

**MX885203A**  
***Bluetooth* Low Energy**  
**Measurement Software**  
**for the MT8852B**  
**Operation Manual**

**Third Edition**

- For safety and warning information, please read this manual before attempting to use the equipment.
- Additional safety and warning information is provided within the MT8852B *Bluetooth* Test Set Operation Manual. Please also refer to it before using the equipment.
- Keep this manual with the equipment.

**ANRITSU CORPORATION**

## Safety Symbols

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This indicates a very dangerous procedure that could result in serious injury or death if not performed properly.



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This indicates a hazardous procedure that could result in serious injury or death if not performed properly.



**CAUTION**

This indicates a hazardous procedure or danger that could result in light-to-severe injury, or loss related to equipment malfunction, if proper precautions are not taken.

### Safety Symbols Used on Equipment and in Manuals

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This indicates a prohibited operation. The prohibited operation is indicated symbolically in or near the barred circle.



This indicates a compulsory safety precaution. The required operation is indicated symbolically in or near the circle.



This indicates a warning or caution. The contents are indicated symbolically in or near the triangle.



This indicates a note. The contents are described in the box.



These indicate that the marked part should be recycled.

MX885203A

*Bluetooth* Low Energy Measurement Software for the MT8852B  
Operation Manual

5    October    2018 (First Edition)

5    June        2020 (Third Edition)

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**Revision History:**

February 29th, 2020

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# Chapter 1 — General Information

## 1-1 About this Manual

This manual details the MX885203A PC software.

The MX885203A software is available on MT8852B units fitted with option 27. It is provided as standard on the MT8852B-043 low energy only model.

Data length extension is available with units fitted with option 34.

Bluetooth 5 2Mbps (2LE) is available with units fitted with option 35.

Bluetooth 5 Long Range (BLR) is available with units fitted with option 36.

Bluetooth 5.1 Angle of Arrival (AoA) and Angle of Departure (AoD) are available with units fitted with option 37.

Explanations in this manual apply equally to all MT8852B model types unless otherwise stated.

## Comments on this Manual

Every effort has been made to ensure that this manual is thorough, easy to use, and free from errors. However, to ensure continued improvement, we would welcome your comments on this, or any other Anritsu document.

Please contact us at the address below if you have any comments, good or bad, find any errors or omissions, or have any suggestions on how our documentation could be improved further.

[bluetooth.support@anritsu.com](mailto:bluetooth.support@anritsu.com)

Your comments will be logged and reviewed, and whenever possible, will be reflected in a subsequent release of the document.

## Software Versions

This document provides information on the following software versions:

MX885203A software: 1.20.012

MT8852B firmware: 5.00.019

Some of the features documented in this manual may not be available to users of earlier software releases. Check the software versions by following the procedures below.

To check the version of the MX885203A software:

1. Start the low energy measurement software.
2. Click [Help] > [About Bluetooth low energy measurement software...].

To check the MT8852B firmware version:

1. Turn on the MT8852B and press **Config**.
2. Use the arrow keys to position the cursor at "MT8852B" and press **Sel**.
3. Use the arrow keys to position the cursor at "Identity" and press **Sel**.
4. Check the number that displays to the right of "Version".

Associated Documentation

The documentation for the MT8852B *Bluetooth* Test Set is supplied on the product CD shipped with the unit. Document part numbers are listed in the table below.

Table 1-1. Associated Documentation





Part number	Document
M-W3968AE	MT8852B <i>Bluetooth</i> Test Set Operation Manual
M-W3969AE	MT8852B <i>Bluetooth</i> Test Set Remote Programming Manual

The pdf files of the above documents can be viewed using Adobe Reader™ , a freeware program that can be downloaded from <https://www.adobe.com/>.

Conventions

The following conventions have been adopted in this manual.

Table 1-2. Notation Conventions

Item	Convention
MT8852B	Unless otherwise stated, the name “MT8852B” is used generically throughout this manual to refer to all models of the MT8852B <i>Bluetooth</i> Test Set.
EUT	The <i>Bluetooth</i> enabled device being tested is referred to as the EUT (Equipment Under Test).
	The five hard keys on the MT8852B (Run, Loop/Stop, Script, Config, and Preset) are depicted using an image of the key in question.
	The keys on the MT8852B numeric keypad are depicted using an image of the key in question.
[Setup]	The names of soft keys appearing on the front panel of the MT8852B are enclosed in square brackets.
“Output Power”	Text appearing on the display of the MT8852B is enclosed in quotation marks when used in a body of text. Items with quotation marks are selected by pressing  .
 > “MT8852B”	A chevron (>) is used to indicate that the user should select the keys or commands in sequential order.
[Packet Contents]	The names of software windows, dialogs, and tabbed pages are enclosed in square brackets.

## 1-2 Bluetooth Low Energy

*Bluetooth* low energy is an addition to the *Bluetooth* Standard introduced in December 2009, and this has been enhanced further by *Bluetooth* 5, which provides a higher data rate and longer range. It is designed specifically for small, button-cell battery powered devices for which low power-consumption and low cost are the primary concerns. *Bluetooth* low energy is designed to work side by side with existing *Bluetooth* devices. It operates in the 2.4 GHz ISM band and offers data rates of 125 kbps/500 kbps/1 Mbps/2 Mbps. *Bluetooth* low energy devices are ideally suited to wireless health care equipment such as wireless blood sugar monitors, fitness performance equipment such as heart rate monitors, and remote displays (such as a wrist watch display) for displaying data from sensing devices.

Unlike the standard for Basic Rate and EDR testing, the *Bluetooth* low energy specification does not define a signalling based test mode connection to the EUT. The EUT must be controlled using defined test control commands sent through the EUT HCI interface. A simple 2-Wire control interface specification allows low energy devices to be controlled without the complexity of a USB or fully featured UART interface. The MT8852B, with *Bluetooth* low energy measurements option, sends these test controls to the EUT to deliver fully automated testing. With the use of this integrated interface, the MT8852B can run a test script that with a single key press to test *Bluetooth* low energy performance of an EUT.

With the BLE Data length Extension MT8852B-034 option, the instrument can test *Bluetooth* low energy devices that support the data length extension defined in *Bluetooth* v4.2. The addition of 2 Mbps (2LE) and Long Range (BLR) options, MT8852B-035/036, allows testing of *Bluetooth* 5 EUT's. The addition of Angle of Arrival (AoA) and Angle of Departure (AoD) options, MT8852B-037, allows testing of Bluetooth 5.1 EUT's.

## 1-3 Product Description

*Bluetooth* RF testing of low energy devices can be performed on the MT8852B by upgrading to firmware version 5.00.016 and installing option 27 (*Bluetooth* low energy), or by purchasing an MT8852B-043.

Option 27 enables users to perform low energy measurements on the MT8852B or by using the MX885203A PC software described in this manual.

The MX885203A software is used to view low energy packets, make transmitter and receiver measurements, and execute automated low energy test scripts. It provides the ideal environment for detailed graphical analysis of low energy packets and allows the user to configure and run a low energy test script from the PC.

### Features

- Graphical display of traces and numerical display of results.
- Create and execute low energy test scripts in a familiar Windows environment.
- Provides a colour-coded display of data packets.
- Transmit low energy packets to the EUT using a standard Windows interface.
- Import script and measurement settings directly from the MT8852B.

### Supported Tests

The MX885203A software enables users to perform three transmitter and three receiver tests in full compliance the *Bluetooth* low energy specification.

#### Transmitter Tests

- **Output Power**  
Verifies the average power and peak to average power emitted from the EUT.
- **Modulation characteristics**  
Verifies that the modulation characteristics of the transmitted signal are correct.
- **Carrier frequency offset and drift**  
Verifies that the carrier frequency offset and carrier drift of the transmitted signal is within specified limits
- **Tx Power Stability**  
Verifies that the Tx power stability of the transmitted signal is within specified limits

#### Receiver Tests

- **Receiver sensitivity**  
Verifies the receiver sensitivity of the EUT.
- **Maximum input signal level**  
Verifies that the receiver is able to demodulate a wanted signal at high signal input levels.
- **PER Report Integrity**  
Verifies that the DUT PER report mechanism reports the correct number of received packets to the tester.

Tests can be completed with packet length 37 Octets for BLE 4.0/4.1, up to 255 Octets for BLE 4.2, 2Mbps or Long Range for Bluetooth 5 and Angle of Arrival and Angle of Departure for Bluetooth 5.1.

# Chapter 2 — Preparation for Use

## 2-1 Required Operating Environment

The following environment is required to install and run the MX885203A software successfully.

- Microsoft Windows 10.
- English, Chinese, or Japanese language environment.
- PC display settings of 1024 x 768 or greater.
- National Instruments GPIB interface card (recommended) or GPIB card that is VISA compatible or has NI-488.2 support.

## 2-2 Installing the MX885203A Software

Double-click the “Setup.exe” file and follow the instructions that display on screen.

<b>Note</b>	The low energy software can be installed on the same PC as the EUT control software or on a separate PC.
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## 2-3 Configuring the MT8852B for Low Energy Testing

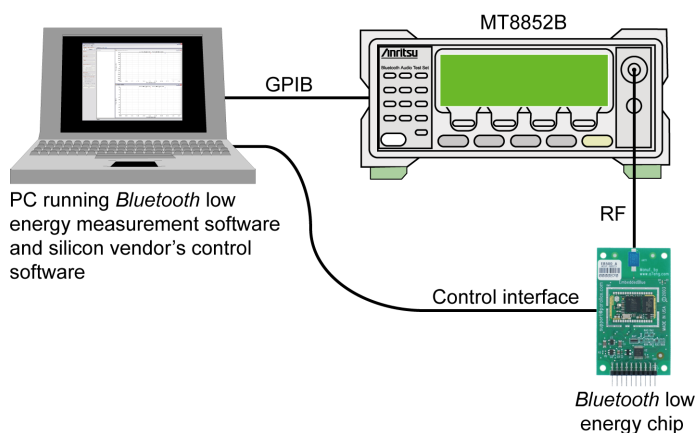
### Test a *Bluetooth* Low Energy Device Controlled through a Proprietary Interface

For *Bluetooth* Low Energy devices without a Direct Test Mode interface, the EUT must be initialized using the silicon vendor's control software running on a remote PC.

<b>Note</b>	Test scripts (as detailed in chapter 6) cannot be run for <i>Bluetooth</i> low energy devices that do not have a Direct Test mode interface.
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#### Using the Silicon Vendor's Control Software

1. Connect an RF cable between the antenna connector on the EUT and the “RF Port” on the front of the MT8852B.
2. Connect the GPIB cable from the rear of the MT8852B to the PC.
3. Connect the EUT control interface lead from the PC running the silicon vendor's control software to the EUT.
4. Ensure the MT8852B is connected to the mains power supply.
5. Press the [On/Standby] key on the front panel of the MT8852B.



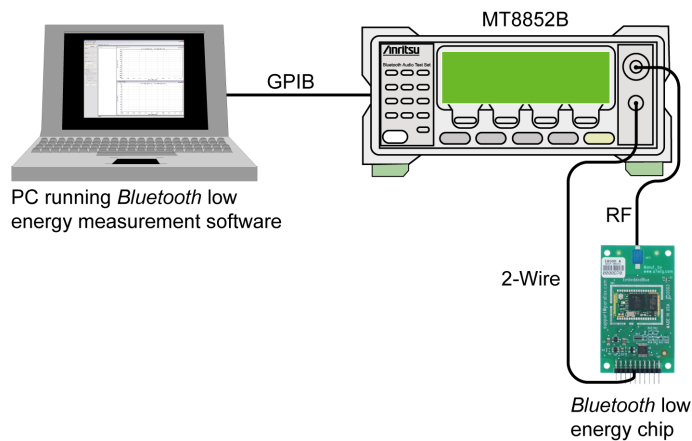
**Figure 2-1.** Configuration for Single Mode Device using Silicon Vendor's Control Software

## Test a *Bluetooth* Low Energy Device Controlled through a Direct Test Mode Interface

For *Bluetooth* Low Energy devices with a Direct Test Mode interface, the EUT can be controlled from the MT8852B.

### Using a 2-Wire Connection

1. Connect an RF cable between the antenna connector on the EUT and the “RF Port” on the front of the MT8852B.
  2. Connect the GPIB cable from the rear of the MT8852B to the PC.
  3. Connect the 2-Wire lead from the “EUT Control” port on the front of the MT8852B to the interface on the EUT.
  4. Ensure the MT8852B is connected to the mains power supply.
  5. Press the [On/Standby] key on the front panel of the MT8852B.
- 

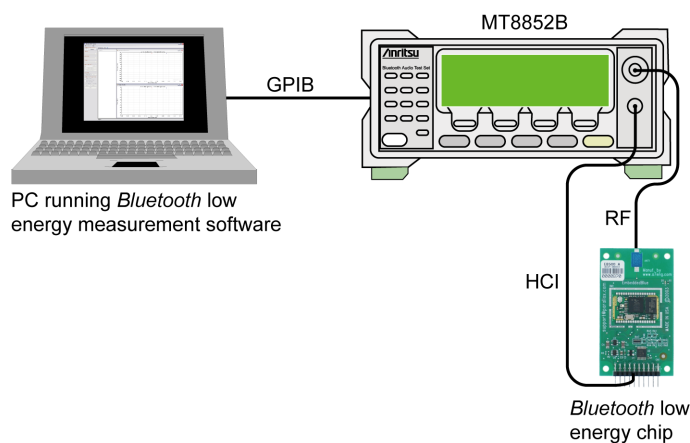


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**Figure 2-2.** Configuration for Bluetooth Low Energy Device using a 2-Wire Connection

## Using a HCI Connection

1. Connect an RF cable between the antenna connector on the EUT and the “RF Port” on the front of the MT8852B.
  2. Connect the GPIB cable from the rear of the MT8852B to the PC.
  3. Connect the HCI control interface lead from the “EUT Control” port on the front of the MT8852B to the HCI interface on the EUT.
  4. Ensure the MT8852B is connected to the mains power supply.
  5. Press the [On/Standby] key on the front panel of the MT8852B.
- 



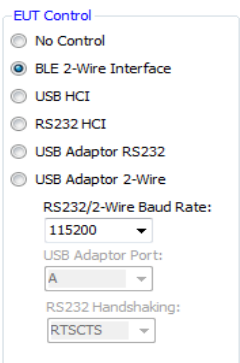
**Figure 2-3.** Configuration for Bluetooth Low Energy Device with HCI Interface

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4. Use the buttons in the "EUT Control" field to select the method of HCI communication between the EUT and the MT8852B.



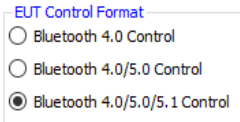
The screenshot shows a dialog box titled "EUT Control". It contains several radio button options: "No Control", "BLE 2-Wire Interface" (which is selected), "USB HCI", "RS232 HCI", "USB Adaptor RS232", and "USB Adaptor 2-Wire". Below these options are three dropdown menus: "RS232/2-Wire Baud Rate:" with "115200" selected, "USB Adaptor Port:" with "A" selected, and "RS232 Handshaking:" with "RTSCTS" selected.

Figure 3-2. EUT Control Setting

Selecting "No Control" informs the software that, as an HCI or 2-Wire interface is unavailable, the EUT is being controlled using the vendor's own control software. Script testing (as detailed in chapter 6) is unavailable at this setting.

For Bluetooth 5 or 5.1 devices, there are two or three command formats for Direct Test Mode 1 Mbps Testing.

- Bluetooth 4.0 Control - This option prioritizes to use the command format from Bluetooth 4.0.
- Bluetooth 4.0/5.0 Control - This option prioritizes to use the command format from Bluetooth 5.0.
- Bluetooth 4.0/5.0/5.1 Control - This option prioritizes to use the command format from Bluetooth 5.1.



The screenshot shows a dialog box titled "EUT Control Format". It contains three radio button options: "Bluetooth 4.0 Control", "Bluetooth 4.0/5.0 Control", and "Bluetooth 4.0/5.0/5.1 Control" (which is selected).

Figure 3-3. Direct Test Mode Command Format

# Chapter 4 — Transmitter Testing

## 4-1 Testing the EUT Transmitter

1. With a GPIB connection established as detailed in chapter 3, click the [Tx Testing] tab to display the tabbed page shown below. The [Tx Testing] tab allows the user to make power, frequency, and modulation measurements on low energy packets transmitted from the EUT.

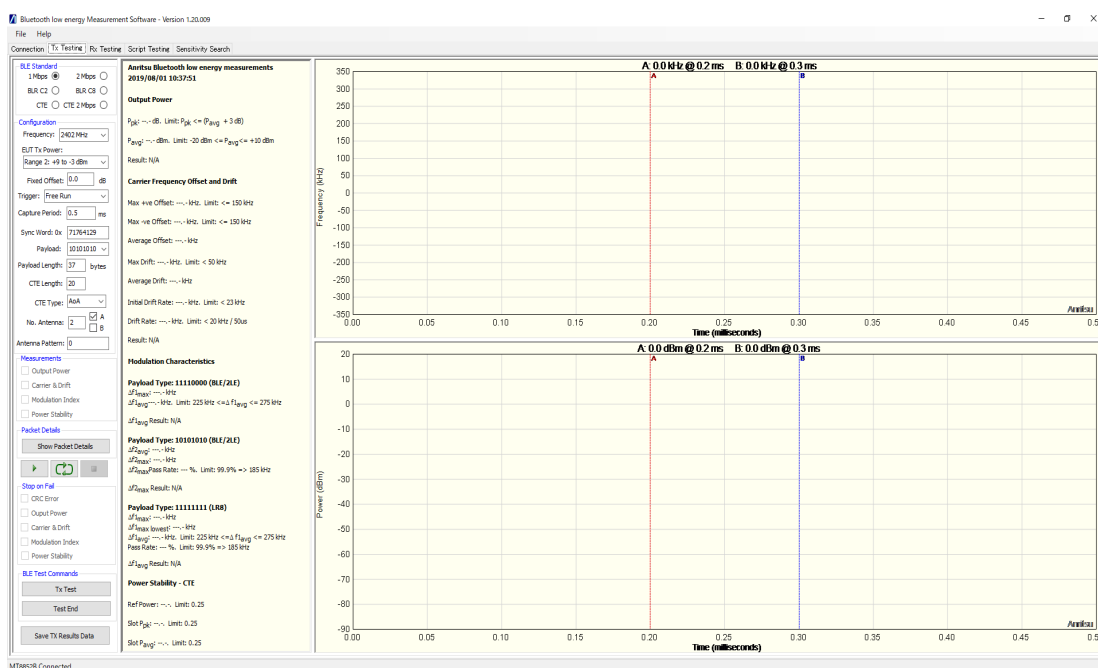


Figure 4-1. [Tx Testing] Tab

2. At the "Frequency" drop-down field, select the frequency at which data will be transmitted from the EUT.
3. At the "EUT Tx Power" drop-down field, select the power level range at which data will be transmitted from the EUT.
4. At the "Trigger" drop-down entry field, select the trigger mechanism.

### Note

"Internal RF" triggers on the EUT power burst rising edge. "Trigger" should be set to "Internal RF" to enable stable packet capture and obtain a numeric display of measurement results.

If "External BNC Input" or "Free Run" is selected the frequency deviation and power profile traces are generated but numerical results are not available.

5. If viewing a graphical display of Tx packets without selecting measurements, set the capture time by entering a value in the "Capture Period" field. The capture period can be set in the range of 0.1 ms to 3.0ms for 1 Mbps or 0.1ms to 1.5 ms for 2 Mbps or 0.1ms to 17.4ms for BLR.

**Note** If measurements are selected, the capture period is set by default to the packet duration.

6. Set the Sync word to match the sync word of the packet under test. The defined sync word for a reference packet is 71764129. If the sync word is not set to match that of the packet being analysed, the software will not be able to decode the packet and display traces or measurement results.
7. Select the appropriate payload.
8. Select the appropriate payload length.

**Note** The payload must be set to 10101010 to perform the Carrier & Drift measurement. The Modulation Index measurement is unavailable if the payload is set to PRBS9.

9. Select the Bluetooth Low Energy Data Rate.

1 Mbps ☒ 2 Mbps ☐  
BLR C2 ☐ BLR C8 ☐  
CTE ☐ CTE 2 Mbps ☐

**Figure 4-2.** Data Rate Setting

10. Select the Tx measurements to be performed by selecting the required check boxes.
11. If required, set a "Stop on Fail" for all or any of the selected measurements. "Stop on Fail" enables the user to capture failed packets for analysis when the failure is intermittent.
12. Configure the EUT to transmit low energy packets to the MT8852B in line with the settings made above.
- For EUTs without a Direct Test Mode interface, use the silicon vendor's control software.
  - For EUTs with a Direct Test Mode interface, the control commands are sent to the DUT when the capture is initiated.



right-click pop-up menu also allows the user to print and save the image, or to display the sample points on the trace.

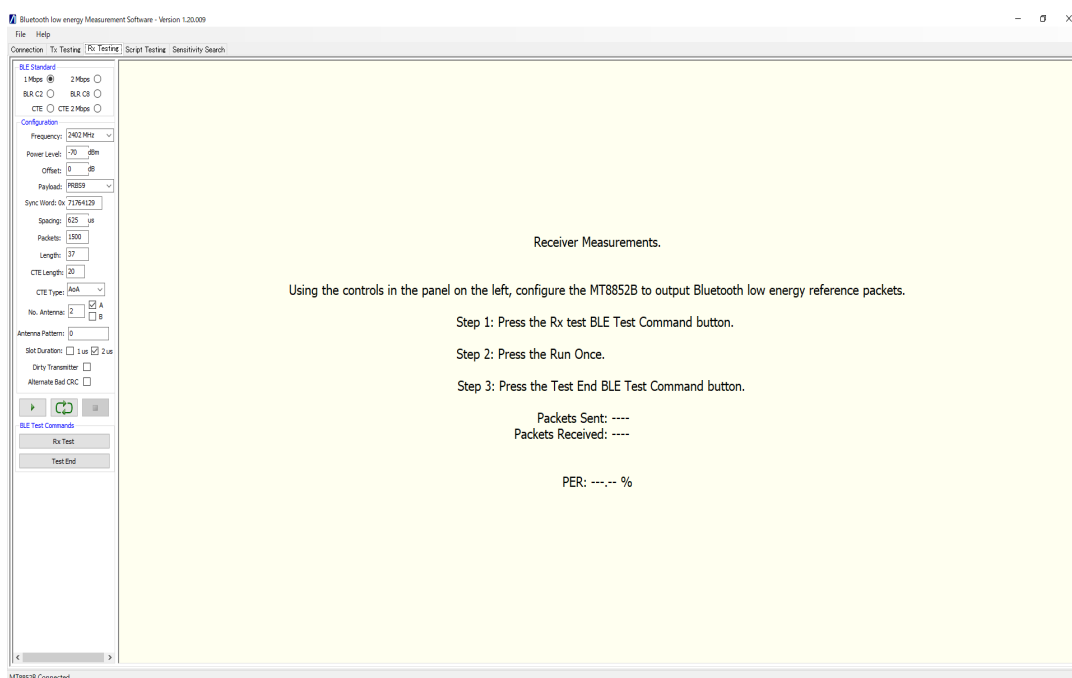
# Chapter 5 — Receiver Testing

## 5-1 Using the Silicon Vendor's Control Software

Receiver testing can be facilitated on Bluetooth Low Energy devices without an available Direct Test Mode connection by using the silicon vendor's test control software.

1. Establish a GPIB connection as detailed in chapter 3.
2. Set “EUT Control” on the [Connection] tab to “No Control”.
3. Click the [Rx Testing] tab.

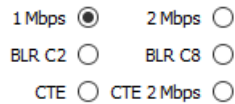
The [Rx Testing] tab allows the user to generate and transmit *Bluetooth* low energy packets to the EUT.



**Figure 5-1.** [Rx Testing] Tab for “No Control” Setting



4. At the "Frequency" drop-down field, select the frequency at which data will be transmitted to the EUT.
5. At the "Power Level" drop-down field, select the power level range at which data will be transmitted to the EUT.
6. Select the appropriate payload.
7. Select the appropriate payload length.

8. Set the Sync word. The defined sync word for a reference packet is 71764129. The sync word should be set to match the requirements of the EUT.
  9. Set the spacing. The spacing setting defines the number of microseconds between the start of consecutive packets.
  10. Select the Bluetooth Low Energy Data Rate.
- 



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**Figure 5-2.** Data Rate Setting

11. Specify the number of packets to be transmitted to the EUT.
12. Use the silicon vendor's control software to configure the EUT for receipt of low energy packets from the MT8852B.
13. Click  (run once) or  (run continuously) to transmit data.
14. Read the number of received packets using the silicon vendor's control software and calculate receiver sensitivity by making the calculation below.  
$$\text{PER \%} = 100 \times (1 - (\text{packets received} / \text{packets sent}))$$



## 5-2 Using a Direct Test Mode Control Interface

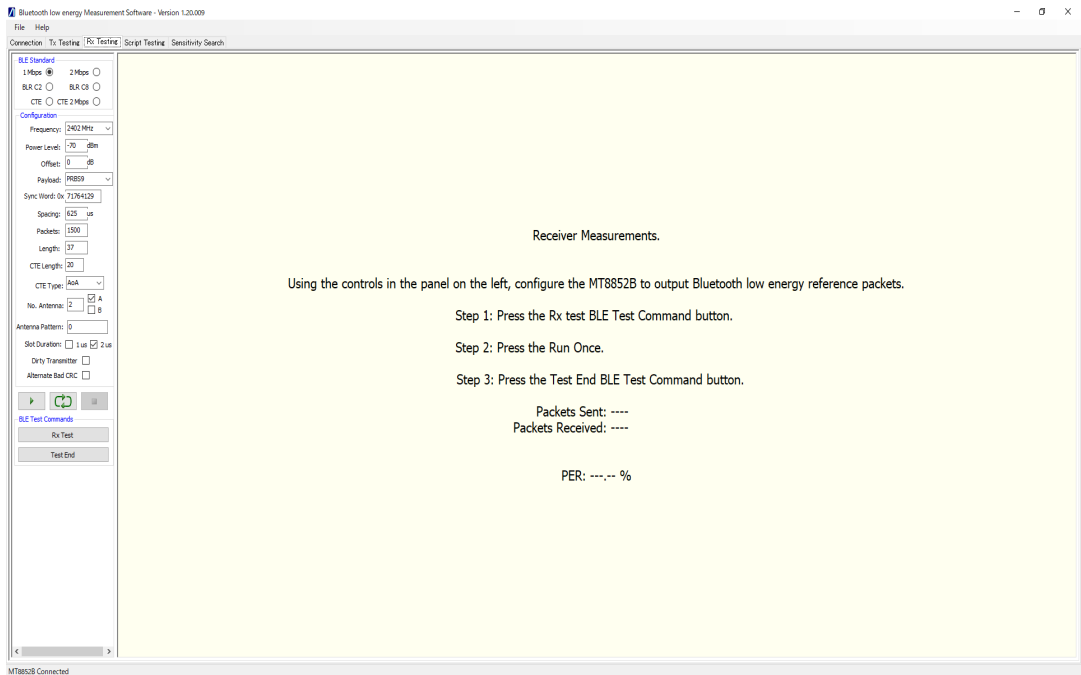
Receiver testing can be performed automatically on devices with an available HCI or 2-Wire connection.

1. Establish a GPIB connection as detailed in chapter 3.
2. Select the appropriate “EUT Control” setting on the [Connection] tab.

**Note** Receiver sensitivity cannot be calculated automatically if “EUT Control” is set to “No Control”. Refer to section 5-1 above if an HCI or 2-Wire connection is not available on the EUT.

3. Click the [Rx Testing] tab.

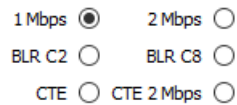
The [Rx Testing] tab allows the user to generate and transmit *Bluetooth* low energy packets to the EUT.



**Figure 5-3.** [Rx Testing] Tab for EUT with Direct Test Mode Control



4. At the "Frequency" drop-down field, select the frequency at which data will be transmitted to the EUT.
5. At the "Power Level" drop-down field, select the power level range at which data will be transmitted to the EUT.
6. Select the appropriate payload.
7. Select the appropriate payload length.

8. Set the Sync word. The defined sync word for a reference packet is 71764129. The sync word should be set to match the requirements of the EUT.
  9. Set the spacing. The spacing setting defines the number of microseconds between the start of consecutive packets.
  10. Specify the number of packets to be transmitted to the EUT.
  11. Select the Bluetooth Low Energy Data Rate.
- 



---

**Figure 5-4.** Data Rate Setting

12. Click [Rx Test] to configure the EUT for receipt of low energy packets from the MT8852B.
13. Click  (run once) or  (run continuously) to transmit data.
14. Click [Test End]. The PC application reads the number of correctly received packets from the EUT.
15. The PER is calculated automatically and displays on screen.

# Chapter 6 — Script Testing

## 6-1 Running a Low Energy Test Script

### Note

Test scripts cannot be run from the *Bluetooth* low energy measurement software if the EUT does not have an available Direct Test Mode connection. The “EUT Control” setting on the [Connection] tab must be set to “No Control” if an HCI or 2-Wire connection is not available.

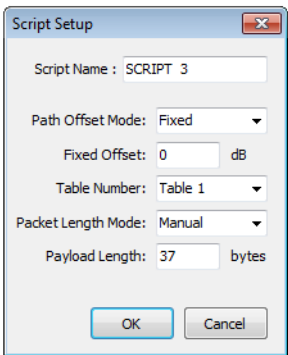
1. With a GPIB connection established as detailed in chapter 3, click the [Script Testing] tab to display the tabbed page shown below. The [Script Testing] tab allows the user to configure and execute an automated test script of *Bluetooth* low energy Tx and Rx test cases.



**Figure 6-1.** [Script Testing] Tab

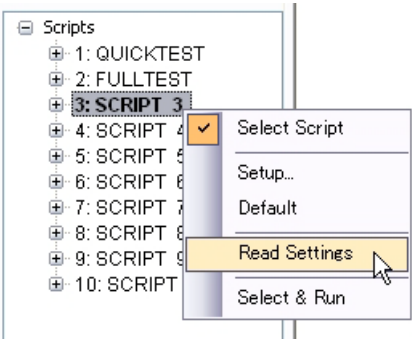
2. Set the power used for the Tx test cases in the script at "EUT Tx Power". This setting is normally left at "Automatic Ranging".

3. Double click the required script within the test tree to open a [Script Setup] dialog such as that below.



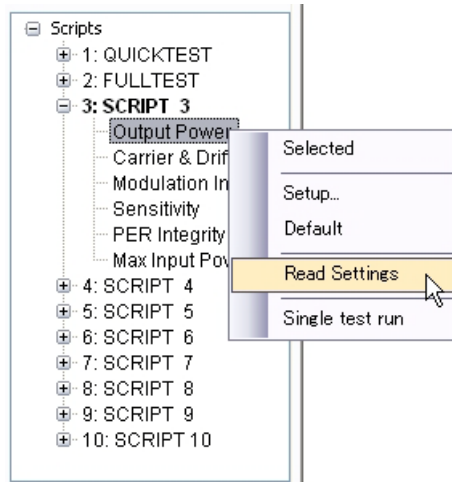
**Figure 6-2.** [Script Setup] Dialog

4. Enter a name for the script, set up a path loss if required, and click [OK] to save the settings.
5. Follow any of the three procedures outlined below to configure the test cases within the script.
- Right-click the script name and select [Read Settings] to read all the selected script and test settings from the MT8852B.



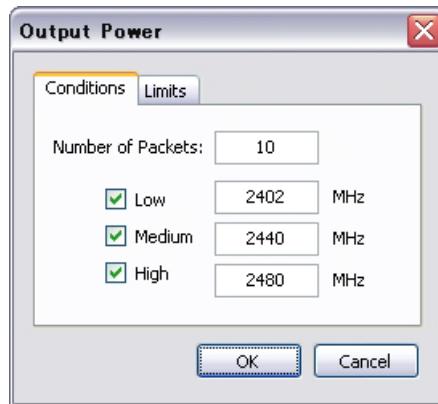
**Figure 6-3.** Read Settings for Script

- Right-click any of required test cases within the script and select [Read Settings] to read all the settings for that test from the MT8852B. Repeat this process as required for each of the test cases in the script.



**Figure 6-4.** Read Settings for Test Case


- Double click any of the required test cases within the script. Set the test conditions and limits in the dialog that displays and click [OK] when complete. Repeat this process as required for each of the tests in the script.



**Figure 6-5.** Output Power Test Conditions and Limits

6. Right-click each of the test cases to be run and click [Selected] from the pop-up menu. The test cases display in bold to indicate selection for execution when the script is run.

**Note** Only test cases displaying in bold are executed when the script is run.

7. Right-click the script to be executed and select [Select Script] from the pop-up menu. The script name displays in bold to indicate that it is selected for execution.
8. Click  (run once) to execute the test script.
9. When the script is complete, a test report such as that shown below displays in the frame to the right. The report can be saved and printed as required using the buttons on the [Script Testing] tab.

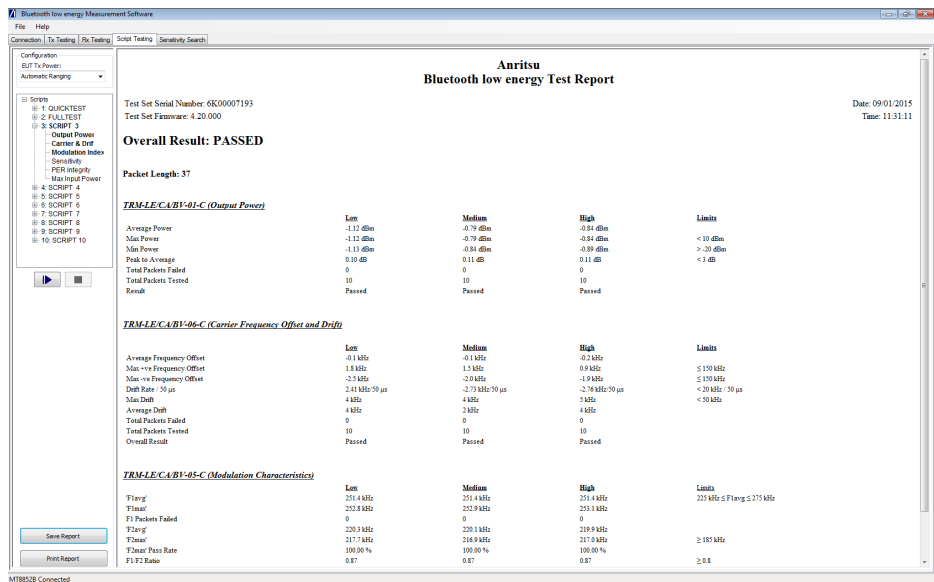


Figure 6-6. Test Report

# Chapter 7 — Running a Sensitivity Search

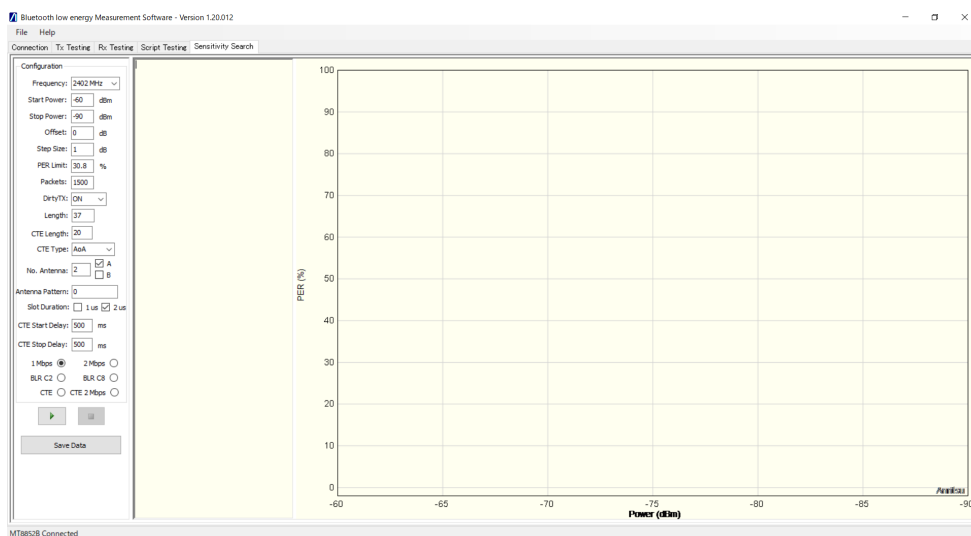
## 7-1 Running a Sensitivity Search

The [Sensitivity] tab allows the user to configure and run sensitivity sweeps on any of the 40 channels.

### Note

A sensitivity search cannot be performed if the “EUT Control” setting on the [Connection] tab is set to “No Control”.

1. Click the [Sensitivity Search] tab.



**Figure 7-1.** [Sensitivity Search] Tab

2. At the "Frequency" drop-down field, select the frequency at which data will be transmitted to the EUT.
3. Enter the “Start” and “Stop” RF level values within which the sensitivity sweep will be performed.
4. If required, enter an “Offset” in dB. Specifying an offset allows the user to compensate for path loss from the MT8852B RF port and EUT test port.
5. Enter a “Step Size” in dB. The step size determines the number of measurements that will be made within the specified power range.
6. At “PER Limit”, specify the maximum permissible error rate percentage. The test is stopped when the specified limit is reached.

- 7. At “Packets”, specify the number of packets to be analyzed at each iteration of the sensitivity sweep.
- 8. At “Dirty TX”, set use of the dirty transmitter to “ON” or “OFF” as required.
- 9. Select the Bluetooth Low Energy Data Rate.

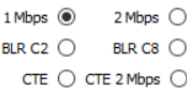



Figure 7-2. Data Rate Setting

- 10. Click  (run once) to start the sensitivity sweep. The PER recorded at each power step is displayed numerically and graphically as shown below.

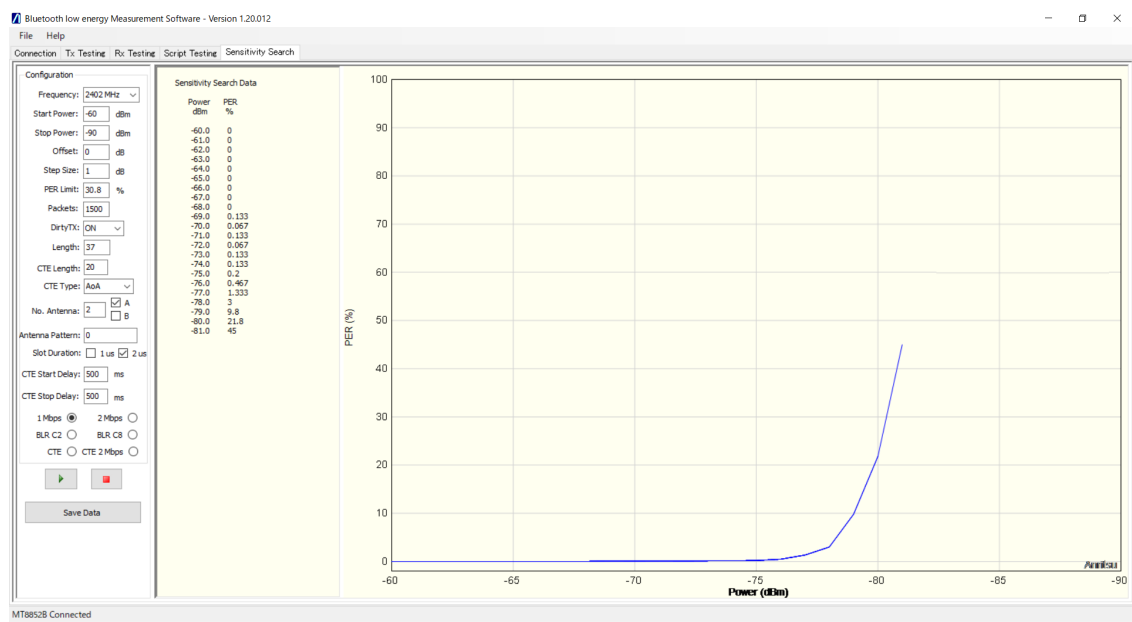
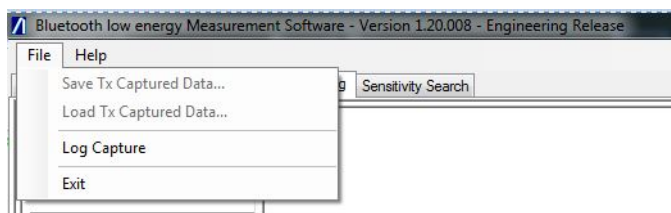


Figure 7-3. Sensitivity Sweep



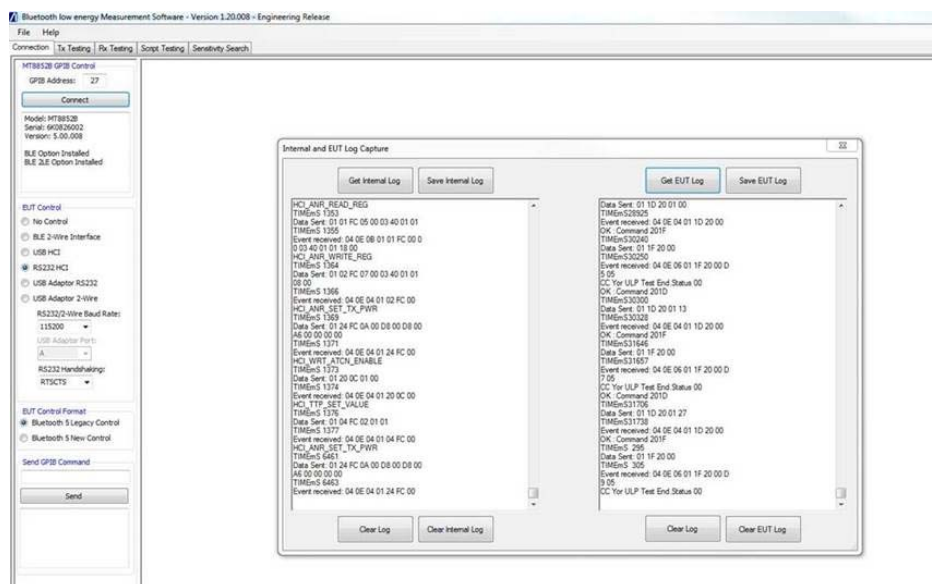
# Chapter 8 — MT8852B Internal Log capture

For support purposes the MT8852B internal logs can be captured and saved to a file. Once a GPIB connection has been established to the MT8852B, the Log Capture button is enabled in the File menu.



**Figure 8-1.** Log Capture

The logs can be captured and saved.



**Figure 8-2.** Log Capture Window



# Appendix A — GPIB PC Card Set-up

The following GPIB driver configuration setup is recommended for reliable GPIB communication with the MT8852B. The setup is expressed in the terms used by the National Instruments GPIB hardware.

## A-1 GPIB Card Settings

The recommended GPIB board settings are as follows:

**Table A-1.** Recommended GPIB Settings

Terminate read on EOS	NO
Set EOI with EOS on write	YES
Type of compare on EOS	8 bit
Send EOI at end of write	YES
EOS byte	10 (0x0A hexadecimal)
System controller	YES
Assert REN when SC	YES
Enable Auto serial polling	NO
NI card. Cable length for HS488	OFF

## A-2 GPIB Device Template

The MT8852B GPIB Default Primary Address is 27. Device templates for the primary address of each device can usually be set up separately. The settings for the device template for the MT8852B are detailed in the table below.

**Table A-2.** GPIB Device Configuration

Terminate Read on EOS	NO
Set EOI with EOS on Write	YES
Type of Compare on EOS	8-bit
EOS Byte	10 (0x0A hexadecimal)
Send EOI at end of write	YES
Readdressing	YES
Secondary address	NONE

