HCI Tester Manual

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Revision History

Version	Date	Description
1.0	November 2009	Release

Reference Documents

The documents listed below provide complementary specifications and information for the device:

- Bluetooth SIG Specifications and the Vendor-Specific Commands documents
- SWRU193A – Bluetooth Vendor-Specific HCI Commands.pdf
- Bluetooth Patch Description
- SWRA288 – eHCILL 4 Wire Power Management Protocol Application Report

About This Document

This document describes the HCI Tester application, which enables the testing of TI Bluetooth devices using Host Controller Interface (HCI) commands and data.

It is divided into the following chapters:

- **Chapter 1, Installation,** on page 7, describes the minimum system requirements and the procedure for installing the HCI Tester tool.
- **Chapter 2, Introduction,** on page 8, introduces the HCI Tester tool.
- **Chapter 3, Configuration,** on page 10, describes the configuration of the HCI Tester tool.
- **Chapter 4, A Quick Tour of the HCI Tester,** on page 21, describes the main window and the options in the menubar, toolbar and status bar.

Installation

The HCI Tester tool is one of the components of the **TI Wireless Tools.exe** installation file. The following is a list of its minimum system requirements:

- Microsoft Windows® 2000 or Microsoft Windows® XP operating system
- Pentium® II processor
- 64 MB of RAM
- Hard disk drive with 100MB free space
- Serial Communication Port (RS-232) or USB Port (using Virtual COM Port)

To install the software:

- Run the **TI Wireless Tools** executable file and then follow the simple displayed instructions.
- After installation, the HCI Tester application can be accessed by selecting **Start ➔ All Programs ➔ Texas Instruments ➔ Wireless Tools ➔ HCI Tester**.

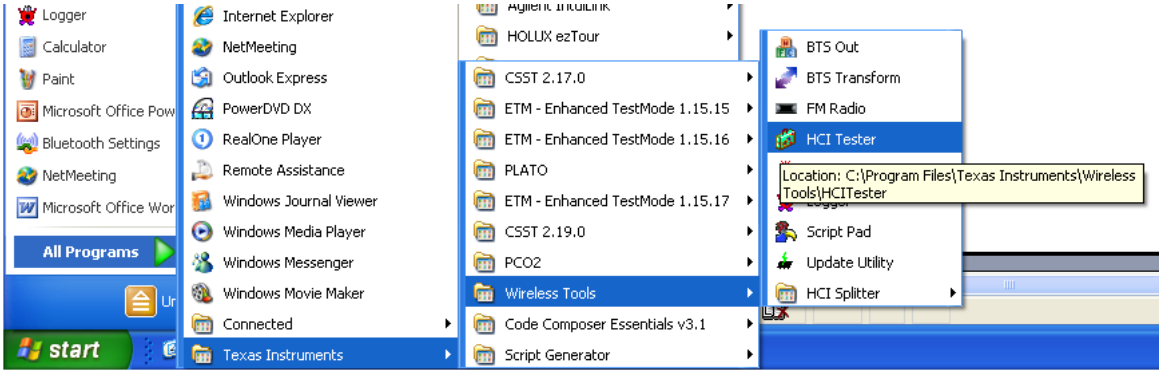

Figure 1: HCI Tester Location

It is also accessible as a desktop shortcut and from the menubar, as shown below:

Figure 2: HCI Tester Shortcut

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Introduction

The HCI Tester tool controls a TI Bluetooth device from a computer by sending and receiving Host Controller Interface (HCI) commands, as well as Asynchronous Connectionless Data (ACL) through a UART port. Furthermore, the HCI Tester can communicate with a TI Bluetooth device in Sleep mode using the TI HCILL protocol.

The HCI Tester tool is not intended to replace a Bluetooth Stack, but rather to be a testing tool for TI Bluetooth devices. By using HCI commands and ACL data, the user can control and test the main functions of a TI Bluetooth device, such as inquiry, paging/connecting, read features, control power and all functions defined in the Bluetooth lower layers (below the HCI layer), as specified in the Bluetooth specifications.

For detailed information on HCI commands, you may refer to the *Bluetooth SIG Specifications* and the *Vendor Specific Commands* documents for standard and TI Proprietary commands respectively. The following figure shows the HCI interface between a Host (upper Bluetooth stack layers) and a TI Bluetooth device (lower Bluetooth stack layers) on a complete Bluetooth system solution.

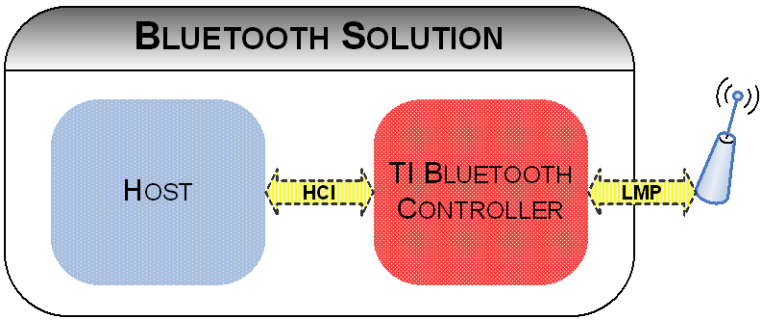

Figure 3: Host Controller Interface (HCI)

The following shows the **HCI Tester** window with its five main panels. Each panel is described in *Chapter 4, A Quick Tour of the HCI Tester,* on page 21.

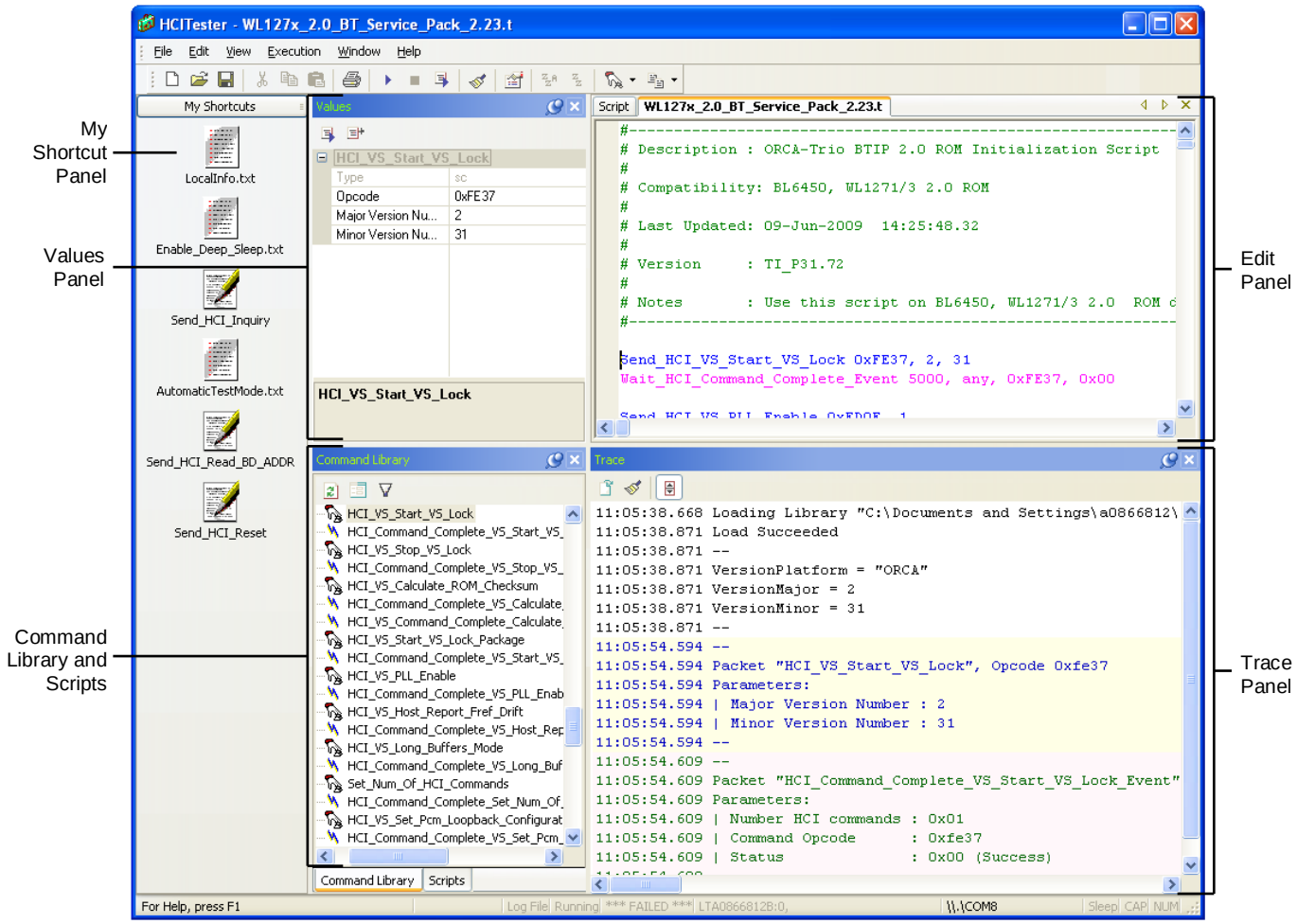

Figure 4: Main HCI Tester Panels

Configuration

The HCI Tester tool requires two mandatory steps in order to configure it for normal use and one additional step to configure the optional Sleep mode. Setting up a COM port and selecting the correct HCI Library to parse the commands are the two obligatory steps. Configuring the HCI Low Level (HCILL) is an additional step that is only required if Sleep mode is needed.

Section 3.1, Setting Up the COM Port and *Section 3.2, HCI Library Selection* describe the instructions for the mandatory configurations and *Section 3.3, Optional: HCILL Sleep Configuration* describe the additional step for setting up the HCILL Sleep mode.

Topic **Page**

3.1 Setting Up the COM Port

To set up the COM Port:

1 In the HCI menubar, select **View ➔ Options**, as shown below:

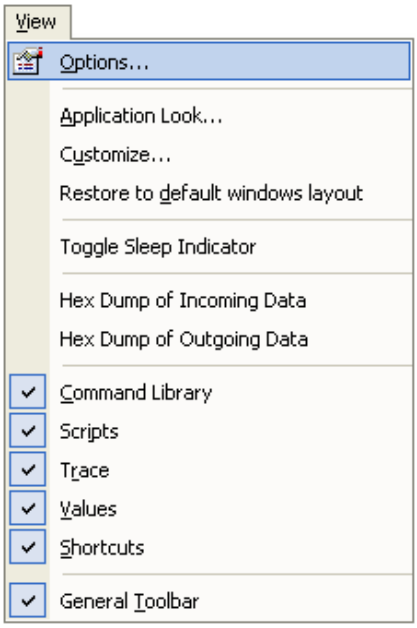

Figure 5: Open Options Window

The **Options** window is displayed, as shown in Figure 6.

2 In the **Options** window, select a COM port from the dropdown list in the **Serial Port** tab that appears under the **Port Connection** menu, as shown below. By default, all TI Bluetooth device are configured to work with the following settings:

- **Baud Rate:** 115,200 bps
- **Flow Control:** Hardware
- **Sleep Type:** None

After selecting the above settings, click **OK**.

Note: The Serial Cable or the USB Cable (Virtual COM port) must be connected to the PC before opening the HCI Tester. Otherwise, the COM port number may not be enumerated on the Port Number dropdown field.

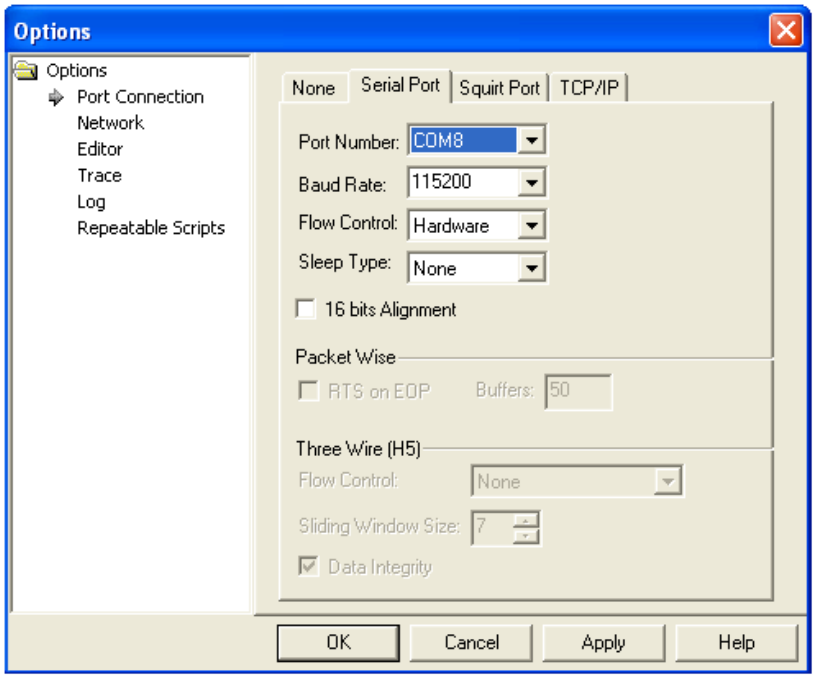

Figure 6: Options Window Settings

3 If the selected COM port is accepted by the HCI Tester tool, it appears in the status bar as shown below.

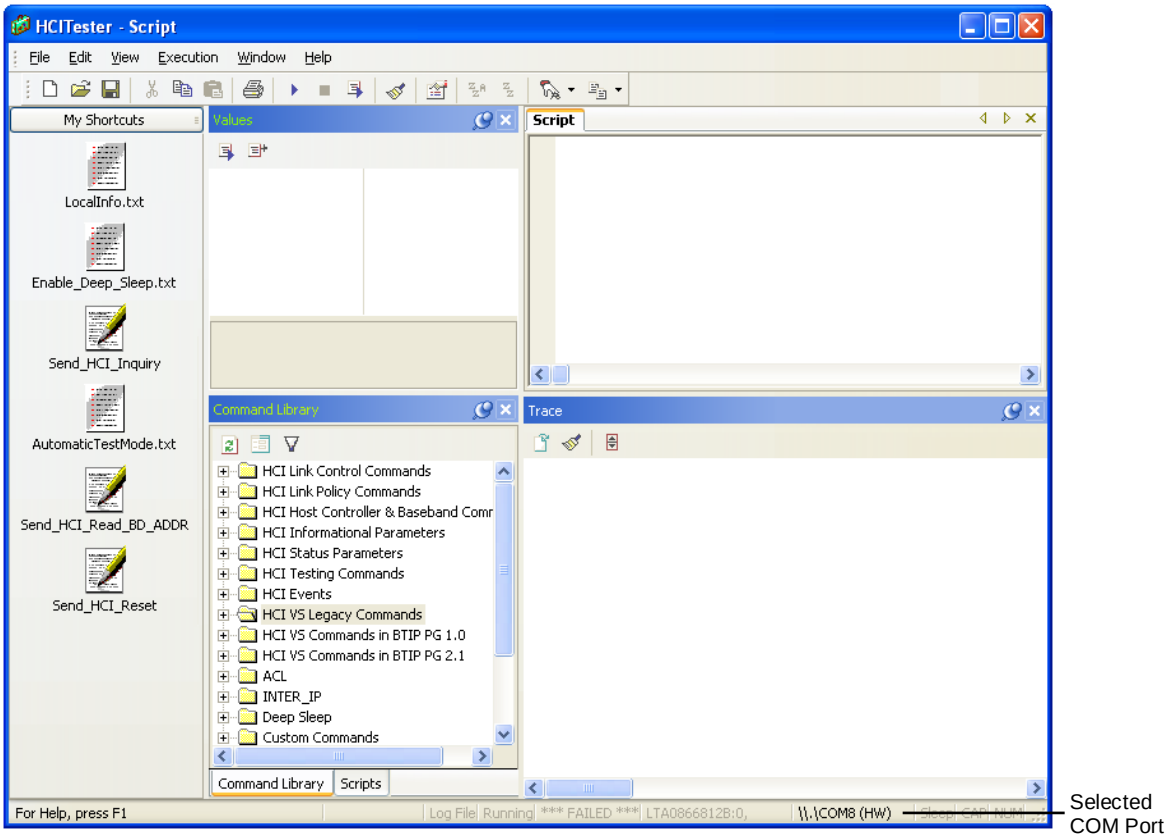

Figure 7: Selected COM Port in the Status Bar

3.2 HCI Library Selection

The HCI Library is required to parse the commands from text format to binary data. Each specific device and specific firmware version has its own HCI Library in XML format. A HCI library is released with each Service Pack, and the latest library can be found in the latest Service Pack. You may contact TI for the latest version. You may refer to the *Bluetooth Patch Description* for more information.

To select the corresponding HCI Library:

1 Click the **Change HCI Libraries** button in the **Command Library** and **Scripts** panel, as shown below.

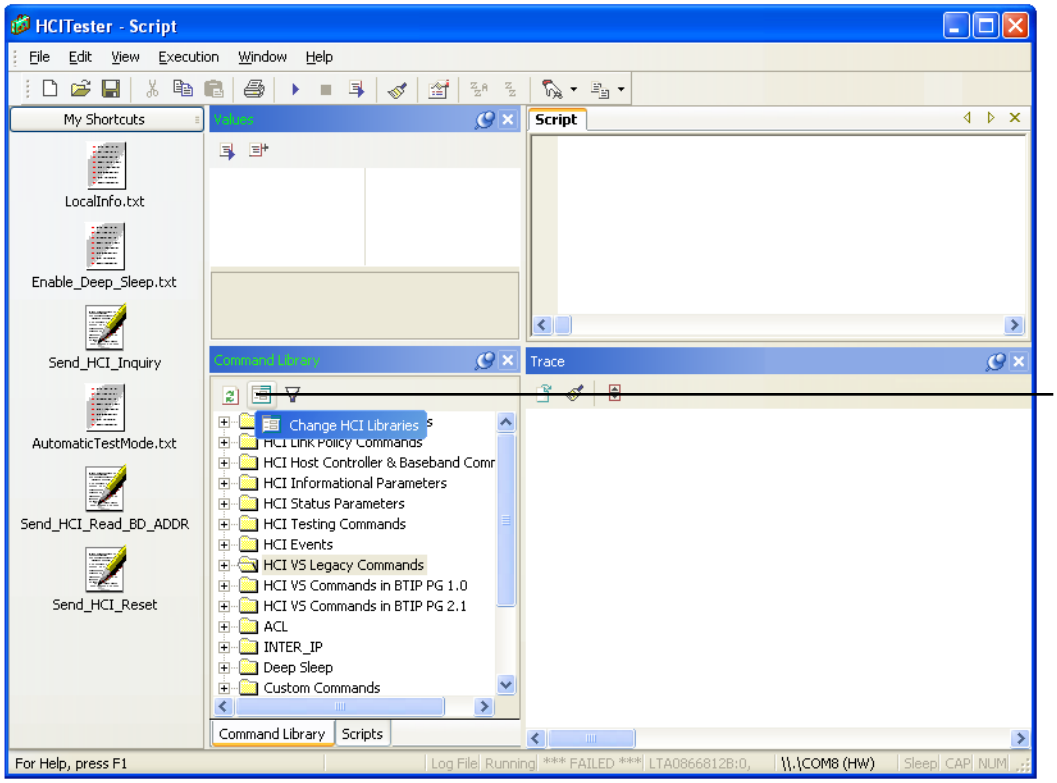

Figure 8: Open and Change Library Files Window

2 Select only one HCI Library according to the device and firmware version, as shown below. Click **OK** to apply changes. If the desired HCI Library is not listed, it can be added using the **Folder** button in this window. Some libraries may be found under the **C:\Program Files\Texas Instruments/Wireless Tools\XML** folder. You may refer to the *Bluetooth Patch Description* for more information.

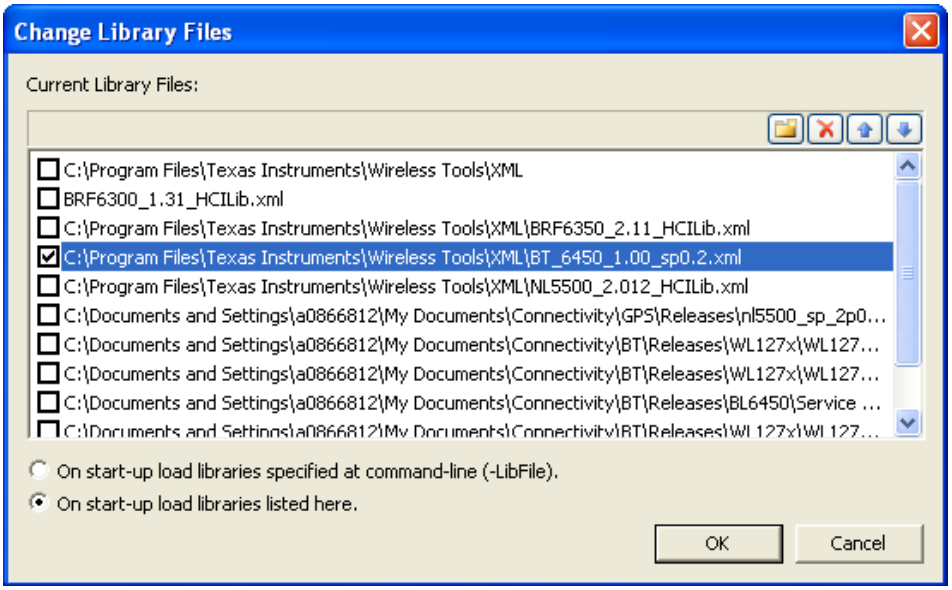

Figure 9: Select an HCI Library

The following table describes the buttons in this window.

Table 1: Buttons in the Change Library Files Window

Button	Description
	Adds a new HCI Library to the panel
	Removes a selected HCI Library from the panel
	Moves up the position of the selected HCI library in the panel
	Moves down the position of the selected HCI library in the panel

Note: The radio buttons on the bottom of the window specify which library is automatically loaded the next time the HCI Tester is opened. The two options are either to use the latest selected library on this window (**On start-up load libraries listed here)** or to define the location using the **-LibFile** parameter in the opener shortcut (**On start-up load libraries specified at command-line (-LibFile)**). For more details describing this last option, you may refer to *Section **4.1.3.2**, **Scripts Tab***.

The HCI Library is then loaded to the **Command Library** and **Scripts** panel and a loading description appears in the **Trace** panel, as shown below:

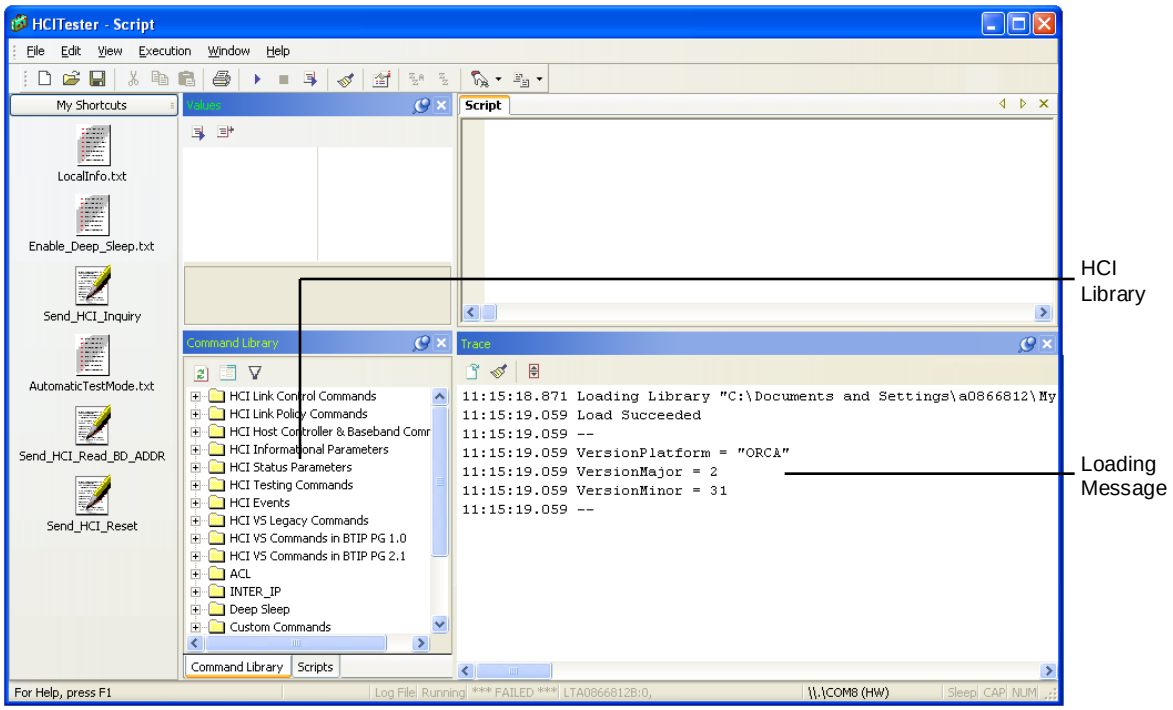

Figure 10: HCI Library Loaded

After selecting a COM port and a HCI Library, the HCI Tester can start communicating with the TI Bluetooth device in Normal mode.

3.3 Optional: HCILL Sleep Configuration

Configuring the HCI Tester for HCILL support is an additional step that is only required if the connected TI Bluetooth device uses the HCILL Sleep mode. For specific details about the HCILL protocol, you may refer to the *SWRA288 – eHCILL 4 Wire Power Management Protocol* application report.

To configure the HCI Tester for HCILL support:

1 In the **Options** window select the HCILL Sleep Type (to open this window you may refer to Figure 5). The following figure shows the selection of the **HCILL Sleep Type** from the dropdown box.

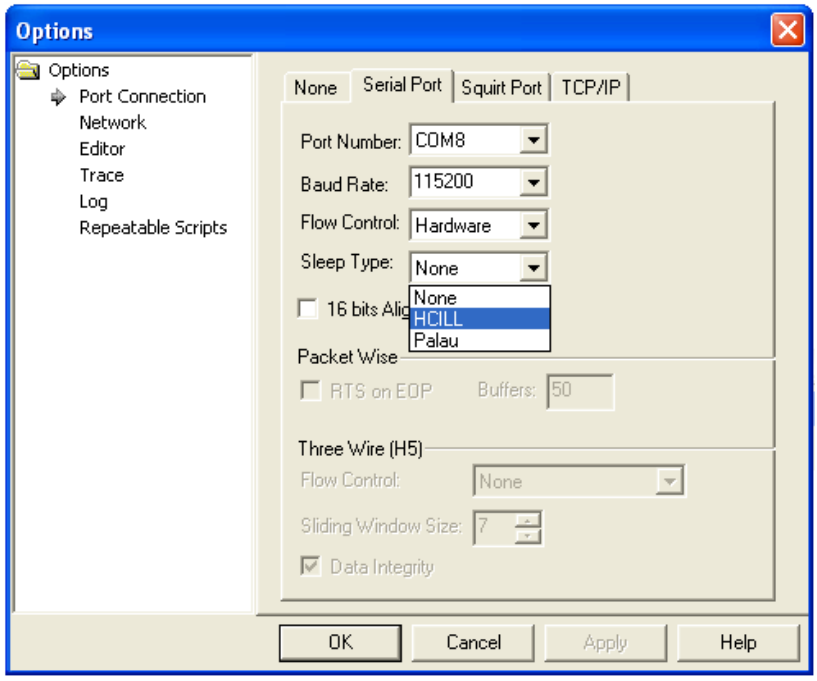

Figure 11: Select HCILL Sleep Type

2 From the toolbar, click the **Automatically awake device on sleep** button (, shown below). After clicking this button, the **Device Sleep** button ( ) is selected automatically and the first HCILL message is displayed on the **Trace** panel. Additionally, the **Sleep** indicator on the status bar is highlighted green, as shown below. The HCILL mechanism on the HCI Tester side is now configured.

Note: If the InitScript has not been executed yet, then it is sent before this step. The TI Bluetooth device is not yet in the HCILL Sleep mode. Some InitScripts can be found under the **C:\Program Files\Texas Instruments/Wireless Tools\InitScripts** folder. Contact your TI representative for the latest version. You may refer to *Section **4.1.1**, **Editor Panel*** for instructions on how to send scripts with the HCI Tester. You may refer to the *Bluetooth Patch Description* for more information.

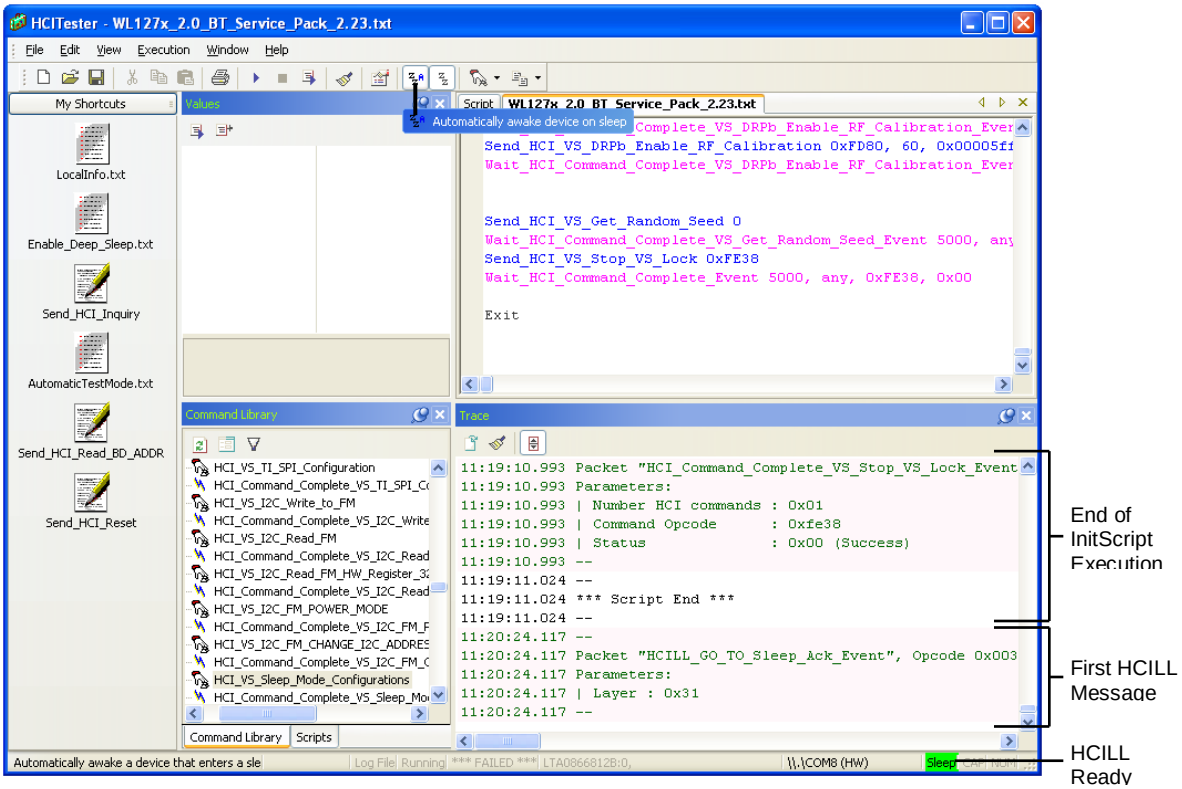

Figure 12: HCILL Configured on the HCI Tester Side

3 Send the commands **Send_HCI_VS_hcill_parameters** and **Send_HCI_VS_Sleep_Mode_Configurations** to the TI Bluetooth device respectively in order to configure and enable HCILL Sleep mode on this device. You may refer to the *Vendor Specific (VS) Command* document for command details. *Section **4.1.1**, **Editor Panel**, Section **4.1.3.1**, **Command Library Tab**, Section **4.1.4**, **Values Panel*** and *Section **4.1.5**, **My Shortcuts Panel*** describe how to send commands with the HCI Tester. You may refer to the *SWRU193A – Bluetooth Vendor-Specific HCI Commands.pdf* for more information.

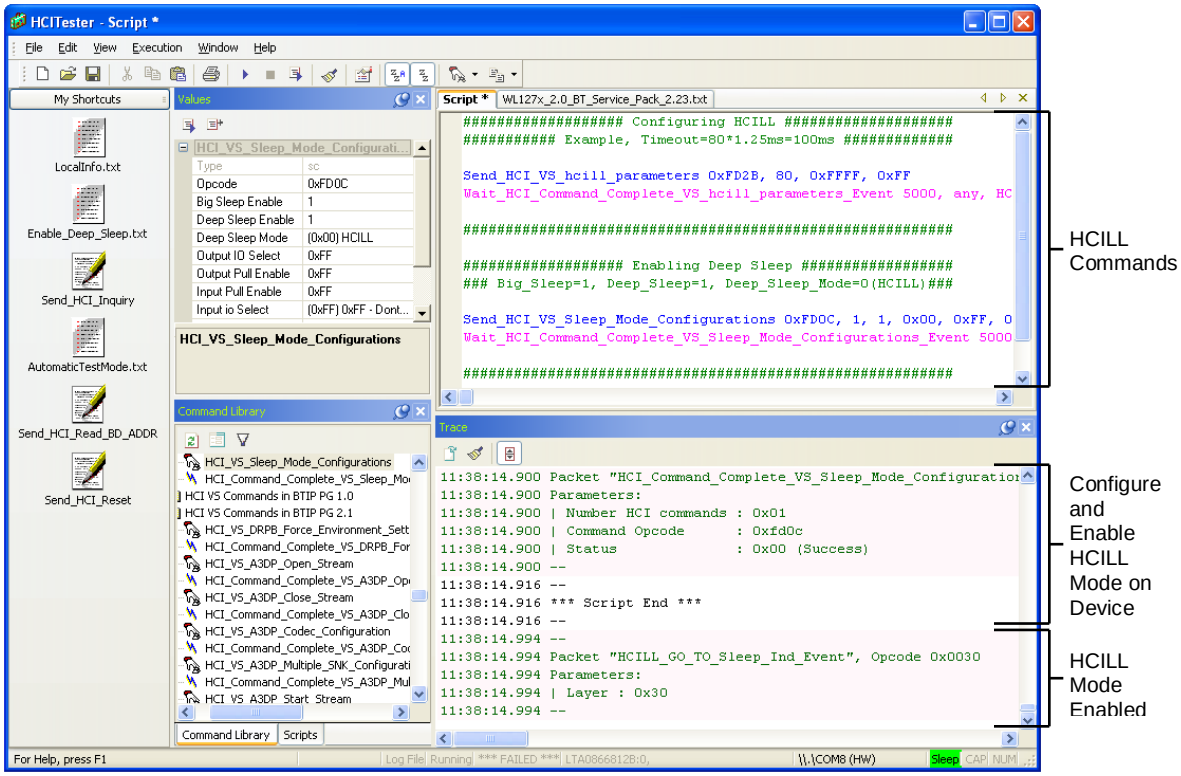

Figure 13: HCILL Configured on the Device Side

The HCI Tester and the TI Bluetooth device now communicate using the HCILL protocol. The following figure shows an example of what happens when a command is sent in this mode. The HCI command and HCILL messages can be observed in the sequence.

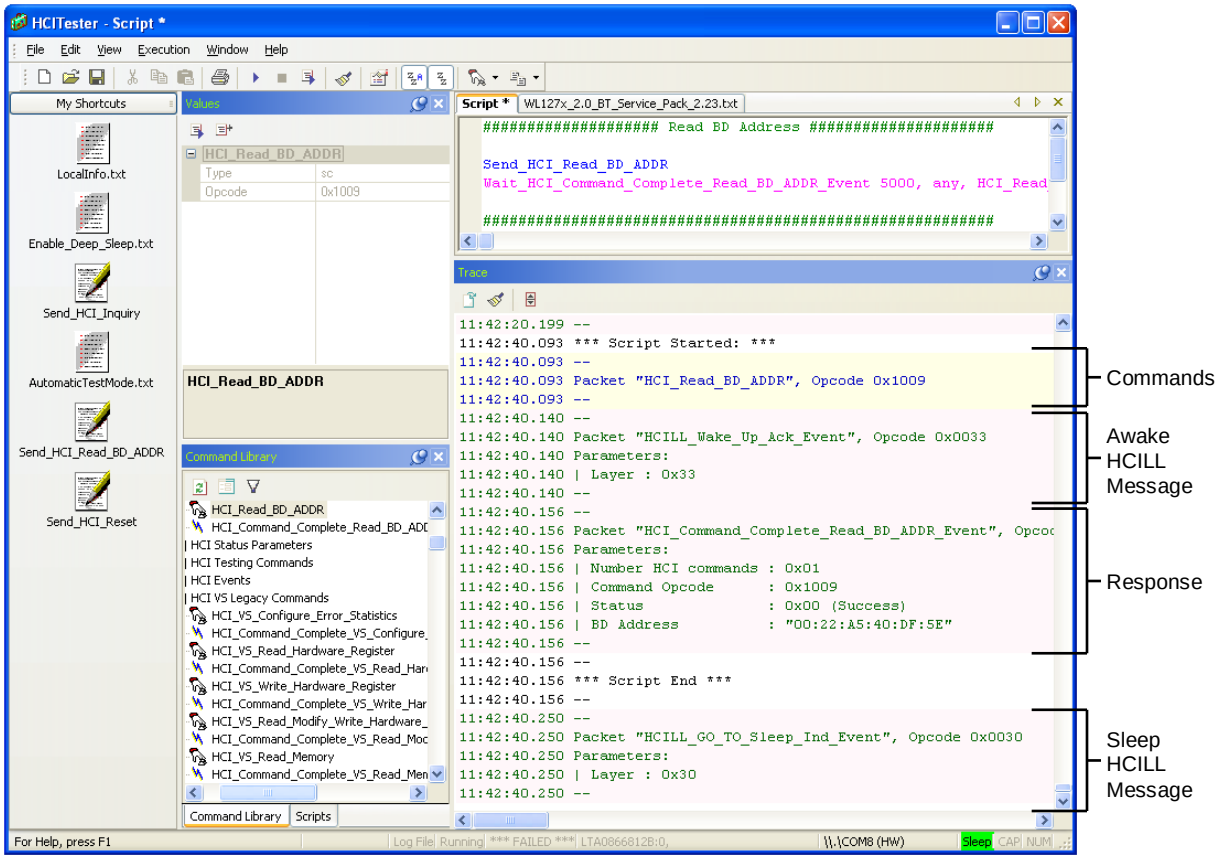

Figure 14: HCI Tester Working under the HCILL Mode

Note: To disable the HCILL mode, follow the same steps mentioned above, but in the reverse order, meaning first perform Step 3, then Step 2 and finally Step 1. Failure to follow this sequence may halt the HCI Tester and TI Bluetooth device. Notice that the HCI commands must now disable the Sleep mode.

A Quick Tour of the HCI Tester

This chapter describes the main window and the options in the menubar, toolbar and status bar.

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4.1 Main Window

The HCI Tester contains five main panels: **Editor, Trace, Command Library and Scripts, Values** and **My Shortcuts**, as follows:

- **Editor Panel:** page 22, Opens, modifies and sends scripts/commands.
- **Trace Panel:** page 25, Displays the flow of HCI messages in different formats.
- **Commands Library and Scripts Panel:** page 27, Contains the commands available on the loaded HCI Library, as well as a shortcut to defined scripts.
- **Values Panel:** page 31, Shows a detailed description of the command selected in the **Editor** or **Command Library** panels.
- **My Shortcuts Panel:** page 32, Provides quick access to selected scripts.

For more details regarding each panel, refer to the corresponding section below. The location of each panel is shown in *Chapter 2, Introduction,* on page 8.

4.1.1 Editor Panel

The **Editor** panel opens, creates, modifies and executes scripts. Multiple script files can be loaded into this panel, but only one can be active at a time.

To switch between scripts:

- Select the corresponding tab of the script on the top of the panel. The selected script becomes the active one and all possible functions apply to this script only, meaning run, save, copy, paste, and so on. Only text format scripts are accepted and not BTS files.

To run a complete script:

- Select the desired script on this panel and click the **Execute** button. The **Execute** button appears in the **Execution** area in the menubar, in the toolbar or by right clicking inside the **Editor** panel, as shown below. While running a script, the execution can be aborted by using the **Stop** button located in the same locations as the **Execute** button. The current executed line is highlighted at the bottom of the panel.

  The following shows the various locations of the **Execute** button.

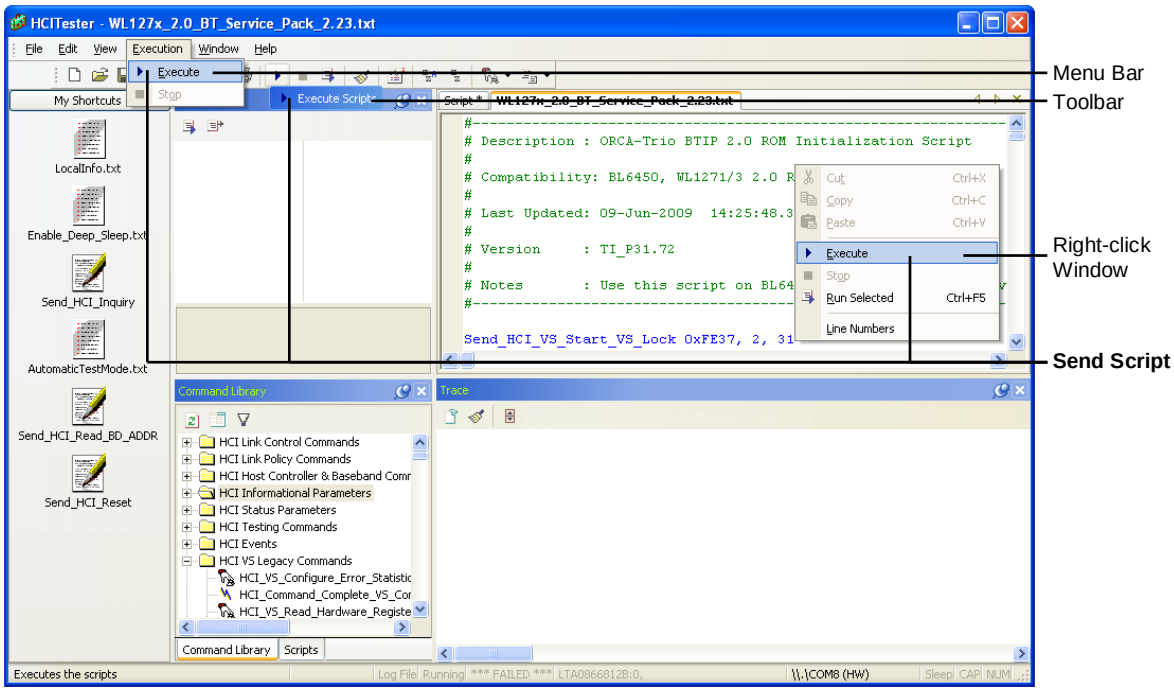

Figure 15: Run Complete Script

To run only part of a script:

- Select the desired commands on the script file and click the **Run Selected** option. This option is available in the toolbar and by right clicking the Editor panel, as shown below.

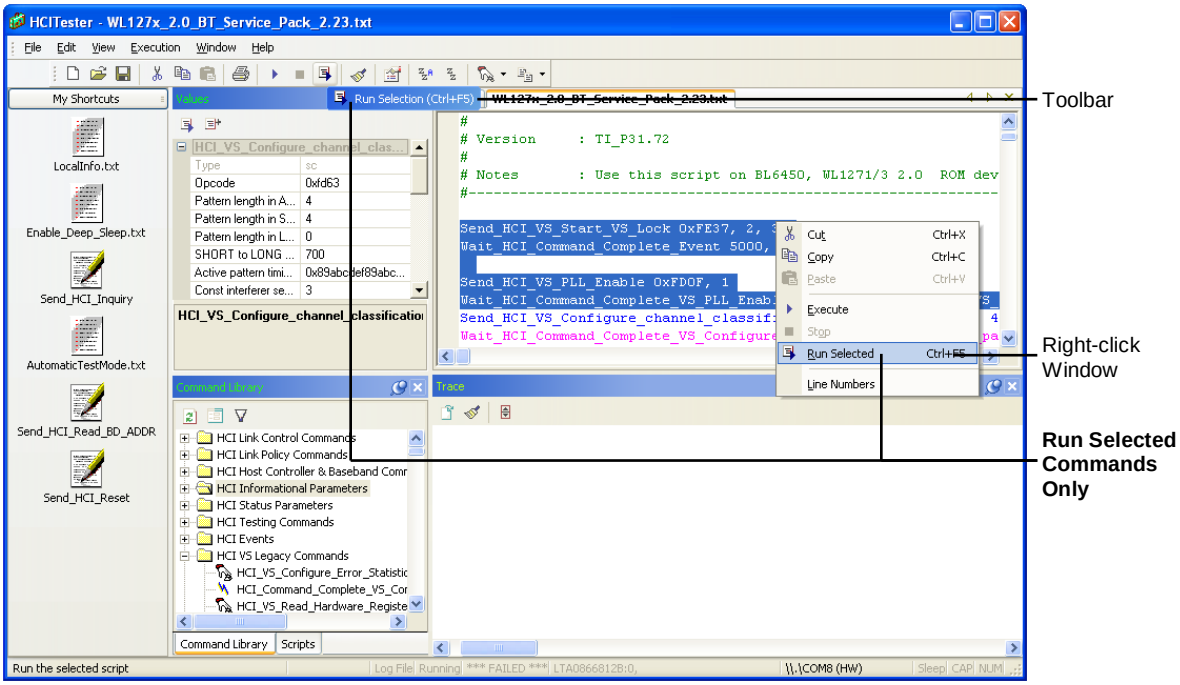

Figure 16: Run Selected Commands in a Script Only

All other common functions, such as **New**, **Open** and **Save** apply to script files and are handled in the same way as in any other standard editors with corresponding menus. The font used on the **Editor** panel can be modified in the **Options** window in the **Editor** tab as shown below. To open the **Options** window, you may refer to Figure 5.

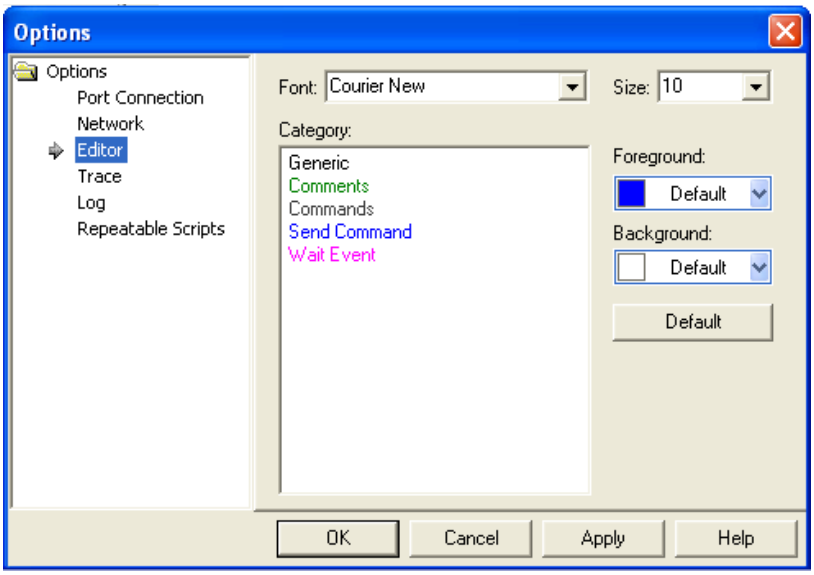

Figure 17: Modify Font on the Editor Panel

4.1.2 Trace Panel

The **Trace** panel displays the flow of HCI messages (commands, events and data) between the HCI Tester and the TI Bluetooth device in text and hex (if enabled) formats, as shown below.

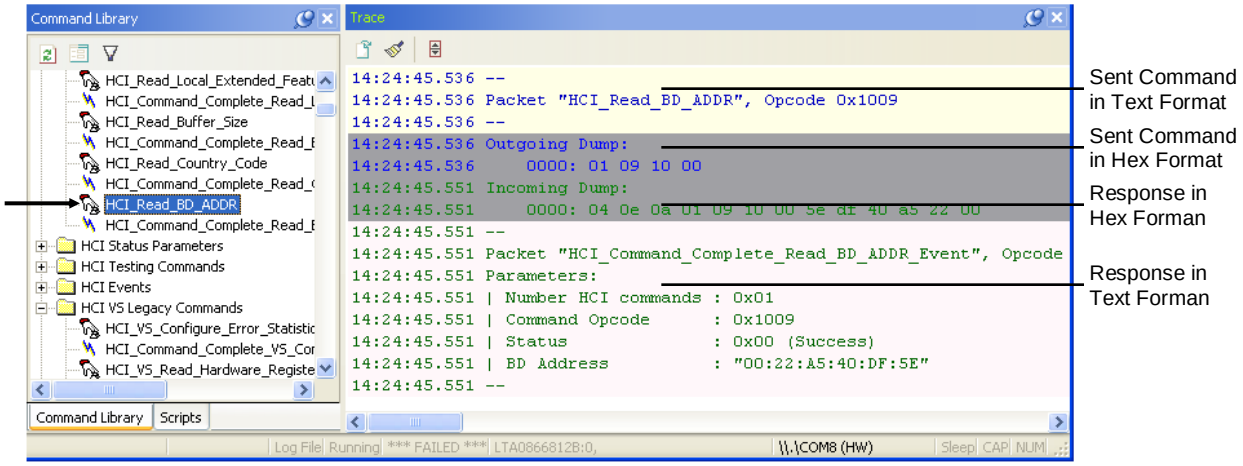

Figure 18: Messages in Text and Hex Formats

The **Trace** panel also provides a variety of helpful options, such as: font changing features, auto-save logs, clear logs and automatic scroll.

To enable the HCI messages in hex format:

- Select the **Hex Dump of Incoming Data** or the **Hex Dump of Outgoing Data** option from the **View** menu, as shown in below:

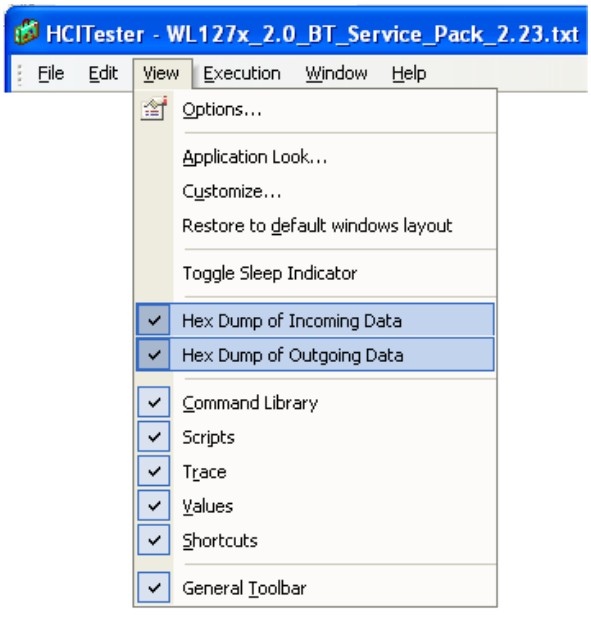

Figure 19: Enable Messages in Hex Format

To customize the font:

- Select the **Trace** tab under the **Options** window, as shown below. For a description of how to open the **Options** window, you may refer to Figure 5.

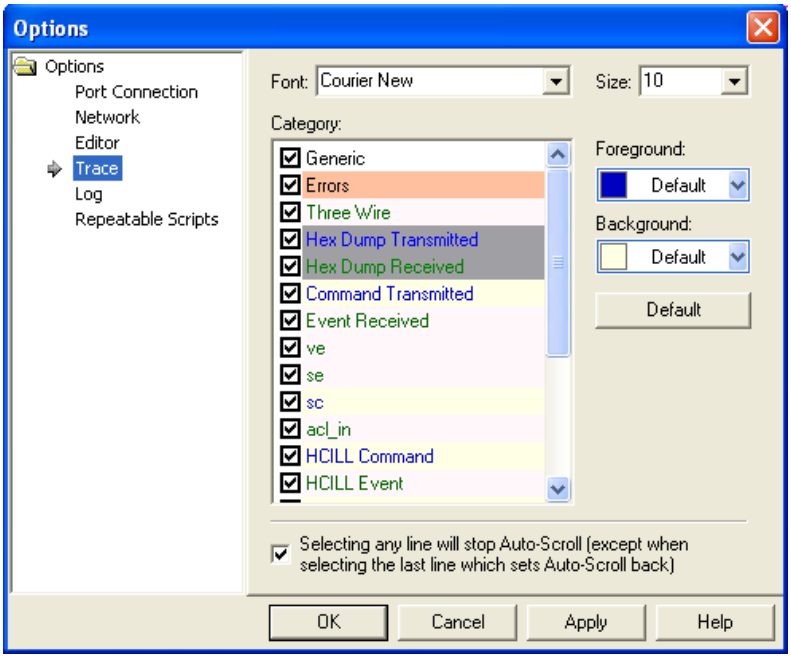

Figure 20: Trace Tab on the Options Window

To auto-save logs:

- Select the **Log** tab under the **Options** window, as shown below. For a description of how to open the **Options** window, you may refer to Figure 5.

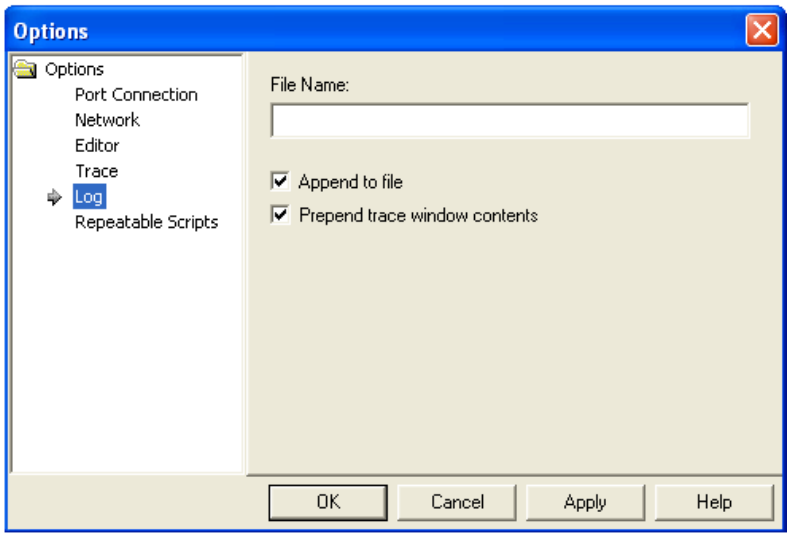

Figure 21: Log Tab on the Options Window

You may refer to Table 2 for additional options.

4.1.2.1 Button Options

The following table describes the buttons available on the **Trace** panel.

Table 2: Buttons in the Trace Panel

Button	Description
	Saves the trace log
	Clears the logs on the Trace panel
	Automatically scrolls down to the latest log

4.1.3 Command Library and Scripts Panel

The Commands Library and Scripts panel is divided into two tabs at the bottom of the panel:

- **Command Library Tab:** Provides the commands and events supported by the loaded HCI Library
- **Scripts Tab:** Provides a list of script files from a defined root folder

4.1.3.1 Command Library Tab

The **Command Library** tab provides all the commands supported in the loaded HCI Library. To load a HCI Library, you may refer to *Section 3.2, HCI Library Selection*. The HCI Tester tool can only execute the commands that are currently supported in the loaded HCI Library.

To find a specific command using an incremental search mechanism:

1. Click anywhere inside the **Command Library** tab (meaning select any folder or command).
2. Type the string to be found in the command name. The string can be a partial sequence of characters at the beginning, middle or end of the command name. Underscores and blank spaces are ignored in the searching process. The search is case insensitive, meaning that the **dbd** string matches the Rea**d**_**BD**_Address command.
3. Press the **F3** key to search forward to the next command and the **Shift+F3** keys to search backwards.

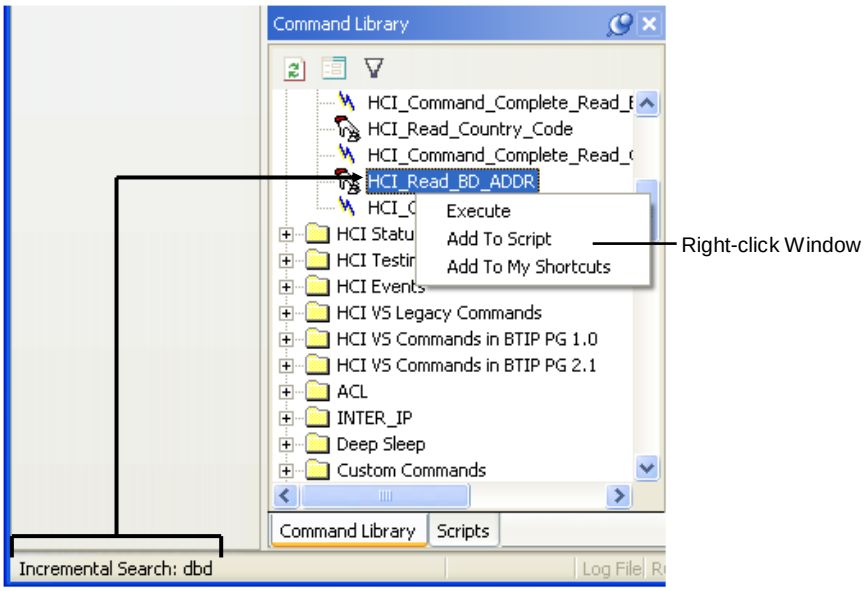

Figure 22: Command Library Tab

To execute commands:

- Double-clicking a command executes it.
- Right-click on any command in this tab to display command options. The selected command can be executed with default values, added to the active script in the **Editor** panel or placed as a shortcut in **My Shortcuts** panel. The right-clicking options are shown above. You may refer to each panel's section in this manual for more information.

4.1.3.1.1 Button Options

The following table describes the buttons in the **Command Library** tab.

Table 3: Buttons in the Command Library Tab

Button	Description
	Refreshes the contents of the **Command Library** tab
	Changes the HCI Library (you may refer to *Section 3.2, HCI Library Selection*)
	Not used

4.1.3.2 Scripts Tab

The **Scripts** panel contains a list of script files from a chosen root folder. Any script in this tab can be opened in the **Editor** panel by double-clicking on it. The script can then be executed from the **Editor** panel, as described in *Section 4.1.1, Editor Panel*. By default, this tab is empty.

To configure the root folder:

1 Create or locate a shortcut to the HCI Tester program on the PC, as shown below.

2 Right click on the shortcut and select the **Properties** option, as shown below:

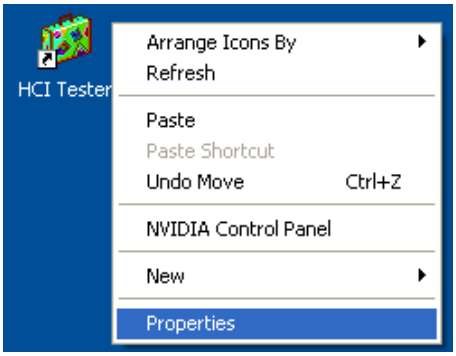

Figure 23: HCI Tester Shortcut

3 In the **Shortcut** tab, insert the following line into the **Target** field (shown below):

“path_HCITester.exe" -LibFile "path_XML_file" –root "path_Scripts_Folder"

For example:

"C:\Program Files\Texas Instruments\Wireless Tools\HCITester\hcitest20.exe" -LibFile "C:\Program Files\Texas Instruments\Wireless Tools\XML" -root "C:\HCI scripts"

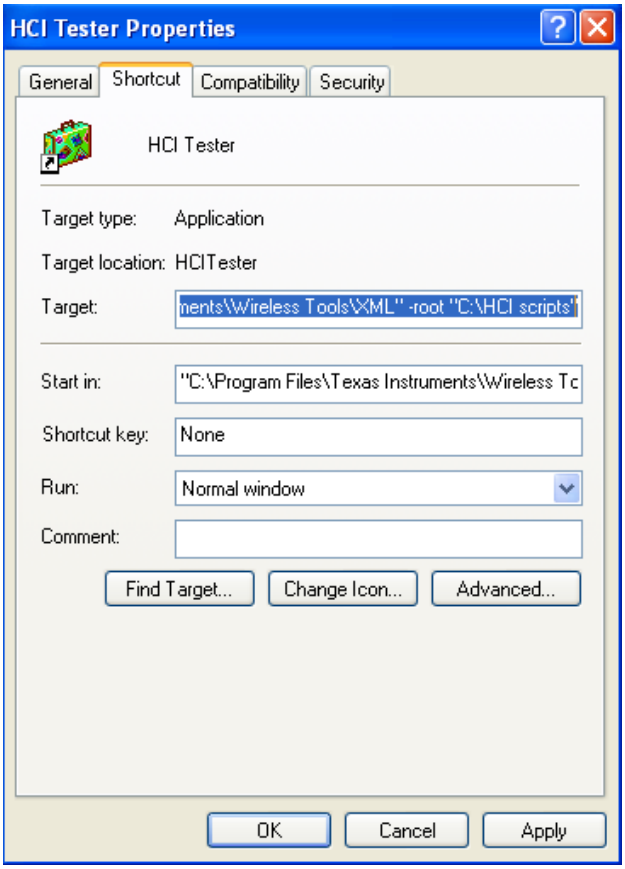

Figure 24: HCI Tester Shortcut Properties Window

Similar to the **Command Library** tab, the user can search for a specific script by using an incremental search mechanism.

To search for a specific command using an incremental search mechanism:

1. Click anywhere inside the **Scripts** tab, meaning select any folder or command.
2. Type the string to be found in the script name. The string can be a partial sequence of characters at the beginning, middle or end of the command name. Underscores and blank spaces are ignored in the searching process. The search is case insensitive, meaning that the **rc** string matches the Master**_C**onnect script, as shown below.
3. Press the **F3** key to search forward to the next command and the **Shift+F3** keys to search backwards.

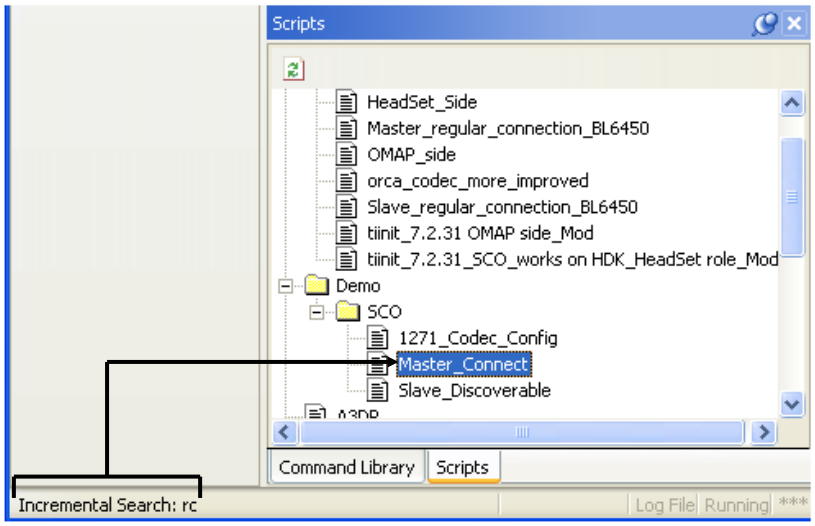

Figure 25: Scripts Tab

4.1.3.3 Button Options

The following table describes the button in the **Scripts** tab.

Table 4: Button in the Scripts Tab

Button	Description
	Refreshes the contents of the **Scripts** tab

4.1.4 Values Panel

The **Values** panel shows a detailed description of a command that was selected either in the **Command Library** tab or in the **Editor** panel. If it reflects a command selected in the **Command Library** tab, then this command can be added to the **Editor** panel by using the **Add To Script** button (as shown in *Section 4.1.4.1, Button Options*). If it shows a command from the **Editor** panel, changing a value in this panel also changes the value of the script in the **Editor** panel. Furthermore, the command displayed on this panel can be executed by using the **Run Selection** button (as shown in *Section 4.1.4.1, Button Options*).

To modify a command's parameters:

- Type directly into the corresponding field or select the required option from a dropdown field (only available for some commands).

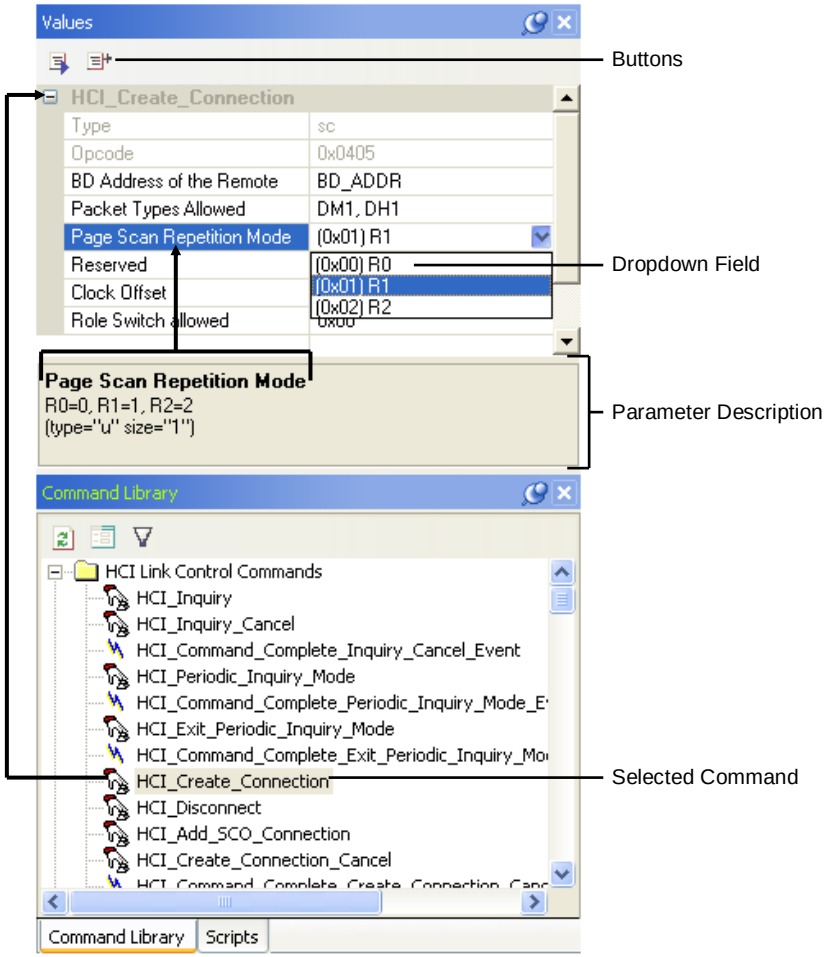

Figure 26: Values Panel

- To display a description at the bottom part of the panel, simply click on the desired parameter.

The following table describes the buttons in the Values Panel.

4.1.4.1 Button Options

Table 5: Buttons in the Values Panel

Button	Description
	Executes the listed command (CTRL+F5)
	Adds the listed command to the active script in the **Editor** panel

4.1.5 My Shortcuts Panel

The **My Shortcuts** panel provides quick access to predefined script files or commands. This panel is mainly used to locate the most common commands or scripts. The basic functionality of this panel enables you to open a shortcut in the **Editor** panel or to execute it directly from this panel.

To create a shortcut, perform one of the following depending on the scenario:

- **To create a shortcut for a script file:** Drag the desired script from its location (Folder in Windows) to the **Shortcuts** panel.
- **To create a shortcut for a code fragment:** Select and drag the desired code from the **Editor** Panel to the **Shortcuts** panel.
- **To create a shortcut for a command:** Right click on the desired command in the **Command Library** tab, and select the **Add to My Shortcuts** option, as shown in Figure 22.

4.1.5.1 Shortcut Options

Various shortcut options are provided by right clicking on the relevant shortcut to display a menu of options, as shown below:

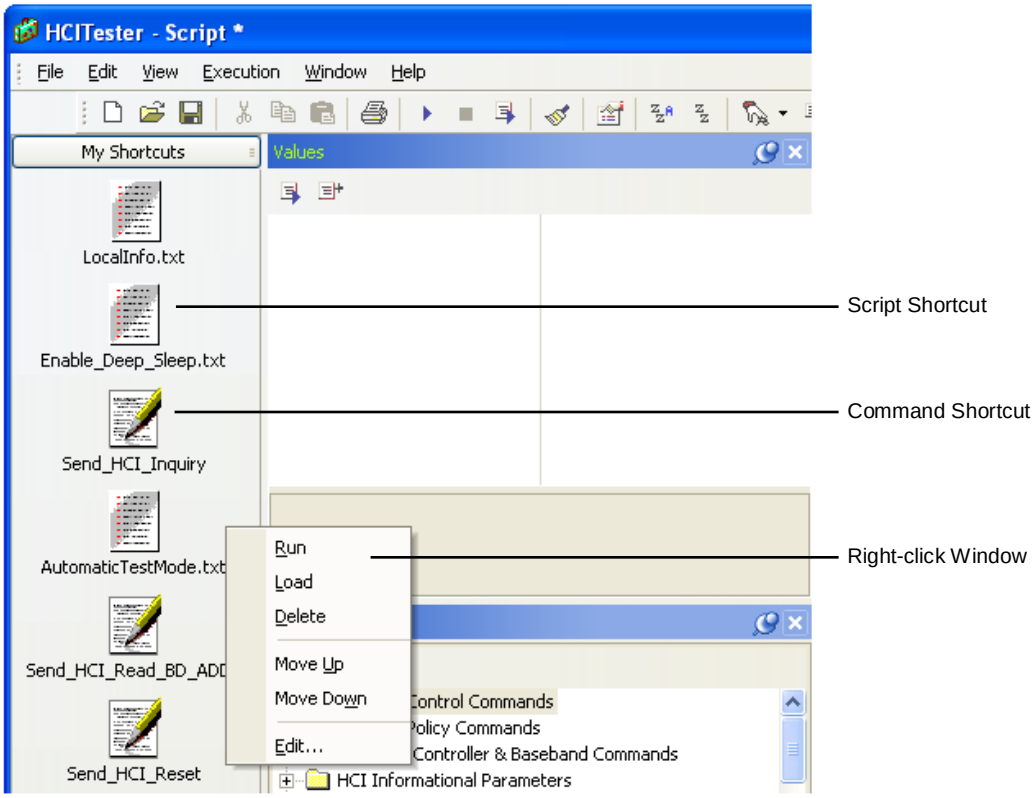

Figure 27: My Shortcuts Panel

To execute a shortcut:

1 Right click on the relevant shortcut and select the **Load** option (CTRL+Click).

2 Select the **Run** option (SHIFT+Click) to execute the shortcut.

To edit a shortcut:

- Right click on the relevant shortcut to display a window in which you can modify various features of the shortcut and its content, as shown below:

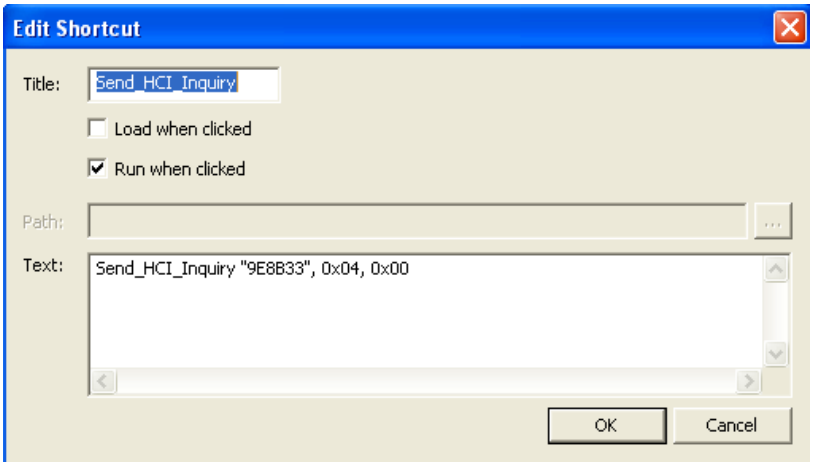

Figure 28: Edit Shortcut Window

To move a shortcut:

- Right click on the desired shortcut and use the **Move Up** or **Move Down** options.

To delete a shortcut:

- Right click on the desired shortcut and select the **Delete** option.

4.2 Menubar

This section describes the menubar options.

4.2.1 File Menu

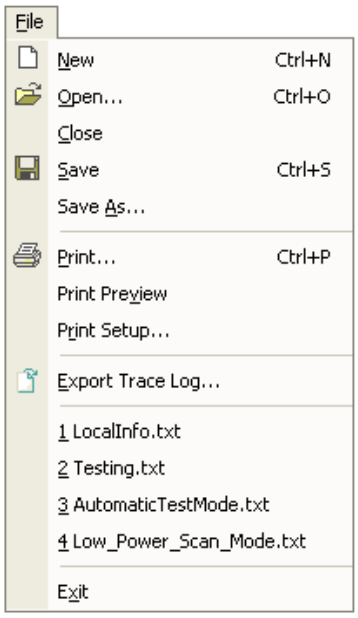

Figure 29: File Menu

Table 6: File Menu Content

File Menu	
New	Creates a new script file (*.txt) in the **Editor** panel
Open…	Opens an existing script file (*.txt) in the **Editor** panel
Close	Closes the active script file in the **Editor** panel
Save	Saves the active script (*.txt) from the **Editor** panel
Save As…	Saves the active script into a new script file (*.txt)
Print…	Opens the **Print** window to print active script file
Print Preview	Opens a preview of the active script to be printed
Print Setup…	Opens the **Print** window to configure the printing options
Export Trace Log…	Saves the trace logs from the **Trace** panel (you may refer to *Section 4.1.2, Trace Panel*)
Filenames	Shortcuts to the last opened script files (*.txt)
Exit	Quits the HCI Tester application

4.2.2 Edit Menu

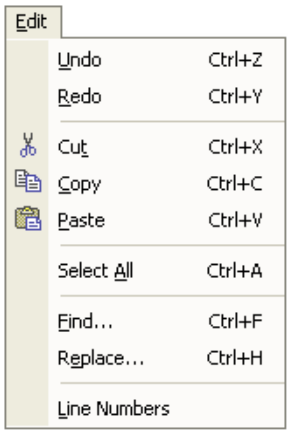

Figure 30: Edit Menu

Table 7: Edit Menu Content

Edit Menu	
Undo	Undoes the last editing action performed in the active script
Redo	Redoes the last undo action performed in the active script
Cut	Cuts the selected text from the active script to the clipboard
Copy	Copies the selected text to the clipboard from the active script or the **Trace** panel
Paste	Pastes text to the active script from the clipboard
Select All	Selects all the contents of the active script in the **Editor** panel
Find…	Opens the **Find** window to search for text in the active script
Replace…	Opens the **Replace** window to replace text in the active script
Line Numbers	Inserts row numbers into the active script

4.2.3 View Menu

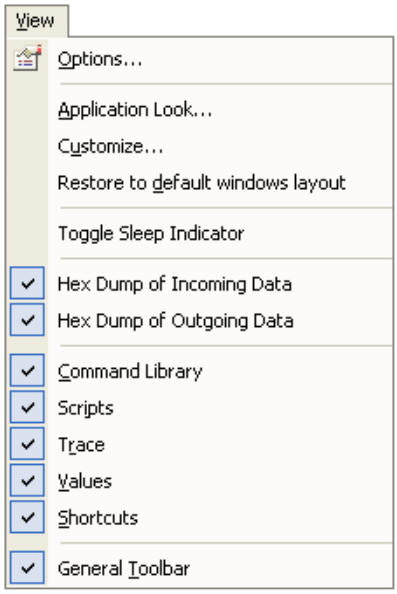

Figure 31: View Menu

Table 8: View Menu Content

View Menu	
Options…	Opens the **Options** window, as described in *Chapter 3, Configuration*, on page 10 and *Chapter 4, A Quick Tour of the HCI Tester*, on page 21)
Application Look…	Opens a window to change the style of the HCI Tester
Customize…	Opens a window to configure the menu and bar options
Restore to default windows layout	Restores the HCI Tester to default view options (requires exiting and restarting the HCI Tester)
Toggle Sleep Indicator	Toggles the sleep state of a connected Bluetooth device ( )
Hex Dump of Incoming Data	Enables the viewing of incoming messages in hex format in the **Trace** panel, as described in *Section 4.1.2, Trace Panel*
Hex Dump of Outgoing Data	Enables the viewing of outgoing messages in hex format in the **Trace** panel, as described in *Section 4.1.2, Trace Panel*
Command Library	Hides/Shows the **Command Library** tab, as described in *Section 4.1.3.1, Command Library Tab*
Scripts	Hides/Shows the **Scripts** tab, as described in *Section 4.1.3.2, Scripts Tab*
Trace	Hides/Shows the **Trace** panel, as described in *Section 4.1.2, Trace Panel*
Values	Hides/Shows the **Values** panel, as described in *Section 4.1.4, Values Panel*
Shortcuts	Hides/Shows the **My Shortcuts** panel, as described in *Section 4.1.5, My Shortcuts Panel*
General Toolbar	Hides/Shows the Toolbar, as described in *Section 4.3, Toolbar*

4.2.4 Execution Menu

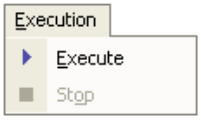

Figure 32: Execution Menu

Table 9: Execution Menu Content

Execution Menu	
Execute	Execute
Stop	Stop

4.2.5 Window Menu

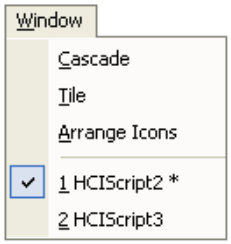

Figure 33: Window Menu

Table 10: Window Menu Content

Window Menu	
Cascade	Cascade
Tile	Tile
Arrange Icons	Arrange Icons
Scripts	Scripts

4.2.6 Help Menu

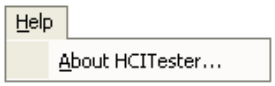

Figure 34: Help Menu

Table 11: Help Menu Content

Help Menu	
About HCI Tester…	Displays the HCI Tester version number

4.3 Toolbar

The toolbar contains shortcuts to the main HCI Tester functions, as shown below:

Figure 35: Tool Bar

Table 12: Tool bar Content

Tool Bar	
	Creates a new script file (*.txt) in the **Editor** panel
	Opens an existing script file (*.txt) in the **Editor** panel
	Saves the active script (*.txt) from the **Editor** panel
	Cuts the selected text from the active script to the clipboard
	Copies the selected text to the clipboard from the active script or **Trace** panel
	Pastes text to the active script from the clipboard
	Opens the **Print** window to print active script file
	Runs the active script in the **Editor** panel to the clipboard *Section 4.1.1, Editor Panel*
	Stops the current execution (if any), as described in *Section 4.1.1, Editor Panel*
	Runs the selected command(s), as described in *Section 4.1.1, Editor Panel*; *Section4.1.3.1, Command Library Tab* and *Section 4.1.4, Values Panel*
	Clears the logs in the **Trace** panel, as described in *Section 4.1.2, Trace Panel*
	Opens the **Options** window, as described in *Chapter 3, Configuration*, on page 10 and *Chapter 4, A Quick Tour of the HCI Tester*, on page 21
	Sends automatic awake messages to a device during Sleep mode, as described in *Section 3.3, Optional: HCILL Sleep Configuration*
	Toggles the sleep state of a connected Bluetooth device, as described in *Section 3.3, Optional: HCILL Sleep Configuration*
	Executes or lists the most recently used commands
	Loads and executes or lists the most recently used scripts

4.4 Status Bar

The status bar provides information showing the connection and function status.

Figure 36: Status Bar

Table 13: Status Bar Content

Status Bar	
Log File	Log File
Running	Running
Failed	Failed
Computer Name	Computer Name
Port	Port
Sleep	Sleep
CAP	CAP
NUM	NUM