Bluetooth **Logger and Link Quality Monitor (LQM) Tools**

This user's guide describes the TI *Bluetooth* debug tools used to trace log messages and protocol transactions output from the TX_DBG pin of the WiLink™ connectivity devices. Consisting of the TI *Bluetooth* Logger and associated plug-ins and the LQM, these tools provide visibility into the inner data and states of the chip as well as information on remote device traffic. The architecture allows debugging of both software and hardware error conditions and general optimization of operations.

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1 Requirements

1.1 System Requirements

The *Bluetooth* Logger and LQM requires the following hardware and software:

- PC running Pentium® II (minimum requirements)
- Operating systems: Windows® 2000, Windows XP, Windows 7
- Access to BT_UART_DBG pin

Debug and calibration tools for WLAN and *Bluetooth*® require four UART ports. The most efficient way to drive these ports to the PC is to use a UART-to-USB converter (not included in the wireless tools package). TI recommends using the WL18XXCOM82SDMMC adapter with the TI WL1837MODCOM8I module or the TI WL1835MODCOM8B module on the COM8 board.

NOTE: Multiple UART to USB adapters are available on the market, such as the FTDI Chip™ development modules.

1.2 Configuration Requirements

The TI Bluetooth Logger and LQM applications for the WiLink 8 TI Bluetooth release require the latest ILI configuration file.

NOTE: The ILI file supports all of the WiLink family and is based on the BTS naming format; for the WL128x and prior releases, follow the guidelines in the README file.

The installation files are located in the directory named *Wireless Tools* at the installation path configured during installation. By default, the files are located at the following path:

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

NOTE: Throughout this document, the directory in which the installation files reside is referred to as *Installation directory*.

2 Installation

The *Bluetooth* 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

3 TI Logger

The TI *Bluetooth* Logger traces log messages and monitors protocol transactions. The Logger records log messages generated by the TI controller. The Logger consists of the following tools:

- Protocol Viewer: Embedded plug-in used to display the communication transactions between the connected devices
- TI Island Message Trace: Embedded plug-in used to trace log messages generated by the TI *Bluetooth* host controller

The TI Logger includes the following features:

- User-friendly, intuitive interface
- Logs traces with different importance levels
- Rich configuration options, including color tagging

After installation, use a UART-USB adapter to connect to the device.

3.1 Setting Up the TI Bluetooth Logger

To set up the TI *Bluetooth* Logger, perform the following steps:

1. Double-click the Logger icon to start the Logger application. The software initializes and displays the main working window (see Figure 3).

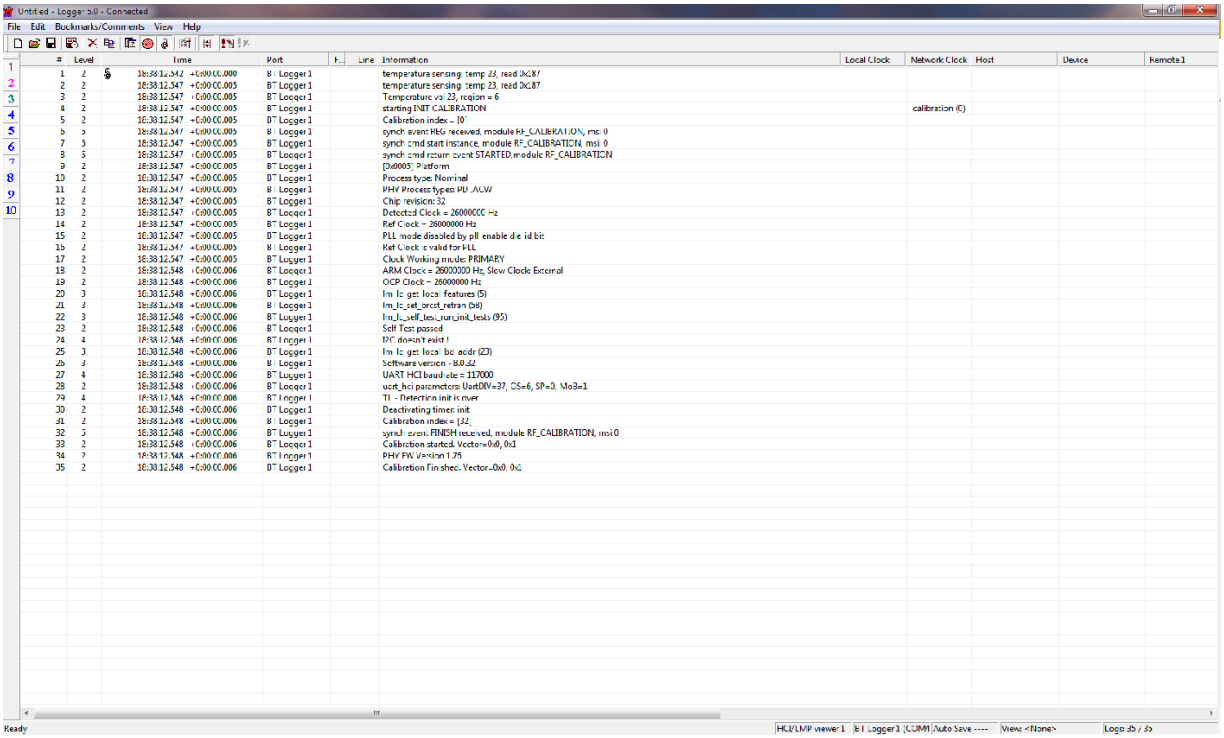

Figure 3. Logger Main Working Window

2. From the menu bar of the main working window, click the View menu and select Settings, as shown in Figure 4.

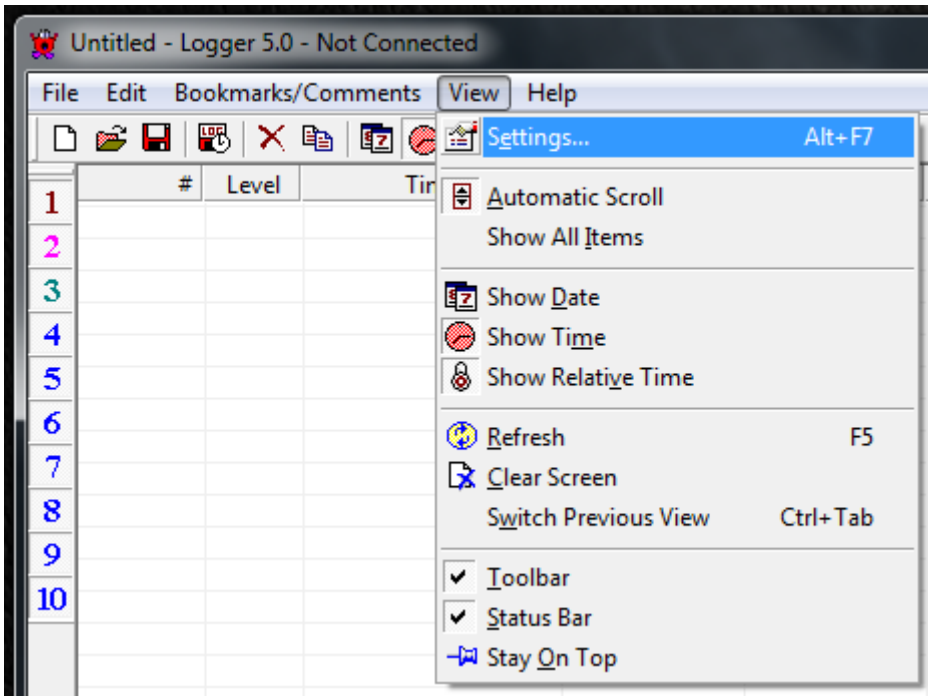

Figure 4. Selecting Logger Settings

The Logger Settings dialog box displays (see Figure 5).

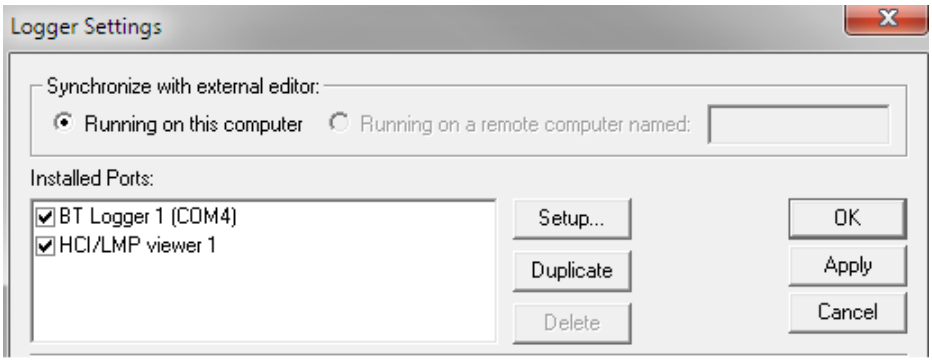

Figure 5. Selecting a Port

3. In the Installed Ports field of the Logger Settings dialog box, select a port from the list of ports. Figure 5 shows the Island1 plug-in selected.

   Table 1 describes the functions of the Logger Settings dialog box buttons.

Table 1. Logger Settings Dialog Box Functions

Button	Function
Setup	Open the setup window
Duplicate	Duplicate the selected port to create a new instance of that port (enables logging from different sources)
Delete	Delete the selected port
Apply	Apply the changes without closing the window
Cancel	Discard the changes and closes the window
OK	Save the new settings and closes the window

4. Use criteria settings to differentiate between distinct logs. Figure 6 shows the Criteria dialog box.

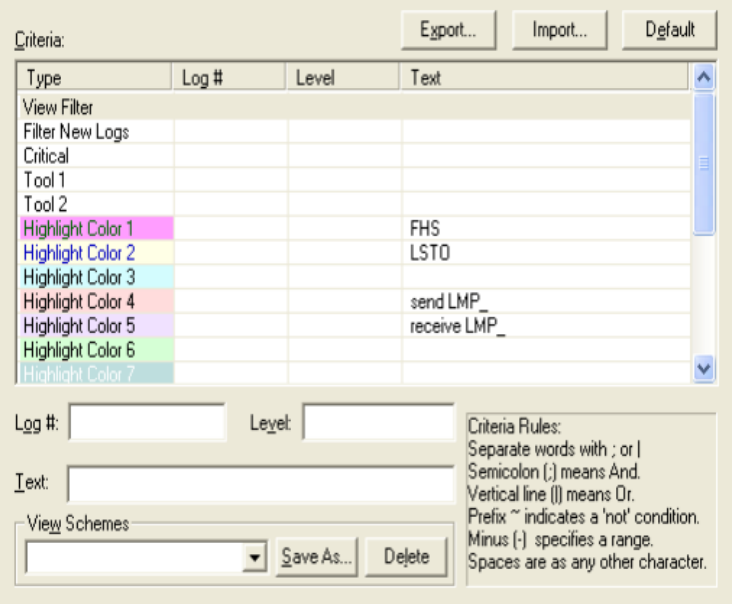

Figure 6. Criteria Dialog Box

To set a criterion:

(a) Select a criteria type (see Table 2).

Table 2. Criteria Settings

Criteria Types	Function
View Filter	Select which logs to view and which to hide
Filter New Logs	Permanently delete all new logs on arrival that meet the set criteria
Critical	Define logs that are deemed critical
Tool	Run any external file or application when the appropriate new log arrives
Highlight Color	Highlight (with the selected color) any log meeting the set criteria

(b) Type the appropriate values in the text box.

Table 3 describes the functions of the Export, Import, and Default buttons.

Table 3. Export, Import, and Default Button Functions

Button	Function
Export	Export the current criteria settings to an external file
Import	Import a previously exported criteria file
Default	Clear all criteria values for the currently selected type

5. When selecting the criteria type (see Table 2), edit the text boxes described in Table 4.

Table 4. Editing Criteria Fields

Edit Box	Function
Log # (number)	Select the log number
Level	Select the level
Text	Enter the criteria data

6. To create (and later select) multiple schemes or delete existing schemes, use the View Schemes field of the Criteria dialog box (see Figure 7).

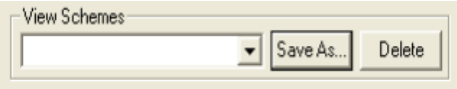

Figure 7. View Schemes Field

(a) After creating a new view scheme, click Save As (see Figure 7). The Select View dialog box displays (see Figure 8).

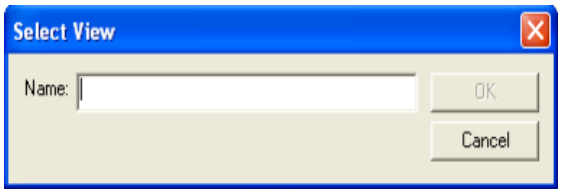

Figure 8. Select View Dialog Box

(b) In the Name field, type a scheme name and click the OK button.

3.2 Logger Protocol Viewer

The TI Protocol Viewer is a plug-in embedded in the Logger application that displays communication transactions between the master and slave devices connected to the network. The main screen is easy to use and intuitive for the new user. The Tool Tips feature describes all headings and toolbars whenever the cursor moves over them. The columns can be dragged and dropped as desired, and the data types can be changed to various colors to make the displayed data easier to read.

3.2.1 Setting Up the Protocol Viewer

To set up the Protocol Viewer, perform the following steps:

1. From the Logger window menu bar, click the View menu and select Settings (see Figure 9).

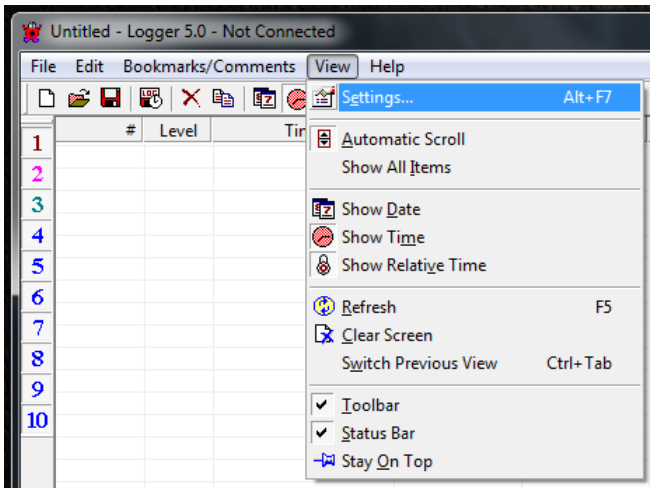

Figure 9. Selecting Logger Settings for Port Setup

The Logger Settings dialog box displays (see Figure 10).

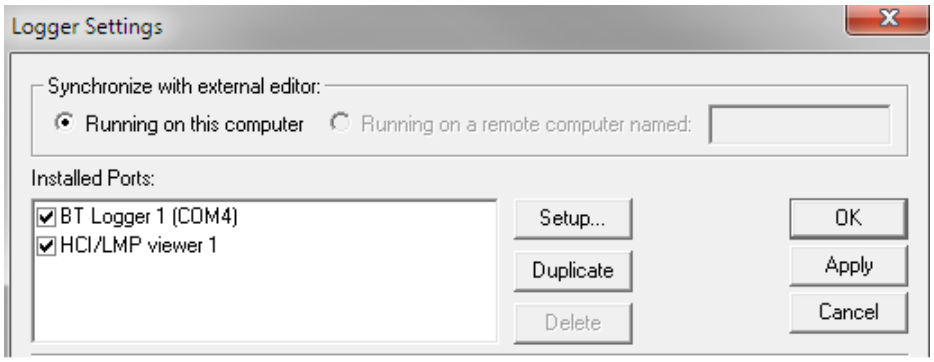

Figure 10. Selecting a Port in the Logger Settings Dialog Box

2. In the Installed Ports field, select the check box of the port to activate (for example, ProtView 1) for the Protocol Viewer. The Setup dialog box displays (see Figure 11).

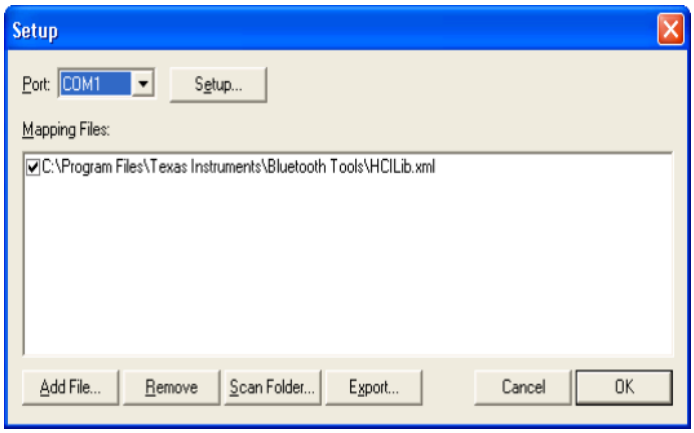

Figure 11. Setup Dialog Box

NOTE: If the Setup dialog box does not open, click the Setup button on the Logger Settings dialog box.

Table 5 lists the functions of the Setup dialog box.

Table 5. Setup Dialog Box Functions

Button	Function
Setup	Open the port setup dialog box
Add File	Add a new .xml file that defines the HCI library containing the HCI command set
Remove	Remove files from the Mapping window
Scan Folder	N/A
Export	N/A
Cancel	Discard changes and closes the window
OK	Save the new settings and closes the window

3. Select a port from the Port drop-down menu.
4. To verify or change the port settings, click the Setup button. The Squirt – Serial Port Settings dialog box displays (see Figure 12).

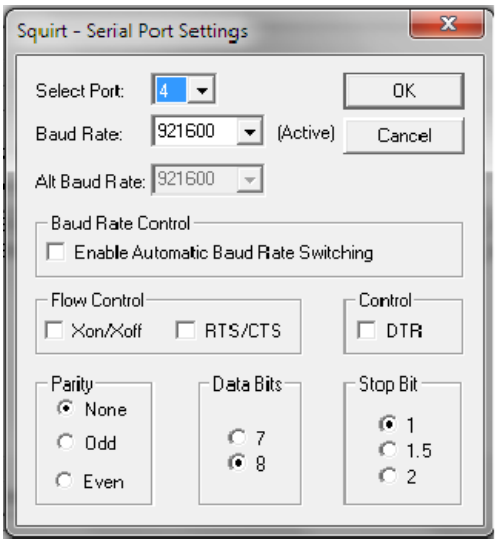

Figure 12. Squirt – Serial Port Settings

5. From the Set Baud Rate drop-down menu, select the baud rate of 921600 and click the OK button.

NOTE: HCI commands are not logged if the ProtView is not set.

3.2.2 Basic Operation Scenario of the Protocol Viewer

As shown in Figure 13, each device combination represents a local host and a remote device. The device communicates using link-manager protocol (LMP) transactions. Each device uses the host controller interface (HCI) protocol to communicate internally between the host and the connected device. All communication transactions appear in sequence in the relevant columns on the protocol viewer screen.

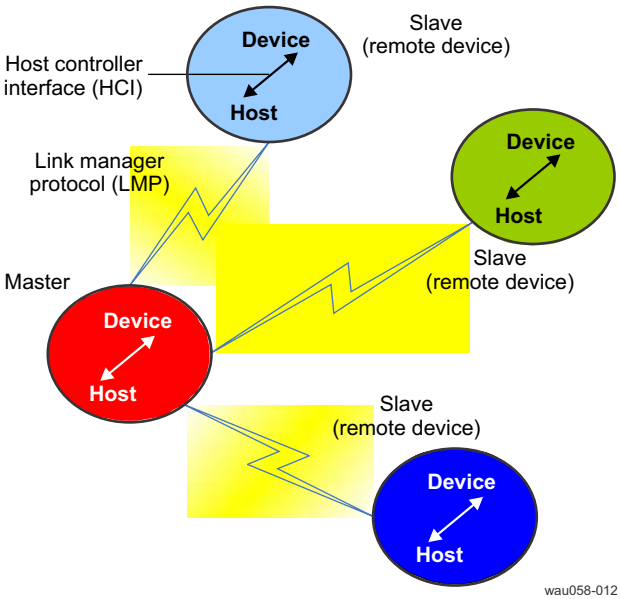

Figure 13. Basic Communications Diagram

3.2.3 Using the Protocol Viewer

Open a second instance of the Logger main working window. The status bar displays the Protocol Viewer (ProtView). If the status bar does not display ProtView, correct the port setup (for more information on port setup, see Section 3.2.1, *Setting Up the Protocol Viewer*).

The host communicates with the local device using HCI protocol transactions. The local device and the remote devices communicate using LMP transactions. Figure 14 shows the direction of the data flow.

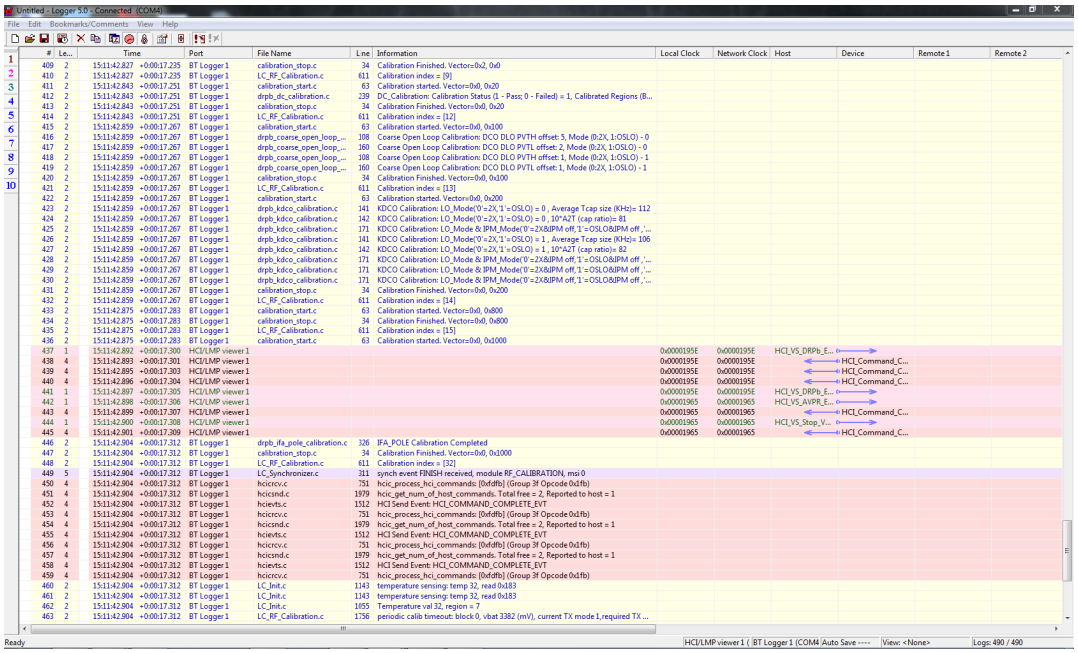

Figure 14. Data Flow Direction in Main Working Window

For more information on the Protocol Viewer, see the *Bluetooth* Specification.

3.3 Logger Message Trace

The TI Island Message Trace is a plug-in embedded in the Logger application that traces log messages generated by the TI *Bluetooth* host controller. The TI Island Message Trace offers a user-friendly, intuitive interface with rich configuration options, including color tagging, and logs traces with different importance levels.

3.4 Using the TI Logger Main Working Window

3.4.1 Toggling Log Levels

Each log has a specific level that can be toggled on and off as follows (see Figure 15):

Figure 15. Log Levels

- To select or deselect levels, use the right-click menu.
- To select a desired level, press the Ctrl key and click the level button.

3.4.2 Using the Toolbar Options

Table 6 describes the functions of the icons toolbar in the Logger main working window.

Table 6. Icons Toolbar Functions

Icon	Function
	Open new screen (Ctrl+N)
	Save screen (Ctrl+S)
	Open file (Ctrl+O)
	When the log reaches a predetermined size, the logs are automatically saved and the log buffer is cleared.
	Delete messages (DEL)
	Copy messages (Ctrl+C)
	Show or hide the date (toggles)
	Show or hide the time (toggles)
	Show or hide the relative time (toggles)
	Open the settings window
	Toggle automatic scrolling
	Audio beep on critical alarm (toggles)
	Mute critical alarm

3.4.2.1 Status Bar

Figure 16 shows the status bar.

Figure 16. Status Bar

Table 7 describes the functions of the status bar.

Table 7. Status Bar Functions

Name	Function
Selected port and connection names	Display the selected port and connection names
Auto Save	Automatically save at a predetermined time duration
View	Currently selected view scheme
	Clicking on this pane enables toggling between view schemes. Ctrl+Tab switches to previous view schemes. Ctrl+0..9 switches to a specific view scheme.
Logs: <Visible>/<Total>	Indicate how many visible logs are currently displayed

3.4.2.2 Bookmarks and Comments

The Bookmarks/Comments menu contains bookmark and comment commands.

- To add or edit comments or toggle bookmarks on and off, right-click the popup menu.
- All comments and bookmarks are automatically saved when the logs are saved to file.

Figure 17 shows the placement of the bookmark and comment icons on the main working window.

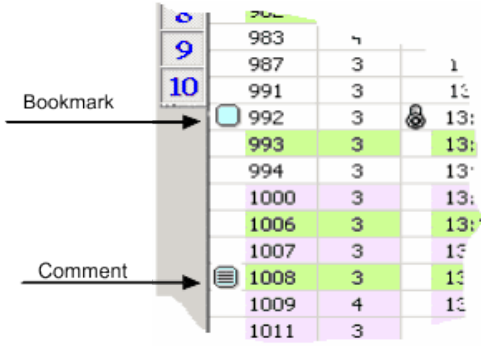

Figure 17. Bookmarks and Comments

Table 8 lists the keystroke commands to select and toggle bookmarks and edit comments.

Table 8. Keystroke Commands for Bookmarks and Comments

Keystroke Command	Function
F2	Next bookmark
Ctrl+F2	Toggle bookmark
Enter	Edit comment

3.4.2.3 Find Function

Figure 18 shows the Find dialog box. To display the Find dialog box, press Ctrl+F.

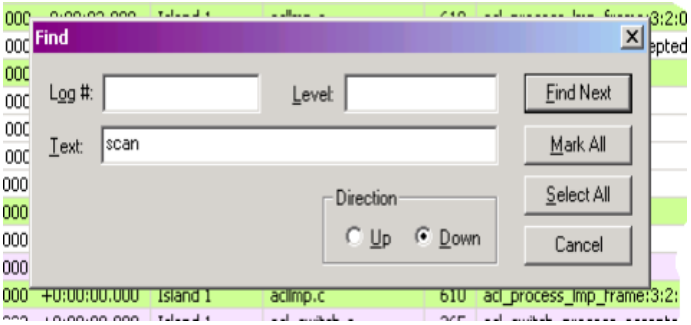

Figure 18. Find Dialog Box

Table 9 lists the functions of the Find dialog box.

Table 9. Find Dialog Box Functions

Ctrl+F	Find Dialog Box
F3	Find next
1..9	Find next level
A..Z	Incremental search

4 Link Quality Monitor

The *Bluetooth* 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 19).

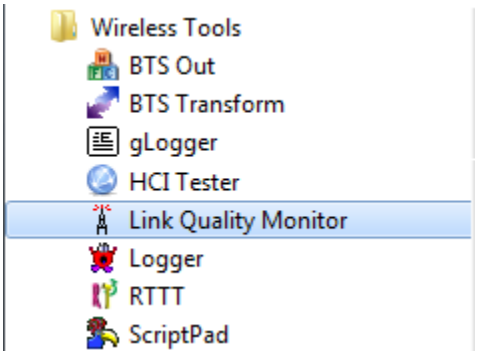

Figure 19. Starting the LQM

2. The LQM main window displays with the following panes (see Figure 20):
   - RSSI pane
   - Throughput pane
   - Used-channel pane (*Bluetooth* and BLE)

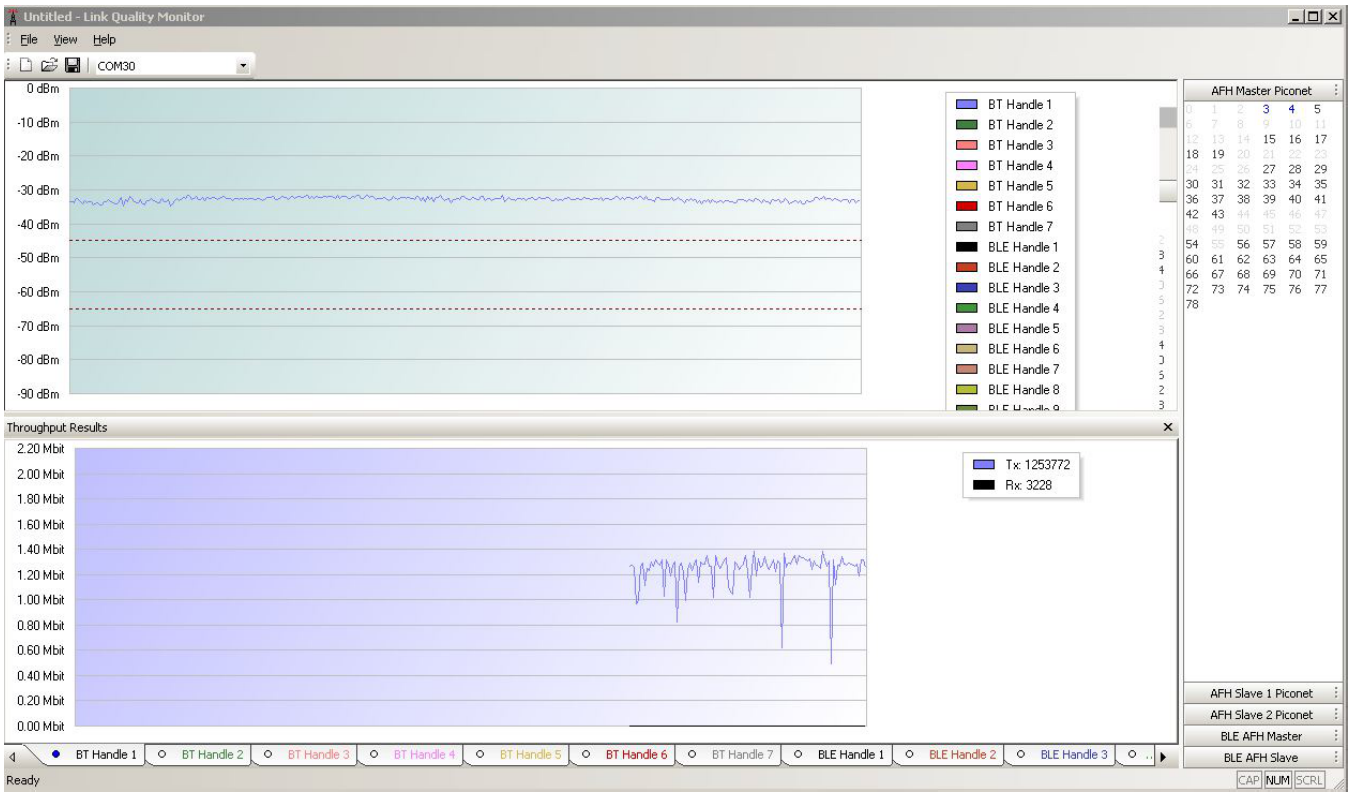

Figure 20. LQM Main Window

3. To select the port:

(a) From the toolbar, click the port connection box. A drop-down menu displays the available ports (see

Figure 21).

(b) Select the desired port. (The COM port uses the following default configuration: baud = 115200, flow control = none, 8-bit data byte without parity check, and 1 stop bit.)

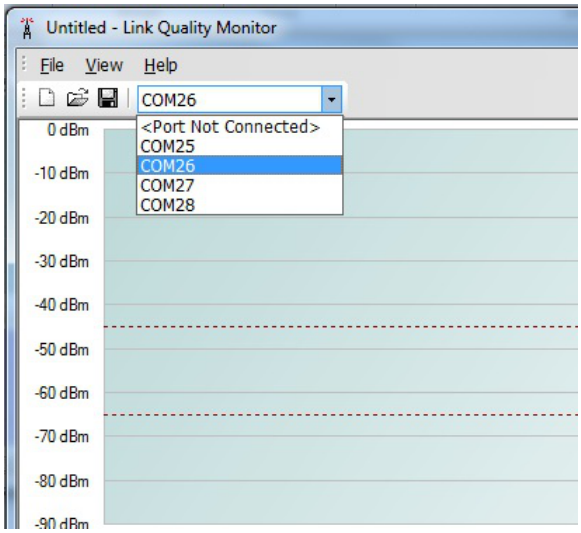

Figure 21. COM Port Selection

4.2 Using the LQM

4.2.1 Menu Bar

Table 10 describes the menu bar menus and submenus.

Table 10. Menu Bar

Menu	Submenu	Function
File	New	Create a new LQM file
	Open	Open an existing LQM file
	Save	Save the active LQM file
	Save as	Save the active LQM file with a new name
	Exit	Exit the LQM application
View	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
	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 11 describes the toolbar options.

Table 11. Toolbar

Item	Function
	Create a new LQM file
	Open an existing LQM file
	Save the active LQM file with a new name
 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 22):

- 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 22).

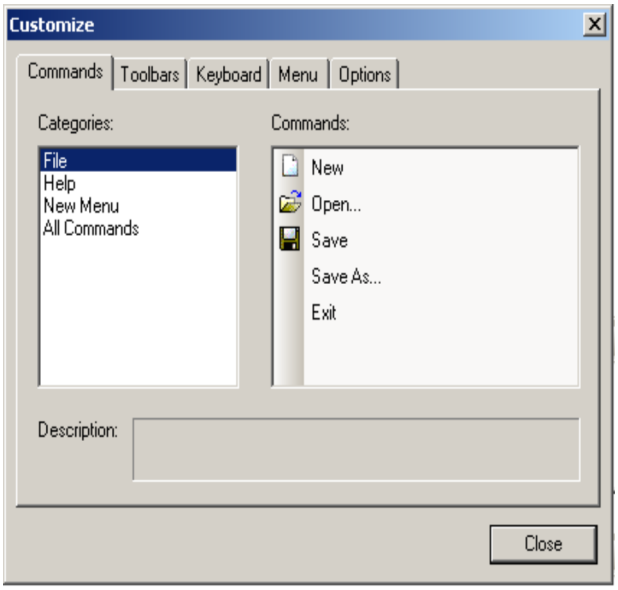

Figure 22. Customize Dialog Box With Commands Tab Selected

Use the Toolbars tab to enable and disable toolbars (see Figure 23).

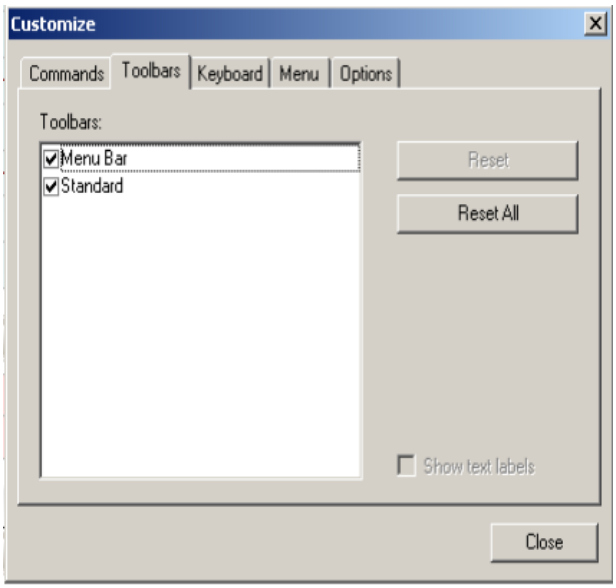

Figure 23. Customize Dialog Box With Toolbars Tab Selected

Use the Keyboard tab to create a keyboard shortcut for each menu item (see Figure 24).

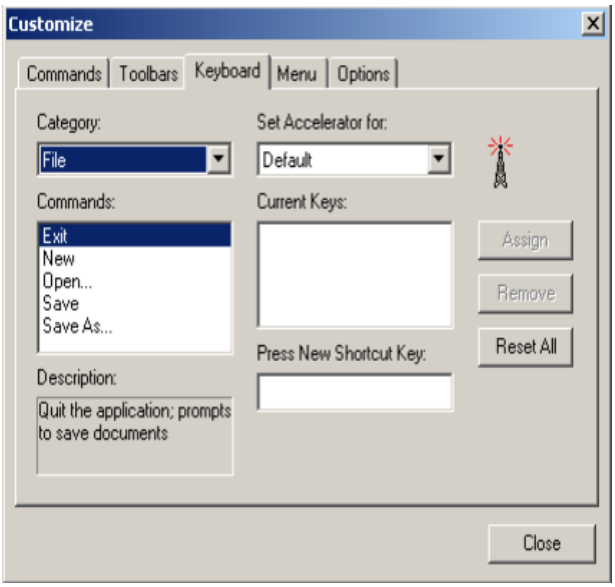

Figure 24. Customize Dialog Box With Keyboard Tab Selected

Use the Menu tab to customize menus, which includes animations and shadows (see Figure 25).

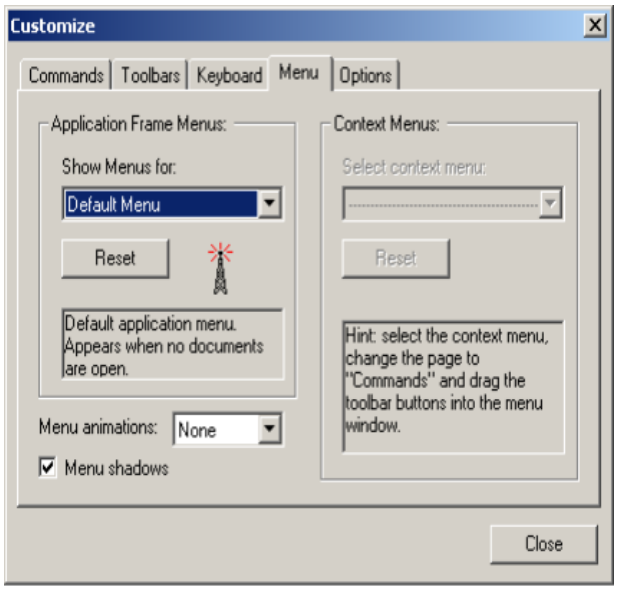

Figure 25. Customize Dialog Box With Menu Tab Selected

Use the Options tab to customize how menus are viewed (see Figure 26).

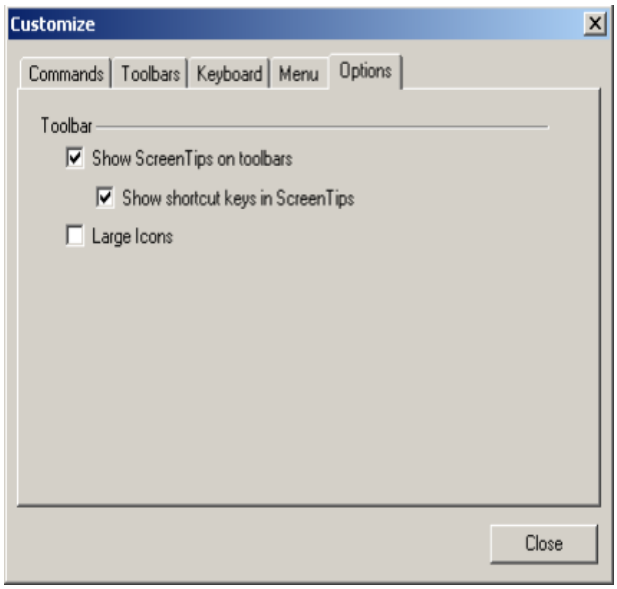

Figure 26. Customize Dialog Box With Options Tab Selected

4.2.4 LQM Active Window

The LQM active window displays the following kinds of data regarding the quality of the link (also Figure 27):

- RSSI
- Used channels map

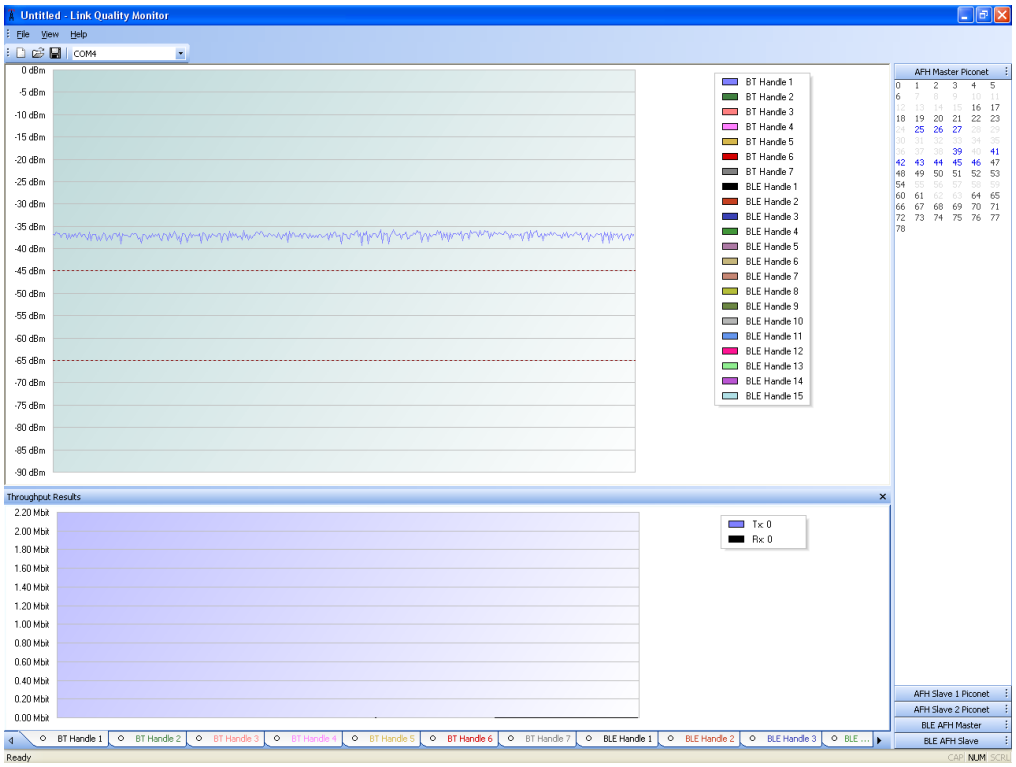

Figure 27. LQM Active Window

The LQM application supports up to seven handles and 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].

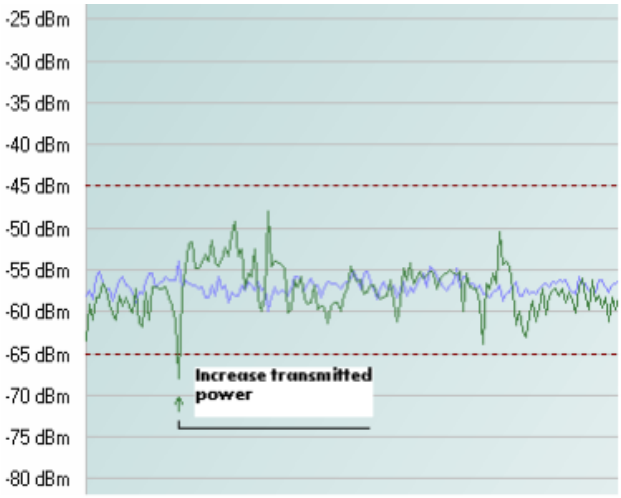

Figure 28. Increase Transmitted Power

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 28). In this case, ↑ (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, ↓ (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.

Figure 29 shows the used-channels window.

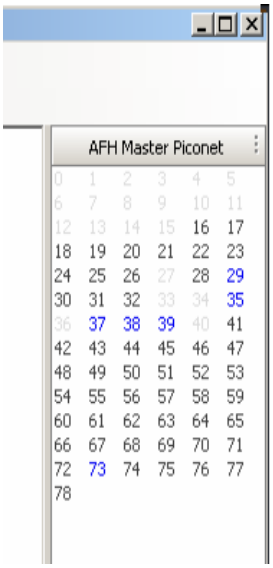

Figure 29. Used-Channels Window

Terms and Abbreviations

Table 12 lists terms and abbreviations.

Table 12. 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

Revision History

Changes from B Revision (March 2011) to C Revision **Page**

- Changed user guide title from *TX_DBG Software Tools User Manual* 1
- Changed organization of user's guide 1
- Added Section 2, *Installation* 3
- Changed Figure 3 4
- Changed Figure 4 5
- Changed Figure 9 7
- Changed Figure 14 10
- Deleted section on *PC Setup for Near Field Communications (NFC)* 13
- Changed Section 4.1, *Installing the LQM* 13
- Deleted section on PER/BER window 19
- Added Appendix A, *Terms and Abbreviations* 20

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