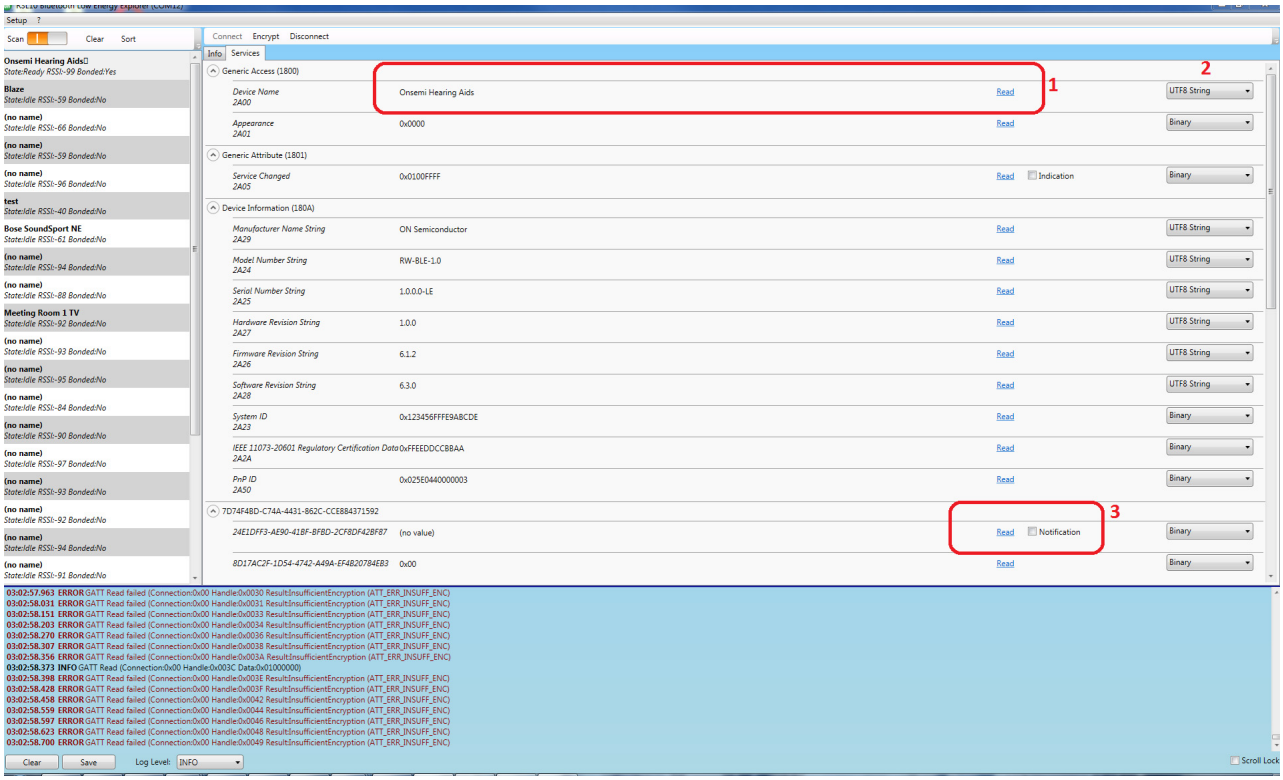

Figure 5. Services Tab of a Connected Device

Typical elements in the **Services** tab, as shown in Figure 5, above:

1. Clicking **Read** uploads the device name from the device.
2. Clicking **Write** stores the name in the text box as the new device name in the connected device.
3. Some services offer a continuous update. Ticking the notification or indication box sets the characteristic in the service to be continuously updated.

NOTE: Some parameters are only accessible over an encrypted connection (see Section 2.4, “Enable Encrypted Connection”).

2.4 Enable Encrypted Connection

So far the connection has not been encrypted. To access all parameters, the connection needs to be changed to an encrypted connection.

1. The supported encryption settings can be selected in **Setup Menu** > **Security**, as shown in Figure 6 on page 8. The Security Manager abbreviations are defined in Table 3 on page 8.

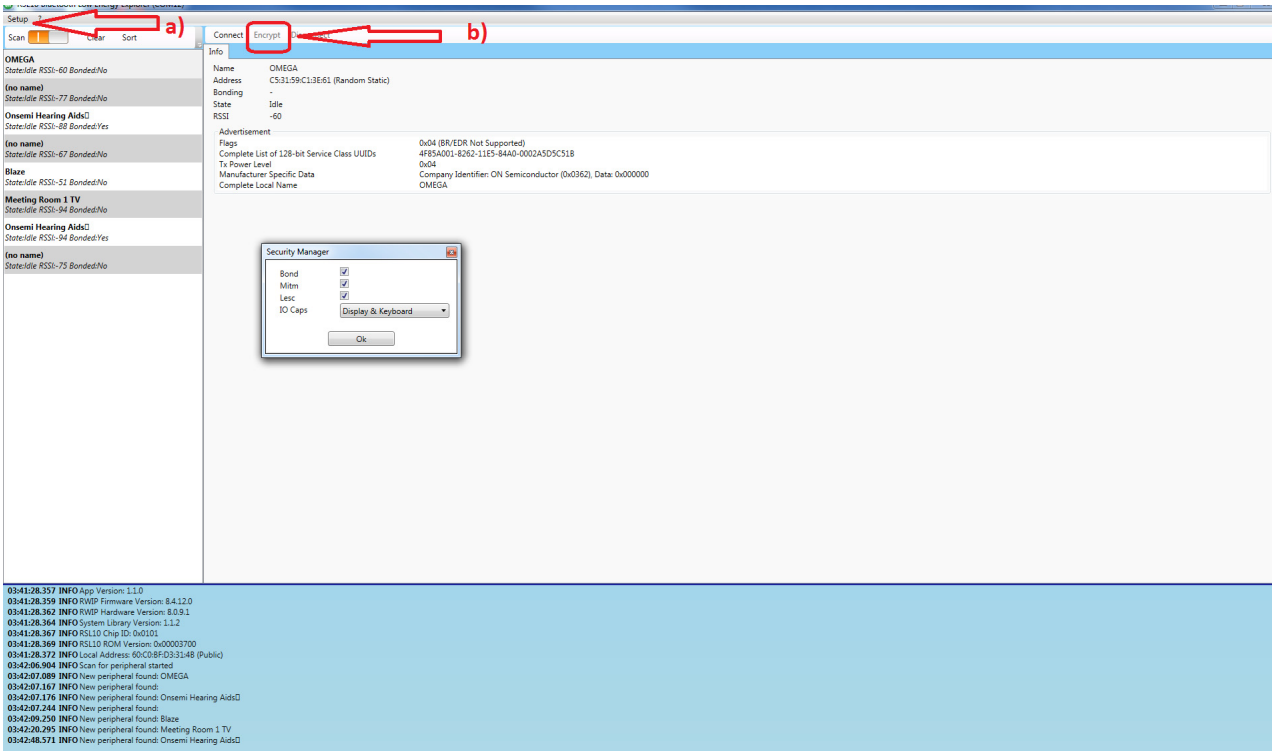

Figure 6. Setting the Security Options

Table 3. Security Manager Abbreviation Meanings

Abbreviation	Definition
Bond	Bonding
Mitm	Man in the Middle
Lesc	LE Security Connections

2. To change the connection to an encrypted one, press the **Encrypt** button.
3. If a passkey is needed, it is displayed, or can be entered in the user action area (see Section 2.3, “Using Bluetooth Low Energy Explorer” on page 4).

2.5 Bond Manager

The Bond Manager is accessible in the main menu under **Settings** > **Bonds**:

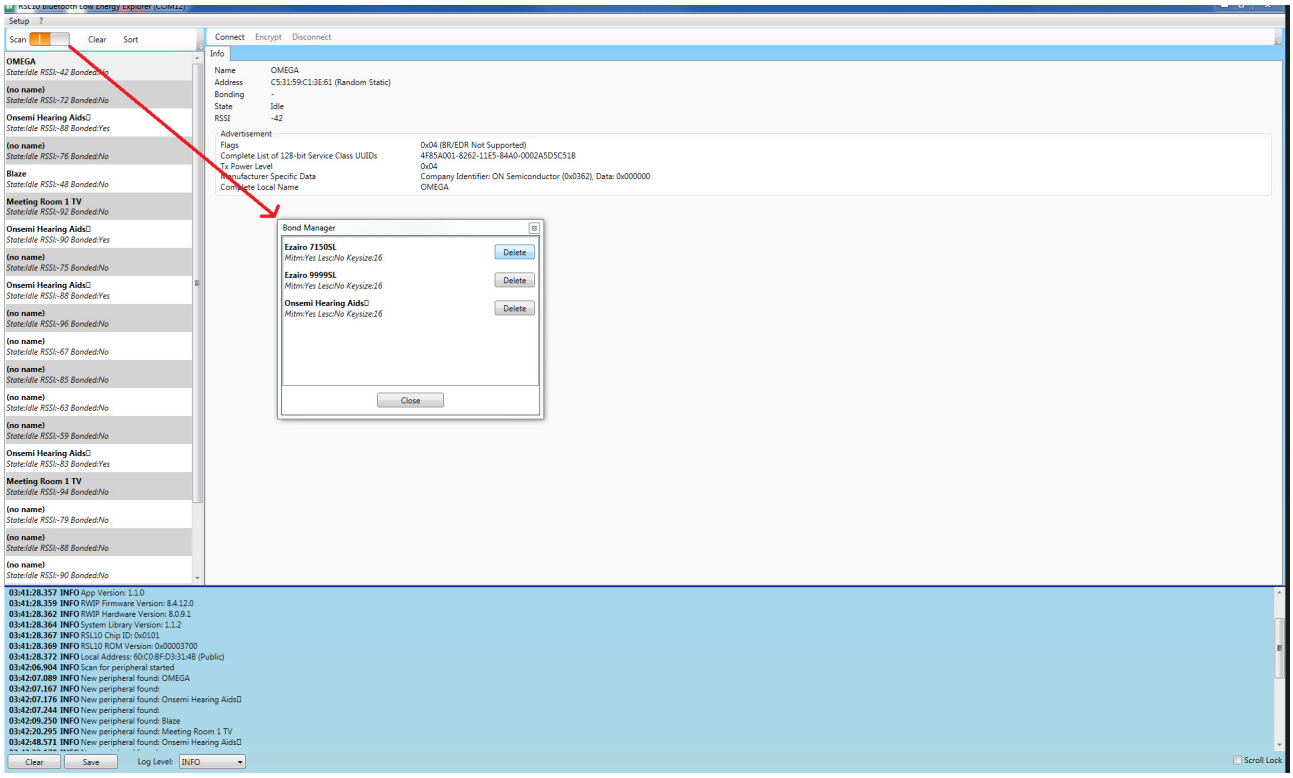

Figure 7. Bond Manager

In the **Bond Manager** window, all currently active bonds are displayed. There is also the option to delete them. (See Figure 7, above.)

2.6 Dongle Information

The Bluetooth Low Energy Explorer version, and Dongle version and ID, can always be accessed in the **About** dialog (see Figure 8 on page 10).

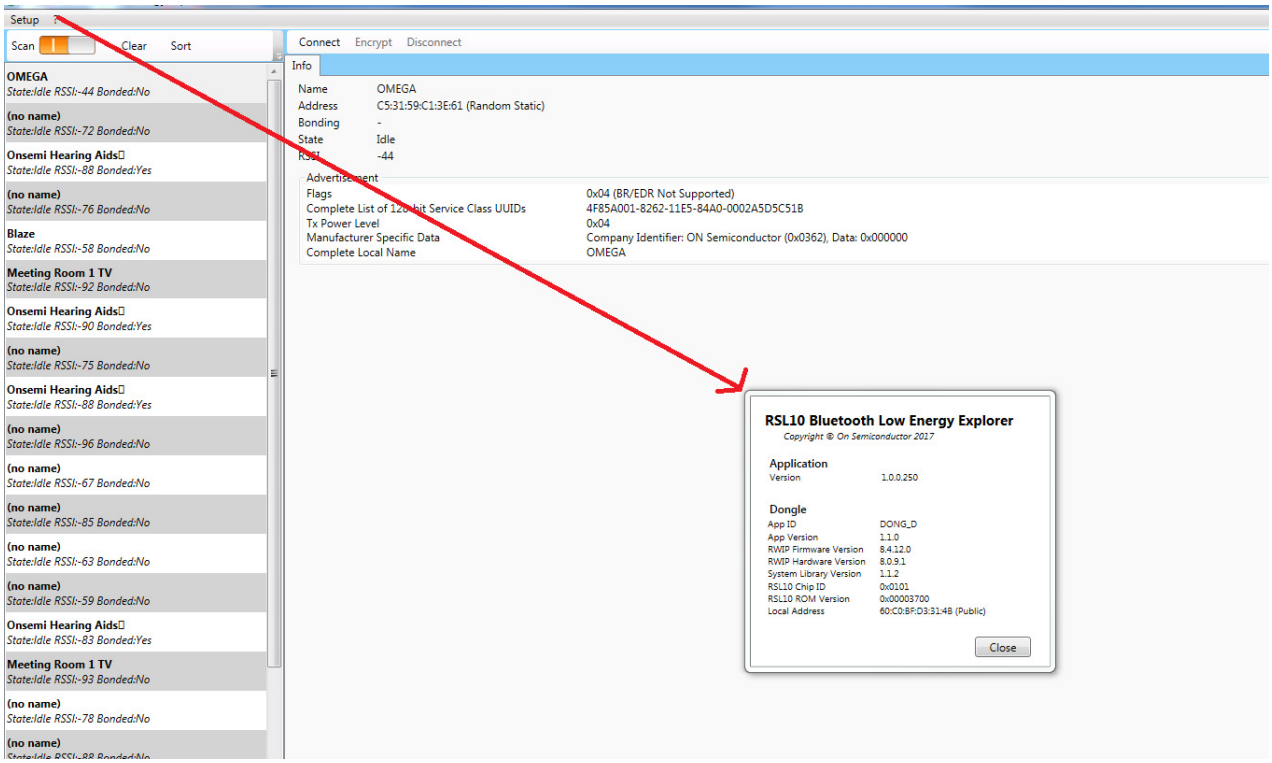

Figure 8. Version and ID Info

2.7 Dongle Updater

For updating the firmware on the dongle itself, a dedicated Python script is available called *updater.py*.

NOTE: A Python interpreter (minimum version 2.7) with the pySerial extension must be installed on the computer before executing *updater.py*.

2.8 Dongle Hardware

The dongle has a dual color LED, which is used to represent different functions as shown in Table 4, below:

Table 4. LED Colors and Functions

Function	LED Color
When using the HciFW	constant blue
When using the DongleFW	a short flash during start up, and then off
When the dongle is in the bootloader	constant red

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