

Bluetooth® Logger and Link Quality Monitor (LQM) Tools

This user's guide describes the TI *Bluetooth*[®] debug tools used to capture and analyze the Bluetooth (BT) firmware log messages and the protocol transactions from the CC256x dual-mode Bluetooth devices or the WL18xx WiLink[™]8 connectivity devices. The BT Logger and the Link Quality Monitor(LQM) tools provide visibility into the inner data and states of the BT controller as well as the information regarding the protocol transactions with the remote devices.

Contents

| 1 | Requir | ements | 3 |
|-------|----------|---------------------------------|----|
| | 1.1 | Hardware Requirements | 3 |
| | 1.2 | Software Requirements | 3 |
| 2 | Installa | ation | 3 |
| 3 | TI Log | ger | 4 |
| | 3.1 | Setting Up the TI BT Logger | 4 |
| | 3.2 | Capturing the Logs | 10 |
| | 3.3 | Analyzing the TI Logger Capture | 13 |
| 4 | Link Q | uality Monitor | |
| | 4.1 | Running the LQM | 17 |
| | 4.2 | Using the LQM | |
| Appen | dix A | Terms and Abbreviations | 25 |

List of Figures

| 1 | Logger Icon | 3 |
|----|--|----|
| 2 | LQM Icon | 3 |
| 3 | Logger Main Working Window | 4 |
| 4 | Opening Logger Settings | 5 |
| 5 | Logger Settings | 5 |
| 6 | Selecting BT Logger in Settings | 6 |
| 7 | Selecting COM Port | 6 |
| 8 | BT Logger Serial Port Settings | 6 |
| 9 | Adding the ILI File | 7 |
| 10 | Selecting HCI/LMP Viewer in Settings | 7 |
| 11 | HCI/LMP Viewer Serial Port Settings | 8 |
| 12 | Adding the XML File | 8 |
| 13 | Properly Configured Logger Settings | 9 |
| 14 | Getting the Logger Ready to Capture the Logs | 10 |
| 15 | BT Controller Initialization Logs | 11 |
| 16 | Saving the Logs | 11 |
| 17 | Selecting Auto Save and Clear | 12 |
| 18 | Configuring Auto Save and Clear | 12 |
| 19 | View Filters | 13 |
| 20 | Logger Highlight Feature | 14 |
| 21 | Log Levels | 15 |
| 22 | Bookmarks and Comments | 15 |

1



| 23 | Find Dialog Box | 16 |
|----|---|----|
| 24 | Time Anchor | 16 |
| 25 | Starting the LQM | 17 |
| 26 | LQM Main Window | 17 |
| 27 | COM Port Selection | 18 |
| 28 | Customize Dialog Box With Commands Tab Selected | 19 |
| 29 | Customize Dialog Box With Toolbars Tab Selected | 20 |
| 30 | Customize Dialog Box With Keyboard Tab Selected | 20 |
| 31 | Customize Dialog Box With Menu Tab Selected | 21 |
| 32 | Customize Dialog Box With Options Tab Selected | 21 |
| 33 | LQM Active Window | 22 |
| 34 | Increase Transmitted Power | 23 |
| 35 | Used-Channels Window | 24 |

List of Tables

| 1 | Menu Bar | 18 |
|---|-------------------------|----|
| 2 | Toolbar | 19 |
| 3 | Terms and Abbreviations | 25 |

Trademarks

WiLink is a trademark of Texas Instruments. Bluetooth is a registered trademark of Bluetooth SIG. FTDI Chip is a trademark of Future Technology Devices; International Limited. All other trademarks are the property of their respective owners.



1 Requirements

1.1 Hardware Requirements

- Access to the BT_UART_DBG pin (for a WL18xx device) or the TX_DBG pin (for a CC256x device).
- A UART-to-USB converter to connect this pin to a PC.

The BT_UART_DBG/TX_DBG pin is a 1.8V UART TX pin that uses the baud rate of 921600. It must be connected to a 1.8V level RX pin of the UART-to-USB converter and the UART-to-USB converter should share the same ground as the BT controller.

NOTE: Multiple UART-to-USB adapters are available on the market, such as the FTDI Chip[™] TTL-232RG-VREG1V8-WE.

1.2 Software Requirements

- BT Logger and LQM applications. These applications are part of the WiLink Wireless Tools package (download link).
 - **NOTE:** Once the Wireless tools are installed, the installation files can be found at the following path:

C:\Program Files (x86)\Texas Instruments\Wireless Tools

This directory is referred to as the Installation directory throughout this document.

- ILI and XML configuration files. The latest files can be downloaded from the following links:
 - For WL18xx : WL18XX-BT-SP
 - For CC2564C : CC256XC-BT-SP
 - For CC256xB/CC2564MODN/CC2564MODA : CC256XB-BT-SP

2 Installation

The BT Logger and LQM are part of the TI wireless tools package release. When the wireless tools package is installed, the Logger and LQM icons are created in the Texas Instrument\Wireless Tools folder at Start→Programs and on the desktop (see Figure 1 and Figure 2).



Figure 1. Logger Icon



Figure 2. LQM Icon

Requirements



TI Logger

3 TI Logger

The TI BT Logger is used to capture the firmware log messages and protocol transactions from the BT controller. The Logger has the following ports.

- BT Logger 1: All the firmware traces are captured under this port.
- HCI/LMP viewer 1: All the protocol transaction messages are captured under this port.

NOTE: In order to capture the complete logs, information from both of these ports must be captured and saved.

3.1 Setting Up the TI BT Logger

Once the hardware is setup for the log capture and the required software is installed on the PC, the following steps must be used to properly configure the BT Logger:

1. Double-click the Logger icon to start the Logger application. The main working window of the logger should appear as shown in the below.

| ×. | 🖞 Untitled - Logger 5.0 - Not Connected — 🗆 🛛 🕹 | | | | | | | | | | | | | | | |
|-------------|---|---|-------|--|--|-----|------|--------|-------|---------------|------|-------------|---------------------|-------------|-------------|----|
| | e <u>E</u> dit | | | | | | | | 1 | | | | | | | _ |
| |) 🖻 🖬 | | 8 X | | | Z 🖉 | 8 | j 🗃 | 18 !× | 1 | | | | | 1 | |
| 1 | 1 | # | Level | | | | Time | | Port | File Name | Line | Information | | Local Clock | Network Clo | ck |
| 2 3 4 | | | | | | | | | | | | | | | | |
| 3 | | | | | | | | | | | | | | | | |
| 4 | | | | | | | | | | | | | | | | |
| 5 | | | | | | | | | | | | | | | | |
| 5 6 7 | | | | | | | | | | | | | | | | |
| 7 | | | | | | | | | | | | | | | | |
| 8 | | | | | | | | | | | | | | | | |
| 9 | | | | | | | | | | | | | | | | |
| 10 | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | |
| | < | | | | | | | | | | | | | | | > |
| Rea | dy | | | | | | | | | | | Auto Save | View: <none></none> | Logs: 0 / 0 | | 11 |

Figure 3. Logger Main Working Window

4



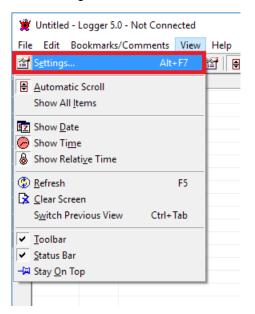


Figure 4. Opening Logger Settings

The Logger Settings dialog box should appear.

| ogger Settings | | | | | | Х |
|-----------------------------------|---------------|-------------|-----------------------------------|---|--|----------|
| Synchronize with external editor: | | | | | | |
| Installed Ports: | | | | | | |
| BT Logger 1 - [2.0 | - | | Setup | | OK | |
| HCI/LMP viewer 1 | - [2.0.0.12] | | Duplicate | | Apply | , |
| | | | | | Cance | |
| | | | Delete | | | |
| Criteria: | | | Export | Import | Defau | ılt |
| Туре | Log # | Level | Text | | Port | ^ |
| View Filter | | | | | | |
| Filter New Logs | | | | | | |
| Critical | | | | | | |
| Tool 1 Tool 2 | | | | | | |
| Highlight Color 1 | | | | | | |
| Highlight Color 2 | | | | | | |
| Highlight Color 2 | | | | | | |
| Highlight Color 4 | | | | | | |
| Highlight Color 5 | | | | | | |
| Highlight Color 6 | | | | | | × |
| < | | | | | > | |
| Log #: Text: - View Schemes | Le | evel: Port: | Sep Sen Verl Prel Min | ria Rules: arate words with nicolon (;) means ical line (!) means ix ∼ indicates a 'r us (-) specifies a ces are as any o | And. Or. not' conditio range. | |

Figure 5. Logger Settings

5

TI Logger



TI Logger

www.ti.com

3. Select the **BT Logger 1** under the Installed Ports list and click on the **Setup...** button.

| Logger Settings | | × |
|--|----------------------|--------|
| Synchronize with external editor: Sunning on this computer C Running on a rem | note computer named: | |
| Installed Ports: | | |
| BT Logger 1 - [2.0.0.8] HCI/LMP viewer 1 - [2.0.0.12] | Setup | OK |
| | Duplicate | Apply |
| | Delete | Cancel |

Figure 6. Selecting BT Logger in Settings

 In the Setup dialog box, select the COM port that is connected to the BT_UART_DBG / TX_DBG pin of the TI BT controller.

| Setup | \times |
|--|----------|
| Connection Details Com Port: COM6 Setup | |

Figure 7. Selecting COM Port

- **NOTE:** Please ensure that the COM port number is less than 50. If not, change the COM port number to a lower value from Control Panel on the PC.
- 5. Setup the COM port for the following settings and click OK.

| Squirt - Serial Port Se | Squirt - Serial Port Settings X | | | | | | |
|---------------------------|---------------------------------|---------------------|--|--|--|--|--|
| Select Port: 6 | • | OK | | | | | |
| Baud Rate: 9216 | 00 💌 (Active) |) Cancel | | | | | |
| Alt Baud Rate: 921600 | | | | | | | |
| Baud Rate Control | | | | | | | |
| Flow Control | RTS/CTS | Control | | | | | |
| Parity | Data Bits | Stop Bit | | | | | |
| ⊙ None C Odd C Even | C 7 © 8 | © 1 O 1.5 O 2 | | | | | |
| | | | | | | | |

Figure 8. BT Logger Serial Port Settings

6



6. Under the Mapping Files section of the Setup dialog box, click on **Add File...** button and select the appropriate *.ili file for the BT controller as listed in the Software Requirements section above.

| Setup | × |
|--|------------------------------------|
| Connection Details Com Port: CDM6 Setup | |
| Load From File | |
| Mapping Files Parse BT Logger protocol Parse Module protocol | Messages not found in source files |
| C:\wl18xx_bt_sp_v4.2\Tllnit_11.8.32.ii | Selected ILI file |
| | |
| Add File Remove Scan Folder | |
| | Cancel OK |

Figure 9. Adding the ILI File

NOTE: Make sure that only one *.ili file is selected.

- 7. Click **OK** to apply the changes to the Setup dialog box for the BT Logger 1 port. Next, configure the HCI/LMP viewer port.
- 8. In the View->Settings... dialog box, select the HCI/LMP viewer 1 under the Installed Ports list and click on Setup....

| Logger Settings | | × | | | | |
|--|----------------------|--------|--|--|--|--|
| Synchronize with external editor: Running on this computer Running on a re | mote computer named: | | | | | |
| Installed Ports: | | | | | | |
| BT Logger 1 - [2.0.0.8] Setup | | | | | | |
| □ HCI/LMP viewer 1 - [2.0.0.12] | Duplicate | Apply | | | | |
| | Delete | Cancel | | | | |

Figure 10. Selecting HCI/LMP Viewer in Settings



TI Logger

9. Setup the Serial Port Settings.

| Squirt - Serial Po | rt Settings | × |
|--------------------|---------------------------------|--------------|
| Select Port: | - | OK |
| Baud Rate: 🛛 | 321600 💌 (Active) | Cancel |
| Alt Baud Rate: | 321600 💌 | |
| Baud Rate Cor | ntrol omatic Baud Rate Switc | hing |
| Flow Control | | Control |
| C Xon/Xoff | RTS/CTS | 🗆 DTR |
| Parity • None | Data Bits | Stop Bit |
| C Odd | 0.7 | 01 |
| C Even | · 8 | C 1.5 C 2 |
| | | |

Figure 11. HCI/LMP Viewer Serial Port Settings

10. Select Add File... and select the appropriate *.xml file for the BT controller as listed in the Software Requirements section above.

| Setup | × |
|---|---|
| Port: COM6 Setup Enable Topology Analyzer | |
| Mapping Files: | |
| C:\wl18xx_bt_sp_v4.2\TIInit_11.8.32.xml | _ |
| | |
| | |
| | |
| | |
| Add File Remove Cancel OK | |

Figure 12. Adding the XML File

NOTE: Make sure that only one *.xml file is selected.

- 11. Click OK to apply the changes to the Setup dialog box for the HCI/LMP viewer port.
- 12. Make sure that both the BT Logger 1 and the HCI/LMP viewer 1 ports are checked and the COM port is displayed next to both of them in the Logger Settings window.

8



| ogger Settings | | | | | | > |
|--|--------|--------------|-----------------|---|-----------------------------|--------|
| - Synchronize with ex Running on this | | Running on a | remote computer | named: | | _ |
| Installed Ports: | | | | | | |
| 🔽 BT Logger 1 (CON | | | Setup | 1 | OK | |
| HCI/LMP viewer 1 | (COM6) | | Duplicate | - | Apply | , |
| | | | Duplicate | 1 | | |
| | | | Delete | | Cance | 9 |
| Criteria: | | | Export | Import | Defau | ılt |
| Туре | Log # | Level | Text | | Port | ~ |
| View Filter | | | | | | |
| Filter New Logs | | | | | | |
| Critical | | | | | | |
| Tool 1 | | | | | | |
| Tool 2 | | | | | | |
| Highlight Color 1 | | | | | | |
| Highlight Color 2 | | | | | | |
| Highlight Color 3 | | | | | | |
| Highlight Color 4 | | | | | | |
| Highlight Color 5 | | | | | | |
| Highlight Color 6 | | | | | | |
| < | | | | | > | |
| Log #: | Le | vel: | | eria Rules: | | |
| Text: - View Schemes | | Port: | Ve Ve Mir | parate words with , micolon (;) means / rtical line ()) means fix ~ indicates a 'n hus (-) ispecifies a i | And. Or. ot' conditio |)n. |
| | • | Save As | | aces are as any ot | | ter. |

Figure 13. Properly Configured Logger Settings

- **NOTE:** If the COM port nuber is not displayed next to either the BT Logger 1 port or the HCI/LMP viewer 1 port, uncheck and check each of the ports to load the COM port settings.
- 13. Click **OK** to apply changes and close the Logger settings.



TI Logger

10

3.2 Capturing the Logs

1. After both the BT Logger 1 and the HCI/LMP viewer 1 ports have been setup with the correct configurations, click on the View->Show All Items option to disable any previously applied filters.

| 👻 Untitled - Logger 5.0 - Connected (COM6) — 🗆 X | | | | | | | | |
|---|------|------------------|------------------|--------------|---------------------|-------------|--|---|
| | | | | | | | | |
| Automatic Scroll | Time | Po | ort | File Name | Line | Information | | |
| Show All Items | | | | | | | | |
| Image: Show Date Show Time Show Relative Time | | | | | | | | |
| Befresh F5 | | | | | | | | |
| <u> </u> | | | | | | | | |
| ✓ Ioolbar ✓ Status Bar → Stay On Top | | | | | | | | |
| | - | | | | | | | |
| | | | | | | | | |
| | | | | | | | | |
| | | | | | | | | |
| | | | | | | | | |
| | | | | | | | | |
| | | | | | | | | |
| | | | | | | | | |
| | | | | | | | | |
| | | | | | | | | |
| | | | | | | | | |
| | | | | | | | | |
| < | | | | | | | | > |
| | | HCI/LMP viewer 1 | (BT Logger 1 (CO | M6 Auto Save | View: <none></none> | Logs: 0 / 0 | | |

Figure 14. Getting the Logger Ready to Capture the Logs

2. Power up the Bluetooth® device and enable the BT controller. An initialization sequence will be captured in the Logger windows as shown in Figure 15.



| | ments View Help | 10.0 | | | | | | |
|-----------------|-----------------|--------------------------------------|--|--------------|-----------------|--------------------------------|---|------|
| 🐮 🗙 🐚 Time | 🔽 🤪 🌡 🖆 🗄 | Port File N | me Line Information | lead Ch. 1 | Network Clock | 14-14 | Device | Remo |
| 16:35:02.507 | | BT Logger 1 | temperature sensing: temp 24, read 0x183 | Local Clock | INSTWORK CIDER | Host | Device | Kemo |
| 16:35:02.507 | | BT Logger 1 BT Logger 1 | temperature sensing: temp 24, read 0x183 temperature sensing: temp 23, read 0x184 | | | | | |
| 16:35:02.523 | | BT Logger 1 | Temperature val 24, region = 6 | | | | | |
| 16:35:02.523 | | BT Logger 1 | starting INIT CALIBRATION | | calibration (0) | | | |
| 16:35:02.523 | | BT Logger 1 | Calibration index = [0] | | canoration (o) | | | |
| 16:35:02.523 | | BT Logger 1 | synch event REG received, module RF_CALIBRATION, msi 0 | | | | | |
| 16:35:02.523 | | BT Logger 1 | synch cmd start instance, module RF_CALIBRATION, msi: 0 | | | | | |
| 16:35:02.523 | | BT Logger 1 | synch cmd return event STARTED, module RF_CALIBRATION | | | | | |
| 16:35:02.523 | | BT Logger 1 | [0x0005] Platform | | | | | |
| 16:35:02.523 | | BT Logger 1 | Process type: Nominal | | | | | |
| 16:35:02.523 | | BT Logger 1 | PHY Process types: PD.ACW | | | | | |
| 16:35:02.523 | | BT Logger 1 | Chip revision: 32 | | | | | |
| 16:35:02.523 | | BT Logger 1 | Detected Clock = 26000000 Hz | | | | | |
| 16:35:02.523 | | BT Logger 1 | Ref Clock = 26000000 Hz | | | | | |
| 16:35:02.523 | | BT Logger 1 | PLL mode disabled by pll_enable die_id bit | | BT | Logger Traces | | |
| 16:35:02.523 | | BT Logger 1 | Ref Clock is valid for PLL | | | | | |
| 16:35:02.523 | | BT Logger 1 | Clock Working mode: PRIMARY | | | | | |
| 16:35:02.523 | | BT Logger 1 | ARM Clock = 26000000 Hz, Slow Clock: External | | | | | |
| 16:35:02.523 | | BT Logger 1 | OCP Clock = 26000000 Hz | | | | | |
| 16:35:02.523 | | BT Logger 1 | Im_ic_get_local_features (5) | | | | | |
| 16:35:02.523 | | BT Logger 1 | Im_ic_set_brcst_retran (58) | | | | | |
| 16:35:02.523 | | BT Logger 1 | Im_lc_self_test_run_init_tests (95) | | | | | |
| 16:35:02.523 | | BT Logger 1 | Self Test passed | | | | | |
| 16:35:02.523 | | BT Logger 1 | I2C doesn't exist ! | | | | | |
| 16:35:02.523 | | BT Logger 1 | Im_lc_get_local_bd_addr (23) | | | | | |
| 16:35:02.523 | | BT Logger 1 | Software version - 8.0.32 | | | | | |
| 16:35:02.523 | | BT Logger 1 | UART HCI baudrate = 117000 | | | | | |
| 16:35:02.523 | | BT Logger 1 | uart hci parameters: UartDIV=37, OS=6, SP=0, MoB=1 | | | | | |
| 16:35:02.523 | | BT Logger 1 | TL - Detection init is over | | | | | |
| 16:35:02.523 | | BT Logger 1 | Deactivating time: init | | | | | |
| 16:35:02.523 | | BT Logger 1 | Calibration index = [32] | | | | | |
| 16:35:02.523 | | BT Logger 1 | synch event FINISH received, module RF_CALIBRATION, msi 0 | | | | | |
| 16:35:02.523 | | BT Logger 1 | Calibration started. Vector=0x0, 0x1 | | | HCI/LMP viewer 1 | Traces | |
| 16:35:02.523 | | BT Logger 1 | PHY EW Version 1.76 | | | | | |
| 16:35:02.523 | | BT Logger 1 | Calibration Finished, Vector=0x0, 0x1 | | | П | | |
| 16:35:09.633 | | BT Logger 1 | TL - transport_detection_interrupt_handler | | | | | |
| 16:35:09.633 | | BT Logger 1 | Transport detection: UART detected | | | | | |
| 16:35:09.633 | | BT Logger 1 | TL - uart_protocol_detection_interrupt_handler | | | 45 | | |
| 16:35:09.633 | | BT Logger 1 | first byte received 1 | | | V I | | |
| 16:35:09.633 | | BT Logger 1 | Uart Active Protocol: H4 PROTOCOL | | | V | | |
| 16:35:09.633 | | BT Logger 1 | TL - h4_init | | | ¥ | | |
| 16:35:09.695 | | HCI/LMP viewer 1 | is organi | 0x00001654 | 0x00001654 | HCI_VS_Get_System_Status | | |
| 16:35:09.695 | | HCI/LMP viewer 1 | | 0x00001654 | 0x00001654 | | HCI_Command_Complete_VS_Get_System_Status_Event | |
| 16:35:09.695 | | BT Logger 1 | TL - host_interface_perform_special_processing_after_first_rx_packet | 0x00001034 | 0x00001034 | - | ric_command_complete_rs_det_system_status_event | |
| 16:35:09.695 | | BT Logger 1 | UART HCI baudrate = 115200 | | | | | |
| 16:35:09.695 | | BT Logger 1 | uart. hci parameters: UartDIV=9, OS=25, SP=0, MoB=11 | | | | | |
| 16:35:09.695 | | BT Logger 1 | hcic_process_hci_commands: HCI_VS_Get_System_Status (Group 3f Opcode 0 | (216) | | | | |
| 16:35:09.695 | | BT Logger 1 | Software version - 8.0.32 | se ny | | | | |
| 16:35:09.695 | | BT Logger 1 | Package ID: P0.32 | | | | | |
| 16:35:09.695 | | BT Logger 1 | hcic_get_num_of_host_commands. Total free = 3, Reported to host = 1 | | | | | |
| 16:35:09.695 | | BT Logger 1 | HCI Send Event: HCI COMMAND COMPLETE EVT | | | | | |
| 16:35:57.671 | | HCI/LMP viewer 1 | HGI SERU EVERG HGI_COMMIAND_COMPLETE_EVT | 0x0000AC73 | 0x0000AC73 | HCI_VS_Update_Uart_HCI_Baudra | | |
| 16:35:57.671 | | HCI/LMP viewer 1 HCI/LMP viewer 1 | | 0x0000AC73 | 0x0000AC73 | rici_v3_opdate_oart_Hcl_Baudra | HCI_Command_Complete_VS_Update_Uart_HCI_Baudrate_Event | |
| 16:35:57.686 | | BT Logger 1 | hcic_process_hci_commands: HCI_VS_Update_Uart_HCI_Baudrate (Group 3f O | | UXUUUUAC73 | - | HCI_Command_Complete_vs_Update_Uart_HCI_Baudrate_Event | |
| | | | | pcode (x550) | | | | |
| 16:35:57.686 | | BT Logger 1 | hcic_get_num_of_host_commands. Total free = 3, Reported to host = 1 | | | | | |
| 16:35:57.686 | | BT Logger 1 | HCI Send Event: HCI_COMMAND_COMPLETE_EVT | | | | | |
| 16:35:57.686 | +0:00:55.179 | BT Logger 1 | UART HCI baudrate = 3000000 | | | | | |

Figure 15. BT Controller Initialization Logs

3. When all the relevant traces (from both BT Logger 1 and HCI/LMP viewer 1 ports) are captured, use the **File->Save As...** option to save the logs as a *.lgr file.

| 👮 Untitled - Logger 5.0 | - Connected | (COM6) | |
|-------------------------|-------------|-----------|-------------|
| File Edit Bookmarks/ | /Comments | View Help | |
| 🗋 <u>N</u> ew | Ctrl+N | | 8 !× |
| 避 <u>O</u> pen | Ctrl+O | | Port |
| Save | Ctrl+S | 0 | BT Logger 1 |
| Save <u>A</u> s | | 6 | BT Logger 1 |
| | | 6 | BT Logger 1 |
| Load Workspace | | 6 | BT Logger 1 |
| Save Workspace | | 6 | BT Logger 1 |
| | | <u> </u> | BT Logger 1 |
| Export All (Ignore Filt | ters) | 6 | BT Logger 1 |
| Export Selected | - | 6 | BT Logger 1 |
| | | 6 | BT Logger 1 |

Figure 16. Saving the Logs

When capturing the logs for a long period of time (i.e. for several hours), it is best practice to use the Auto Save and Clear feature of the Logger. Doing so prevents a single log file from getting too large and it helps keep the logs organized for analysis later.



TI Logger

To Setup the Audo Save and Clear, click **Edit->Auto Save and Clear...** option to open the Save and Clear window.

| 黉 Untitled - Logger 5.0 - Connected (COM6) | | | | | | |
|--|----------------------------------|---|--|--|--|--|
| File Edit Bookmarks/Comments View Help | | | | | | |
| 🖹 <u>С</u> ору | 🖬 🧶 💩 🗃 🗄 🔢 💌 | | | | | |
| X Delete | Time | F | | | | |
| Invert Selection | 16:35:02.507 +0:00:00.000 | E | | | | |
| | 16:35:02.523 +0:00:00.016 | E | | | | |
| <u>F</u> ind | 16:35:02.523 +0:00:00.016 | E | | | | |
| Find <u>N</u> ext | 16:35:02.523 +0:00:00.016 | E | | | | |
| Find Previous | 16:35:02.523 +0:00:00.016 | E | | | | |
| | 16:35:02.523 +0:00:00.016 | E | | | | |
| Set Time <u>A</u> nchor | 16:35:02.523 +0:00:00.016 | E | | | | |
| | 16:35:02.523 +0:00:00.016 | E | | | | |
| 避 Auto Save and Clear | 16:35:02.523 +0:00:00.016 | E | | | | |
| | 16:35:02.523 +0:00:00.016 | E | | | | |
| Open In Editor | 16:35:02.523 +0:00:00.016 | E | | | | |
| 10 12 2 | 16:35:02.523 +0:00:00.016 | E | | | | |
| | | - | | | | |

Figure 17. Selecting Auto Save and Clear

Click **OK** after setting up the parameters for Auto Save.

| Save And Clear | | × |
|------------------------------|----------------|--------|
| Activate Save And Clea | r | |
| When logs count reaches | 100000 | |
| Save the logs in the folder: | C:\Debug_logs\ | |
| Filename Prefix: | DBGLogs1_ | |
| | ОК | Cancel |

Figure 18. Configuring Auto Save and Clear

NOTE: When the log capture is complete, save the last instance by clicking File->Save As... option.



3.3 Analyzing the TI Logger Capture

The saved logger traces can be opened in a new window of the TI Logger by selecting **File->Open**. There are several features in the TI Logger to help with analysis of the saved logs.

3.3.1 View Filter

The View Filter is used to see only the specified traces on the working window. This feature is useful when limiting the log analysis to only certain type of traces and/or traces with a specific keywords.

To apply the View Filter, open the **View->Settings** window and click on the **View Filter** row of the "Criteria" section.

Once the View Filter criteria is selected, enter the filter criteria in the **Text** box. For example, the macro "--" can be used to only view all the HCI/LMP viewer traces.

| Logger Settings X | | | | | |
|---|---------------|-----------|---------|--|-------------|
| Synchronize with external editor: Running on this computer C Running on a remote computer named: | | | | | |
| Installed Ports: | | | | | |
| BT Logger 1 - [2.0.0 |).8] | | Setup | . | OK |
| HCI/LMP viewer 1 | - [2.0.0.12] | | | | Applu |
| | | | Duplica | ie | Apply |
| | | | Delete | | Cancel |
| Criteria: | | | Export. | . Import | Default |
| Туре | Log # | Level | Text | | Port 🔨 |
| View Filter | | | | | |
| Filter New Logs | - | | | | |
| Critical | | | | | |
| Tool 1 Tool 2 | | | | | |
| Highlight Color 1 | | | | | |
| Highlight Color 2 | | | | | |
| Highlight Color 3 | | | | | |
| Highlight Color 4 | | | | | |
| Highlight Color 5 | | | | | |
| Highlight Color 6 | | | | | ¥ |
| < | | | | | > |
| Log #: | Leve | : | | Criteria Rules: | |
| Text: | Р | ort: | | Separate words with ; Semicolon (;) means / Vertical line (I) means Prefix ~ indicates a 'n | And. Or. |
| View Schemes | • | Save As D | | Minus (-) specifies a i Spaces are as any ot | ange. |

Figure 19. View Filters

Click **Apply** to apply the View Filter.



3.3.2 Highlight

The Highlight feature is used to highlight traces by color coding the traces that match the defined criteria. To add a highlight filter, click on one of the **Highlight Color** criteria in the Logger Settings dialog box.

Once the Highlight Color row is selected, enter the criteria in the Text box and click **Apply** to highlight the specified traces.

| Logger Settings X | | | | | | | |
|---|------------------|---------|------------|--------|---------|--|--|
| Synchronize with external editor: | | | | | | | |
| Running on this computer | | | | | | | |
| Installed Ports: | Installed Ports: | | | | | | |
| BT Logger 1 - [2.0.0 | | | Setup | | OK | | |
| HCI/LMP viewer 1 | - [2.0.0.12] | | Duraficata | | Apply | | |
| | | | Duplicate | | | | |
| | | | Delete | | Cancel | | |
| Criteria: | | | Export | Import | Default | | |
| Туре | Log # | Level | Text | | Port 🔨 | | |
| View Filter | | | | | | | |
| Filter New Logs | | | | | | | |
| Critical | | | | | | | |
| Tool 1 Tool 2 | | | | | | | |
| Highlight Color 1 | | | | | | | |
| Highlight Color 2 | | | | | | | |
| Highlight Color 3 | | | | | | | |
| Highlight Color 4 | | | | | | | |
| Highlight Color 5 | | | | | | | |
| Highlight Color 6 | | | | | × 1 | | |
| < | | | | | > | | |
| Log #: Color: Color: Color 1 | | | | | | | |
| Text: Port: VS_Update_Uart_HCI_Baudrate Bg View Schemes | | | | | | | |
| | • | Save As | Delete | | | | |

Figure 20. Logger Highlight Feature



3.3.3 Toggling Log Levels

Each log trace has a specific log level. Toggling the log levels can be used to quickly apply view filters to the traces with the selected log levels.

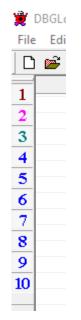


Figure 21. Log Levels

3.3.4 Bookmarks and Comments

This feature is used to add Bookmark to a trace. It can also be used to (optionally) add a comment to the bookmark.

To toggle bookmark on and off on a trace, select the trace and use **Bookmarks/Comments->Toggle Bookmark (Ctrl+F2)**. To add/edit comment on the bookmark, use the **Bookmarks/Comments->Edit Comment...(Enter)**.

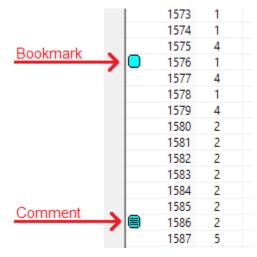


Figure 22. Bookmarks and Comments

NOTE: The **F2** or **Shift+F2** shortcuts can be used to quickly jump to next or previous bookmark respectively.

15

TI Logger

3.3.5 Find Function

The Edit->Find(Ctrl+F) option can be used to find a trace in the log file.

| _com Find | | | × |
|---------------------|------|--------------|-------------------|
| tor= Log | #: | Level: | <u>F</u> ind Next |
| ector <u>T</u> ext: | scan | | <u>M</u> ark All |
| Port: | | Direction | Select All |
| | | ⊂ <u>U</u> p | Cancel |



3.3.6 Time Anchor

The Time Anchor is used to display the relative time of each of the traces in the log file with respect to the anchored trace.

NOTE: Make sure that the **View->Show Relative Time** option is enabled before applying the time anchor.

To anchor a trace, right click on the trace row and select Edit->Set Time Anchor.

| | 51 | 4 | 16:35:09.695 -0:00:48.085 BT Logger 1 |
|--------------------|----|-----|--|
| | 52 | 1 | 16:35:57.671 -0:00:00.109 HCI/LMP viewer 1 |
| | 53 | 4 | 16:35:57.671 -0:00:00.109 HCI/LMP viewer 1 |
| | 54 | 4 | 16:35:57.686 -0:00:00.094 BT Logger 1 |
| | 55 | 4 | 16:35:57.686 -0:00:00.094 BT Logger 1 |
| | 56 | 4 | 16:35:57.686 -0:00:00.094 BT Logger 1 |
| | 57 | 4 | 16:35:57.686 -0:00:00.094 BT Logger 1 |
| Time Anchor Symbol | 58 | 2 | 16:35:57.686 -0:00:00.094 BT Logger 1 |
| TIME ANCHOL SYMBOL | 59 | 1 1 | 16:35:57.780 +0:00:00.000 HCI/LMP viewer 1 |
| | 60 | 4 | 16:35:57.780 +0:00:00.000 HCI/LMP viewer 1 |
| | 61 | 4 | 16:35:57.780 +0:00:00.000 BT Logger 1 |
| | 62 | 4 | 16:35:57.780 +0:00:00.000 BT Logger 1 |
| | 63 | 4 | 16:35:57.780 +0:00:00.000 BT Logger 1 |
| | | 1.1 | |

Figure 24. Time Anchor



4 Link Quality Monitor

The BT Link Quality Monitor (LQM) application monitors the Received Signal Strength Indication (RSSI) and the Link Quality (averaged throughput) information during a connection in runtime.

4.1 Running the LQM

1. To start the LQM, click the Link Quality Monitor program icon (see Figure 25).

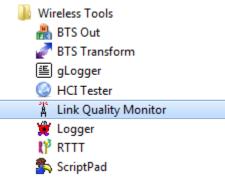


Figure 25. Starting the LQM

- 2. The LQM main window displays with the following panes (see Figure 26):
 - RSSI pane
 - Throughput pane
 - Used-channel pane (BT and BLE)

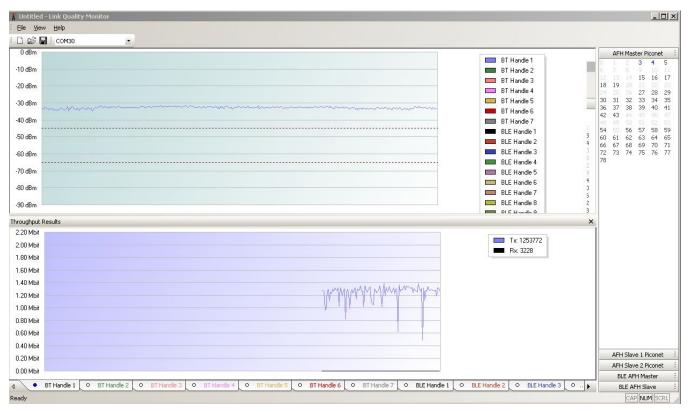


Figure 26. LQM Main Window



Link Quality Monitor

www.ti.com

- 3. To select the port:
- a. From the toolbar, click the **Port Connection** box. A drop-down menu displays the available ports (see Figure 27).
- b. Select the desired port.

| T Untitled - Li | ink Quality Monitor | |
|-----------------|---|--|
| Eile View | <u>H</u> elp | |
| :0 📽 🖬 | COM26 • | |
| 0 dBm | <port connected="" not=""> COM25</port> | |
| -10 dBm | COM26 COM27 | |
| -20 dBm | COM28 | |
| -30 dBm | | |
| -40 dBm | | |
| -50 dBm | | |
| -60 dBm | | |
| -70 dBm | | |
| -80 dBm | | |
| -90 dBm | | |

Figure 27. COM Port Selection

4.2 Using the LQM

4.2.1 Menu Bar

Table 1 describes the menu bar menus and submenus.

Table 1. Menu Bar

| Menu | Submenu | Function |
|------|--------------------------|---|
| | New | Create a new LQM file |
| | Open | Open an existing LQM file |
| File | Save | Save the active LQM file |
| | Save as | Save the active LQM file with a new name |
| | Exit | Exit the LQM application |
| | Chart throughput results | Display or hide chart throughput results |
| | AFH Master | Display or hide the AFH Master Piconet pane |
| | BLE AFH master | Display or hide the BLE AFH Master Piconet pane |
| | BLE AFH Slave | Display or hide the BLE AFH Slave Piconet pane |
| View | AFH Slave 1 Piconet | Display or hide the AFH Slave 1 Piconet pane |
| | AFH Slave 2 Piconet | Display or hide the AFH Slave 2 Piconet pane |
| | Standard toolbar | Display or hide the standard toolbar |
| | Status bar | Display or hide the status bar |
| | Customize | Customize the keyboard and toolbar |
| Help | | LQM information and version number |



4.2.2 Toolbar

Table 2 describes the toolbar options.

| Table | 2. | Toolbar |
|-------|----|---------|
| | | |

| Item | Function |
|-----------------------------|--|
| D | Create a new LQM file |
| | Open an existing LQM file |
| | Save the active LQM file with a new name |
| COM1 Port connection box | Select the port to configure the connection between the application and the device |

4.2.3 Customize Dialog Box

To open the customize dialog box, click the View menu and select Customize. The Customize dialog box with the following tabs (see Figure 28):

- Commands
- Toolbars
- Keyboard
- Menu
- Options

Use the Commands tab to drag and drop commands from the Customize dialog box to the menu or toolbars (see Figure 28).

| Customize | | × |
|---|-----------|---|
| Commands Toolbars Keyboard | | 1 |
| Categories: File Help New Menu All Commands | Commands: | |
| Description: | | |
| | Close | |

Figure 28. Customize Dialog Box With Commands Tab Selected



Link Quality Monitor

Use the Toolbars tab to enable and disable toolbars (see Figure 29).

| Cu | ustomize | × |
|----|---|------------------|
| | Commands Toolbars Keyboard Menu Options | |
| | Toolbars: | |
| | Menu Bar | Reset |
| | ✓ Standard | Reset All |
| | | |
| | | |
| | | |
| | | |
| | | |
| | Г | Show text labels |
| | | |
| | | Close |

Figure 29. Customize Dialog Box With Toolbars Tab Selected

Use the Keyboard tab to create a keyboard shortcut for each menu item (see Figure 30).

| Customize | | X |
|--|-------------------------|-------------------------------|
| Commands Toolbars Keyboa | ard Menu Options | |
| Category: | Set Accelerator for: | * |
| Commands: | Current Keys: | ~ |
| Exit New Open Save Save As | Press New Shortcut Key: | Assign Remove Reset All |
| Description: Quit the application; prompts to save documents | | |
| | | Close |





Use the Menu tab to customize menus, which includes animations and shadows (see Figure 31).

| Customize | × |
|--|---|
| Commands Toolbars Keyboard Menu | Options |
| Application Frame Menus: | Context Menus: |
| Show Menus for: | Select context menu: |
| Default Menu 🔽 | |
| Reset | Reset |
| Default application menu. Appears when no documents Jare open. | Hint: select the context menu, change the page to "Commands" and drag the |
| Menu animations: None | toolbar buttons into the menu window. |
| Menu shadows | , |
| | Close |

Figure 31. Customize Dialog Box With Menu Tab Selected

Use the Options tab to customize how menus are viewed (see Figure 32).

| Customize | × |
|---|---|
| Commands Toolbars Keyboard Menu Options | |
| Toolbar | |
| Close | |

Figure 32. Customize Dialog Box With Options Tab Selected



Link Quality Monitor

4.2.4 LQM Active Window

The LQM active window displays the following kinds of data regarding the quality of the link (also Figure 33):

- RSSI
- Used channels map

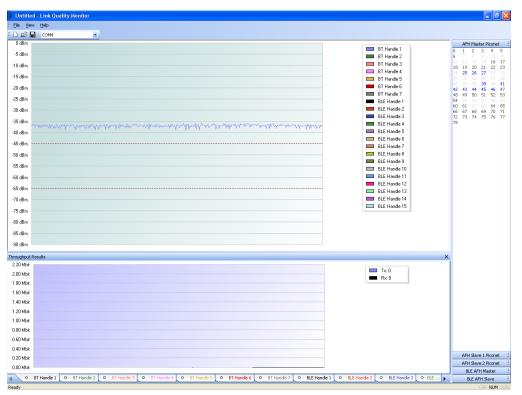


Figure 33. LQM Active Window

The LQM application supports up to seven BT handles and up to three piconets (one master and two slaves).

4.2.4.1 RSSI Window

The RSSI window displays the RSSI measurements of up to seven handles. Each handle is represented by a color. The scale of the window varies from 0[dbm] to -90[dbm]. The increase threshold is -65[dbm], and the decrease threshold is -45[dbm].

Link Quality Monitor

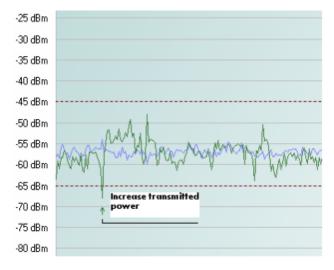


Figure 34. Increase Transmitted Power

Each time the measured RSSI falls below the lower threshold, the device sends a request to the transmitting device to increase the transmitted power to within the desired range (see Figure 34). In this case, \uparrow (up arrow symbol) indicates (in the same color of the specific handle) that transmitted power must increase. When the transmitted power rises above the upper threshold, \downarrow (down arrow symbol) indicates that transmitted power must decrease.

The last throughput results sample is displayed near the related graph. Green text indicates enough samples are present for statistics; red text indicates not enough samples are present for statistics.

4.2.4.2 Used-Channels Window

The Used-Channels window includes up to three channel maps and up to two piconets (a device can be a master in one piconet and a slave in two other piconets).

Channels appear as decimal values from 0 to 78 (for example, channel 0 = 2402 MHz; channel 1 = 2403 MHz).

The following colors can represent each channel:

- Light gray: the specific channel is not in use.
- Dark gray: the specific channel is recently removed.
- Blue: the specific channel is recently added.
- Black: the specific channel is in use.



Link Quality Monitor

Figure 35 shows the used-channels window.

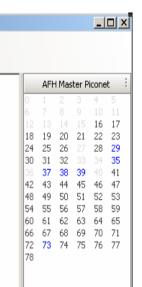


Figure 35. Used-Channels Window



Appendix A SWAU058D–December 2008–Revised May 2018

Terms and Abbreviations

Table 3 lists terms and abbreviations.

Table 3. Terms and Abbreviations

| Term | Description |
|--------------|--|
| BD_ADDR | Bluetooth® device address |
| BER | Bit error rate |
| BT | Bluetooth® |
| HCI | Host controller interface |
| Host/host PC | A PC connected to the device through the serial port |
| LMP | Link manager protocol |
| LQM | Link quality monitor |
| PER | Packet error rate |
| RF | Radio frequency |
| RSSI | Received signal strength indication |
| SW | Software |
| VS | Vendor-specific |



Page

Revision History

| • | Updated Requirements section | 3 |
|---|--|-----|
| • | Updated Setting Up the TI BT Logger section. | . 4 |
| • | Updated Capturing the Logs section. | 10 |
| | Added View Filter section. | |
| • | Added Highlight section. | 14 |
| | Updated Log Levels image. | |
| | Updated Bookmarks and Comments image | |
| | Updated Find Dialog Box image. | |
| | Added Time Anchor section. | |
| | Removed Using the TI Logger Main Working Window section. | |
| | Tomorod Comy and The Edgger Main Working Window Coolern | |

IMPORTANT NOTICE FOR TI DESIGN INFORMATION AND RESOURCES

Texas Instruments Incorporated ('TI") technical, application or other design advice, services or information, including, but not limited to, reference designs and materials relating to evaluation modules, (collectively, "TI Resources") are intended to assist designers who are developing applications that incorporate TI products; by downloading, accessing or using any particular TI Resource in any way, you (individually or, if you are acting on behalf of a company, your company) agree to use it solely for this purpose and subject to the terms of this Notice.

TI's provision of TI Resources does not expand or otherwise alter TI's applicable published warranties or warranty disclaimers for TI products, and no additional obligations or liabilities arise from TI providing such TI Resources. TI reserves the right to make corrections, enhancements, improvements and other changes to its TI Resources.

You understand and agree that you remain responsible for using your independent analysis, evaluation and judgment in designing your applications and that you have full and exclusive responsibility to assure the safety of your applications and compliance of your applications (and of all TI products used in or for your applications) with all applicable regulations, laws and other applicable requirements. You represent that, with respect to your applications, you have all the necessary expertise to create and implement safeguards that (1) anticipate dangerous consequences of failures, (2) monitor failures and their consequences, and (3) lessen the likelihood of failures that might cause harm and take appropriate actions. You agree that prior to using or distributing any applications. TI has not conducted any testing other than that specifically described in the published documentation for a particular TI Resource.

You are authorized to use, copy and modify any individual TI Resource only in connection with the development of applications that include the TI product(s) identified in such TI Resource. NO OTHER LICENSE, EXPRESS OR IMPLIED, BY ESTOPPEL OR OTHERWISE TO ANY OTHER TI INTELLECTUAL PROPERTY RIGHT, AND NO LICENSE TO ANY TECHNOLOGY OR INTELLECTUAL PROPERTY RIGHT OF TI OR ANY THIRD PARTY IS GRANTED HEREIN, including but not limited to any patent right, copyright, mask work right, or other intellectual property right relating to any combination, machine, or process in which TI products or services are used. Information regarding or referencing third-party products or services does not constitute a license to use such products or services, or a warranty or endorsement thereof. Use of TI Resources may require a license from a third party under the patents or other intellectual property of the third party, or a license from TI under the patents or other intellectual property of TI.

TI RESOURCES ARE PROVIDED "AS IS" AND WITH ALL FAULTS. TI DISCLAIMS ALL OTHER WARRANTIES OR REPRESENTATIONS, EXPRESS OR IMPLIED, REGARDING TI RESOURCES OR USE THEREOF, INCLUDING BUT NOT LIMITED TO ACCURACY OR COMPLETENESS, TITLE, ANY EPIDEMIC FAILURE WARRANTY AND ANY IMPLIED WARRANTIES OF MERCHANTABILITY, FITNESS FOR A PARTICULAR PURPOSE, AND NON-INFRINGEMENT OF ANY THIRD PARTY INTELLECTUAL PROPERTY RIGHTS.

TI SHALL NOT BE LIABLE FOR AND SHALL NOT DEFEND OR INDEMNIFY YOU AGAINST ANY CLAIM, INCLUDING BUT NOT LIMITED TO ANY INFRINGEMENT CLAIM THAT RELATES TO OR IS BASED ON ANY COMBINATION OF PRODUCTS EVEN IF DESCRIBED IN TI RESOURCES OR OTHERWISE. IN NO EVENT SHALL TI BE LIABLE FOR ANY ACTUAL, DIRECT, SPECIAL, COLLATERAL, INDIRECT, PUNITIVE, INCIDENTAL, CONSEQUENTIAL OR EXEMPLARY DAMAGES IN CONNECTION WITH OR ARISING OUT OF TI RESOURCES OR USE THEREOF, AND REGARDLESS OF WHETHER TI HAS BEEN ADVISED OF THE POSSIBILITY OF SUCH DAMAGES.

You agree to fully indemnify TI and its representatives against any damages, costs, losses, and/or liabilities arising out of your noncompliance with the terms and provisions of this Notice.

This Notice applies to TI Resources. Additional terms apply to the use and purchase of certain types of materials, TI products and services. These include; without limitation, TI's standard terms for semiconductor products http://www.ti.com/sc/docs/stdterms.htm), evaluation modules, and samples (http://www.ti.com/sc/docs/stdterms.htm), evaluation

Mailing Address: Texas Instruments, Post Office Box 655303, Dallas, Texas 75265 Copyright © 2018, Texas Instruments Incorporated