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Spec Title: AN214823 - OVER-THE-AIR REMOTE LOOPBACK THROUGHPUT TESTING USING CYPRESS BLUETOOL(TM) SOFTWARE

Replaced by: None

AN214823

Over-The-Air Remote Loopback Throughput Testing Using Cypress BlueTool™ Software

Associated Part Family: CYW20730

This application note contains instructions for using Cypress BlueTool™ software to prepare for and execute a remote loopback throughput test of a CYW20730-equipped device.

It is for engineers responsible for conducting Bluetooth throughput measurements of CYW20730-equipped devices.

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1 About BlueTool

BlueTool is a proprietary Cypress software tool for exercising, testing, scripting, debugging, and programming devices that use Cypress Bluetooth chips. BlueTool runs on a standard PC running the Microsoft® Windows® operating system. BlueTool interfaces with the Cypress Bluetooth chips at the HCI protocol layer. The HCI UART is supported.

1.1 Cypress Part Numbering Scheme

Cypress is converting the acquired IoT part numbers from Broadcom to the Cypress part numbering scheme. Due to this conversion, there is no change in form, fit, or function as a result of offering the device with Cypress part number marking. The table provides Cypress ordering part number that matches an existing IoT part number.

Table 1. Mapping Table for Part Number between Broadcom and Cypress

Broadcom Part Number	Cypress Part Number
BCM20730	CYW20730

2 IoT Resources

Cypress provides a wealth of data at http://www.cypress.com/internet-things-iot to help you to select the right IoT device for your design, and quickly and effectively integrate the device into your design. Cypress provides customer access to a wide range of information, including technical documentation, schematic diagrams, product bill of materials, PCB layout information, and software updates. Customers can acquire technical documentation and software from the Cypress Support Community website (http://community.cypress.com/).

3 System Requirements

3.1 Host System Requirements

A personal computer running the Microsoft® Windows® operating system is required to use BlueTool. Cypress recommends running Windows XP; however, other versions of Windows are supported.

Note: BlueTool is constantly being revised, resulting in operational and other changes to the graphical user interface. Consequently, this document only contains basic instructions on using BlueTool. These instructions should remain the same for all BlueTool releases. If discrepancies exist between this document and the version of BlueTool you are using, contact your Cypress technical representative or visit Cypress Developer Community (see also "IoT Resources").

3.2 Hardware Requirements

Besides the host personal computer, the following hardware is required:

- Two USB cables.
- One USB-to-UART adapter board.
- A Cypress BCM20730-based board (Bluetooth device with a UART host connection).
- A Broadcom BCM20702-based board (Bluetooth device with a USB host connection).

Note: Contact your Cypress sales representative about acquiring any of the above boards.

3.3 Software Requirements

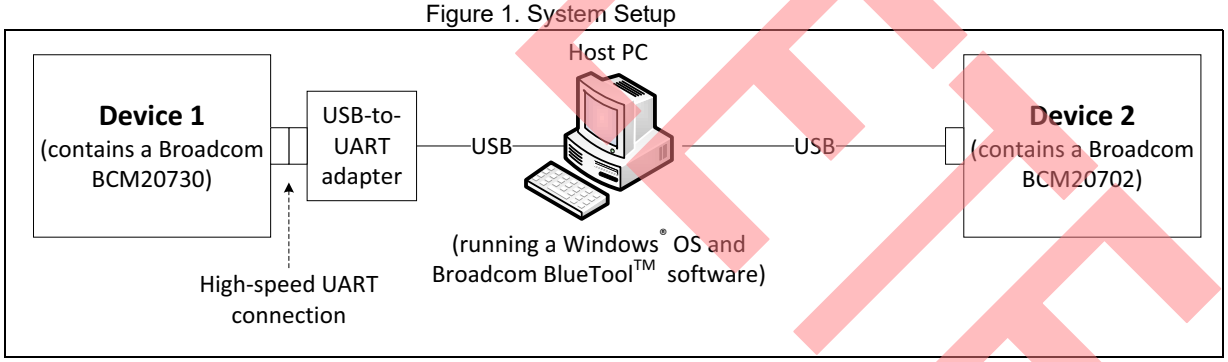
BlueTool provides support for Perl® scripting. If this feature is being used to automate throughput testing (see 7. BlueTool Support for Perl Scripts), a Win32® version of ActivePerl (5.8.4 or higher) must be installed on the host computer. Earlier versions of ActivePerl are not supported.

Note: ActivePerl is available from ActiveState at www.activestate.com.

4 System Connections

Figure 1 shows the throughput test setup.

Figure 1. System Setup

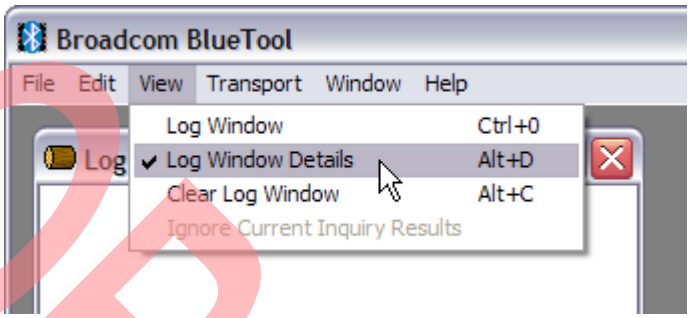


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5 Launching BlueTool

Complete these steps to launch BlueTool and display the log window:

1. Click **Start>All Programs>Cypress BlueTool>BlueTool** to open the BlueTool application.
2. In BlueTool, click **View>Log Window** to display the log window.
3. Click **View>Log Window Details** to enable the log window to display detailed log information.



6 Configuring BlueTool for Remote Loopback Throughput Testing

This section contains the following subsections on configuring BlueTool for over-the-air throughput testing:

6.1. Setting Up the HCI Control Transport

6.2. Setting Up HCI Control

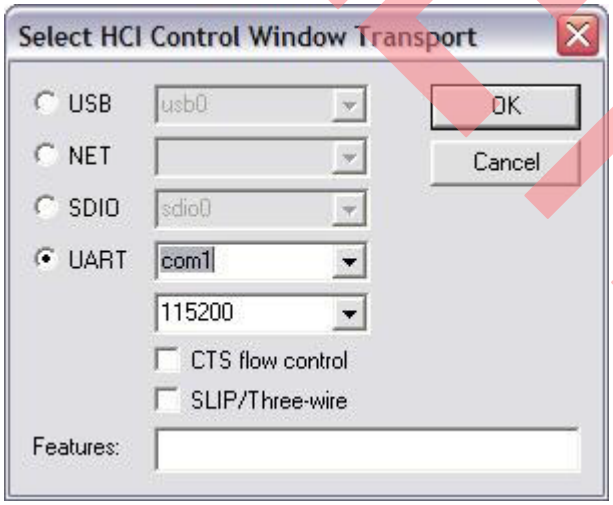
6.3. Setting Up for Remote Loopback Throughput Testing

Remote loopback throughput testing requires two Cypress Bluetooth-capable devices. One device (labeled **Device 1** in Figure 1 and in subsequent document headings) is CYW20730-based and requires a UART HCI, and the other (labeled **Device 2**) is BCM20702-based and requires a USB HCI.

6.1 Setting Up the HCI Control Transport

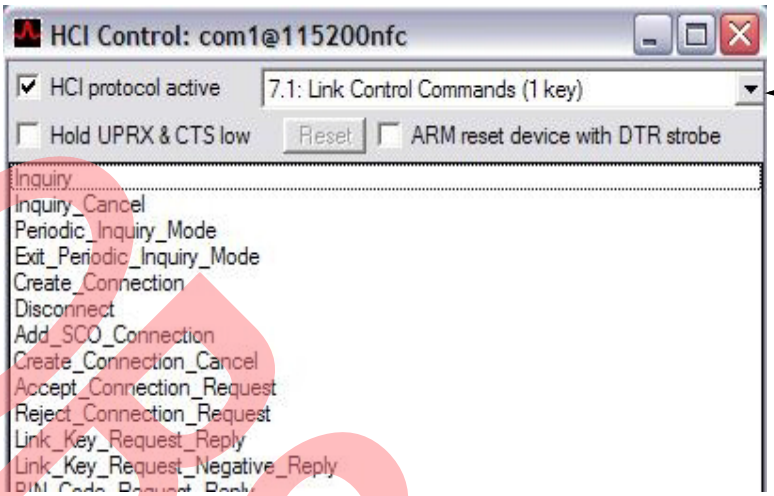
6.1.1 Setting Up the HCI Control Transport for Device 1 (UART HCI)

1. Click **Transport>HCI Control** (keyboard shortcut **CTRL+1**) to display the Select HCI Control Window Transport window.



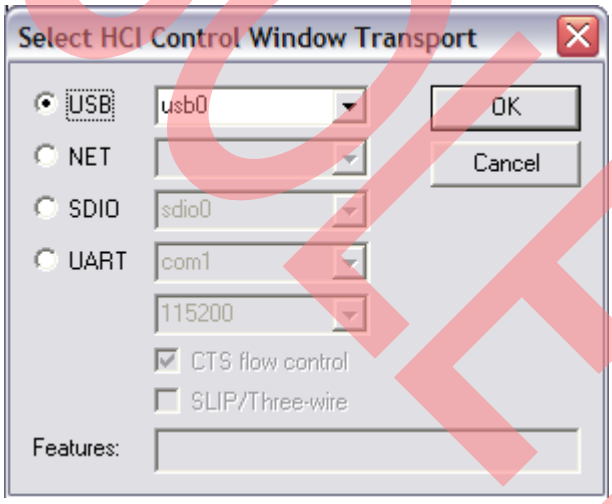
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2. Select the **UART** option and select or type the device 1 COM port, and then click **OK**.
3. BlueTool displays an HCI Control window with the selected COM port and rate displayed in the window title. For the case of the following screenshot, the port and rate are shown as com1@115200nfc.



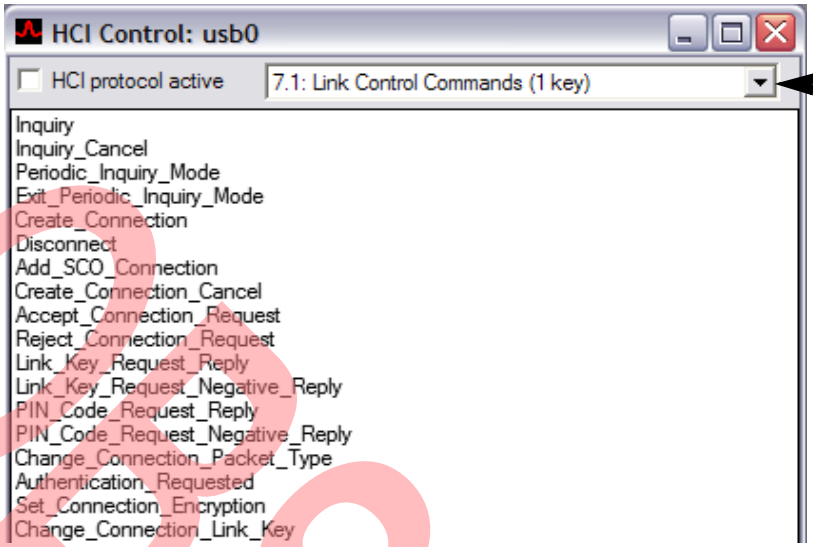
6.1.2 Setting Up the HCI Control Transport for Device 2 (USB HCI)

1. Click **Transport>HCI Control** (keyboard shortcut **CTRL+1**) to display the Select HCI Control Window Transport window.



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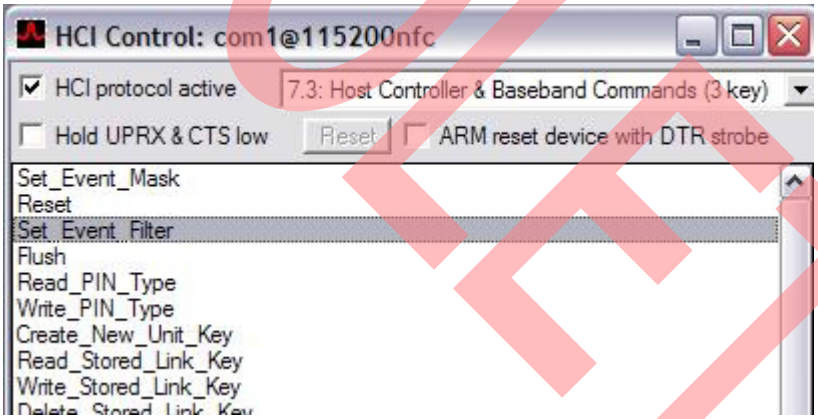
2. Select the **USB** option, select **usb0**, and then click **OK**.
3. BlueTool displays an HCI Control window with usb0 displayed in the window title.



6.2 Setting Up HCI Control

6.2.1 Setting Up HCI Control for Device 1 (UART HCI)

1. In the HCI Control window, do the following to evoke the HCI Command window for setting the event filter:
   a. Select **7.3: Host Controller & Baseband Commands (3 key)** from the Command Group list.
   b. Double-click **Set_Event_Filter**.

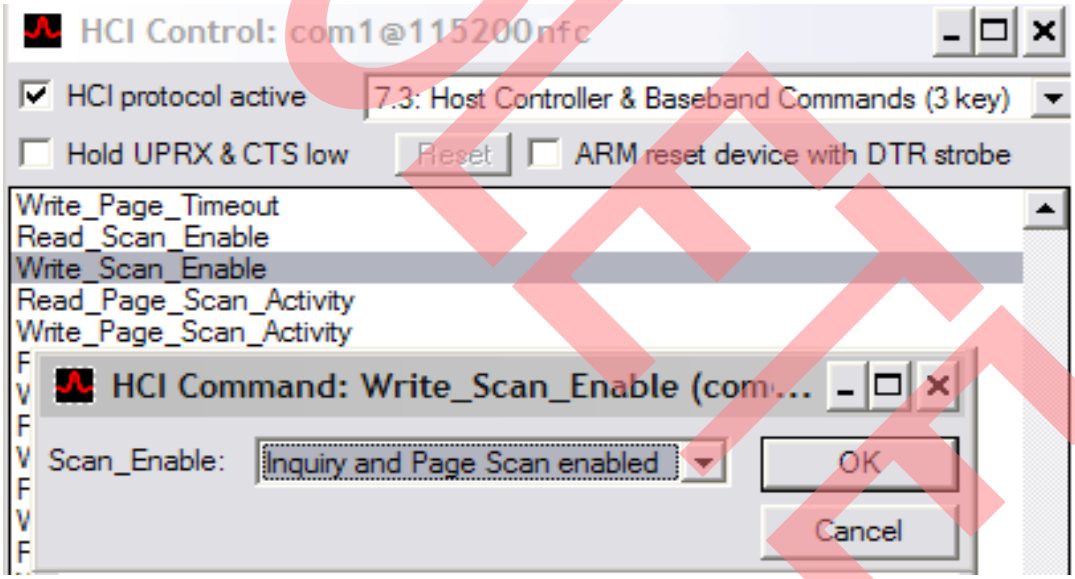


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2. In the HCI Command window, do the following to set the event filter:
   a. Set Filter_Type to **Connection Setup**.
   b. Set Connection_Setup_Filter_Condition_Type to **Allow Connections from all devices**.
   c. Set Auto_Accept_Flag to **Do Auto accept the connection with role switch disabled**.
   d. Click **OK**.

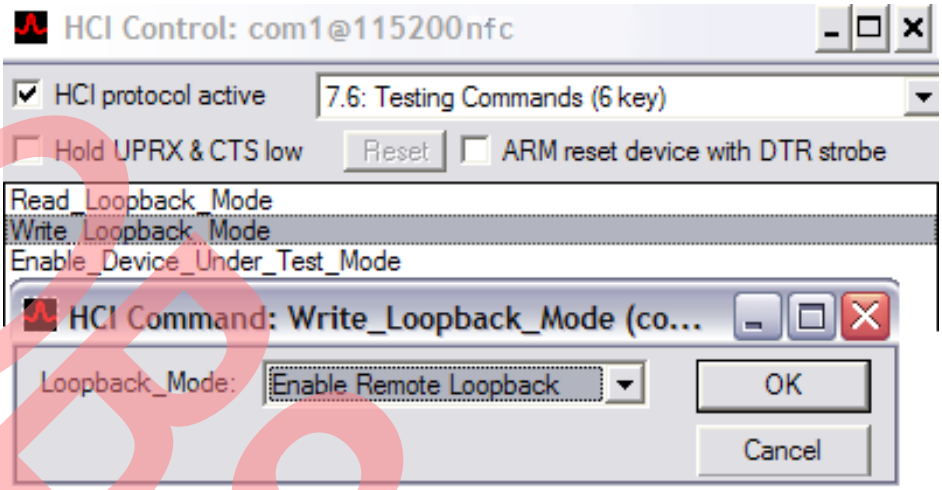


3. Do the following to enable inquiry and page scanning:
   a. In the HCI Control window, double-click **Write_Scan_Enable**.
   b. In the HCI Command: Write_Scan_Enable window, select **Inquiry and Page Scan enabled** and click **OK**.

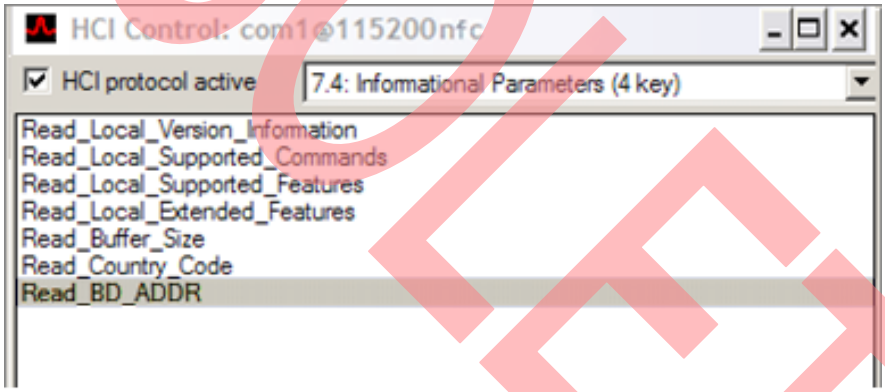


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4. Do the following to enable a remote loopback:
   a. In the HCI Control window, Select **7.6: Testing Commands (6 key)** from the Command Group list.
   b. In the HCI Control window, double-click **Write_Loopback_Mode**.
   c. In the HCI Command: Write_Loopback_Mode window, select **Enable Remote Loopback** and click **OK**.



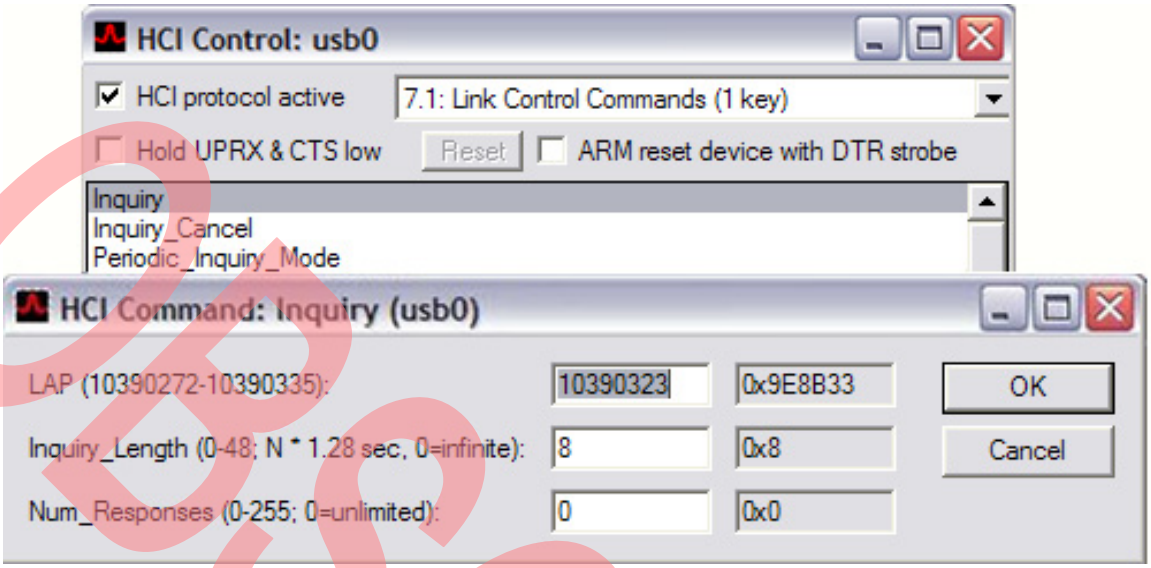
5. Do the following to read and display the Bluetooth device address in the Log window:
   a. In the HCI Control window, Select **7.4: Informational Parameters (4 key)** from the Command Group list.
   b. In the HCI Control window, double-click **Read_BD_ADDR**.



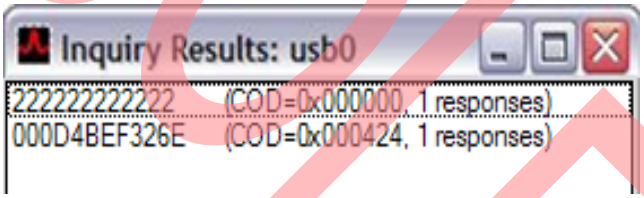
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6.2.2 Setting Up HCI Control for Device 2 and Establishing a Connection to Device 1

1. Do the following to enter the Inquiry scan state:
   a. In the HCI Control window, select **7.1: Link Control Commands (1 key)**, then double-click **Inquiry**.
   b. In the HCI Command: Inquiry window, click **OK**.

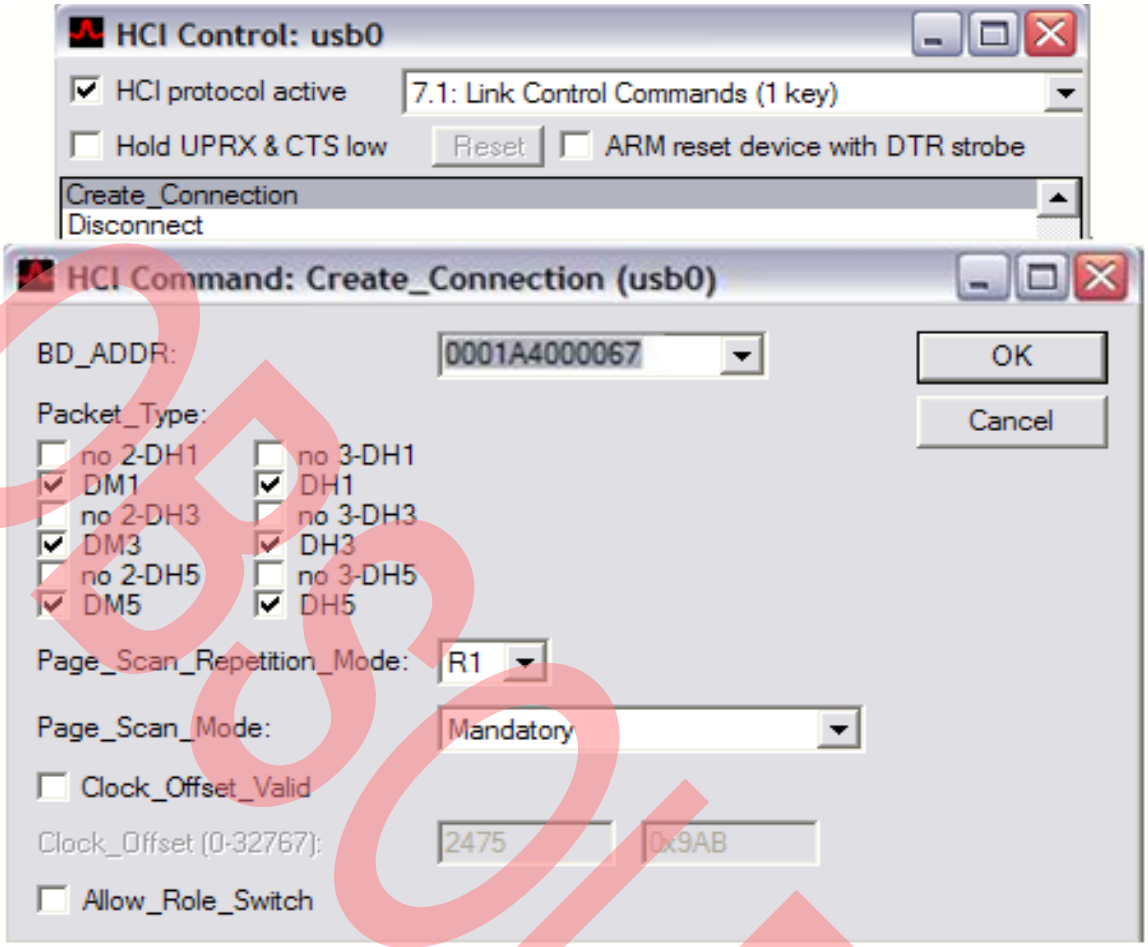


BlueTool displays the Inquiry Results window, which shows the Bluetooth device address (BD ADDR) of nearby Bluetooth devices. This list should include the BD ADDR of device 1 (com1@115200nfc).



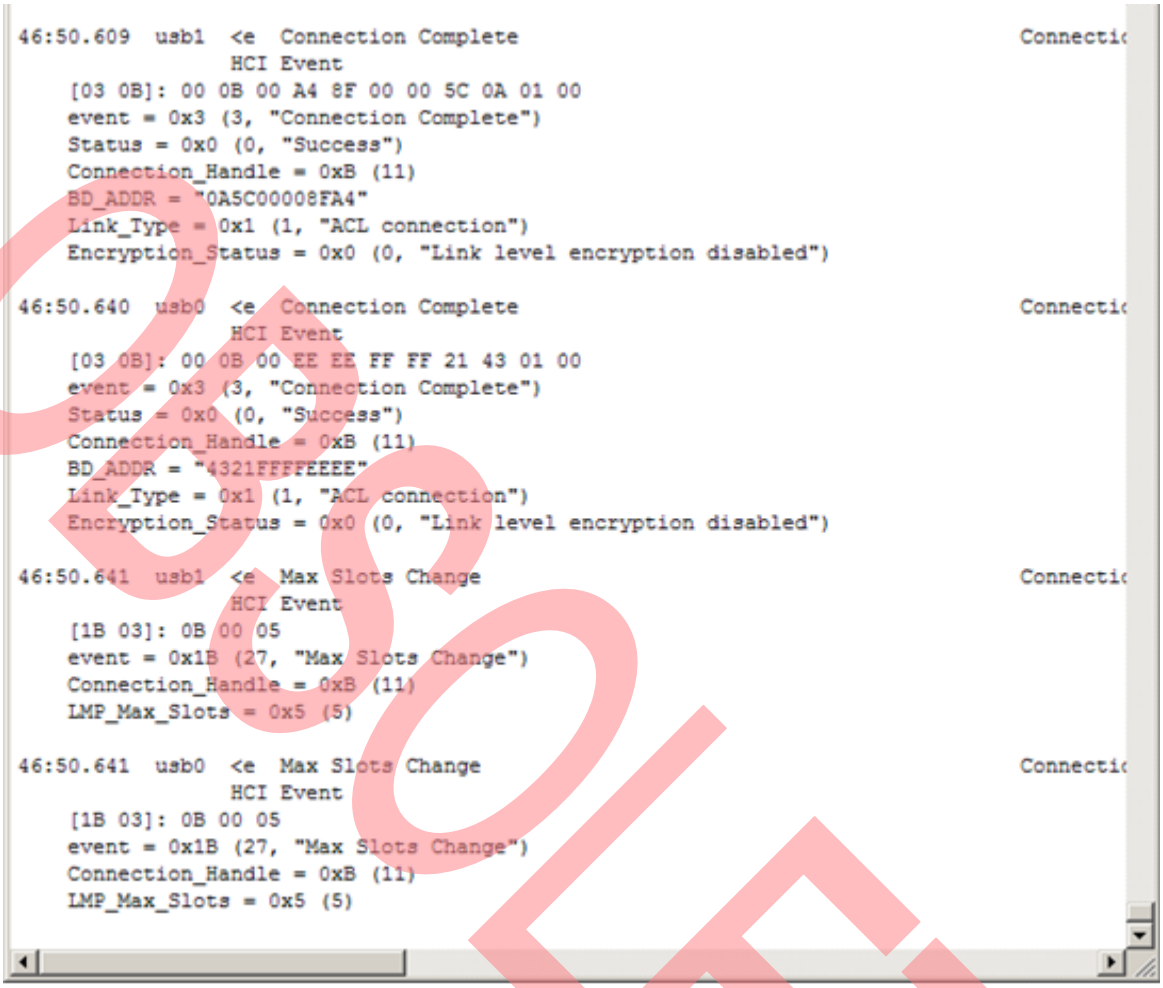
2. Do the following to create a connection:
   a. In the HCI Control window, double-click **Create_Connection**.
   b. In the HCI Command: Create Connection window:
      - From the BD_ADDR list, select the device 1 Bluetooth address.
      - Under Packet_Type select the packet types to be used.
      - Click **OK**.

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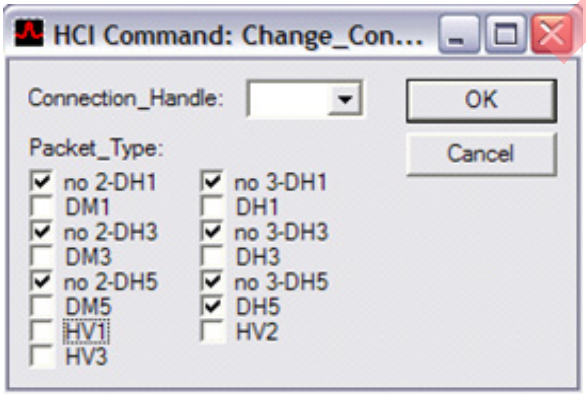

HCI Control: usb0
HCI protocol active
7.1: Link Control Commands (1 key)
Hold UPRX & CTS low
Reset
ARM reset device with DTR strobe
Create_Connection
Disconnect
HCI Command: Create_Connection (usb0)
BD_ADDR:
0001A4000067
OK
Cancel
Packet_Type:
no 2-DH1
DM1
no 2-DH3
DM3
no 2-DH5
DM5
no 3-DH1
DH1
no 3-DH3
DH3
no 3-DH5
DH5
Page_Scan_Repetition_Mode:
R1
Page_Scan_Mode:
Mandatory
Clock_Offset_Valid
Clock_Offset (0-32767):
2475
0x9AB
Allow_Role_Switch

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3. Ensure that a successful connection has been established by verifying that a connection handle has been assigned and that four HCI events (similar to those shown in the following screenshot) get displayed to the Log window.



4. Do the following to change the packet types of each Bluetooth device:
   a. In the HCI Control window (associated with each device), double-click **Change_Connection_Packet_-Type**.
   b. In the HCI Command: Change_Connection_Packet_Type window (associated with each device), select the packet types to match the following screenshot and then click **OK**.

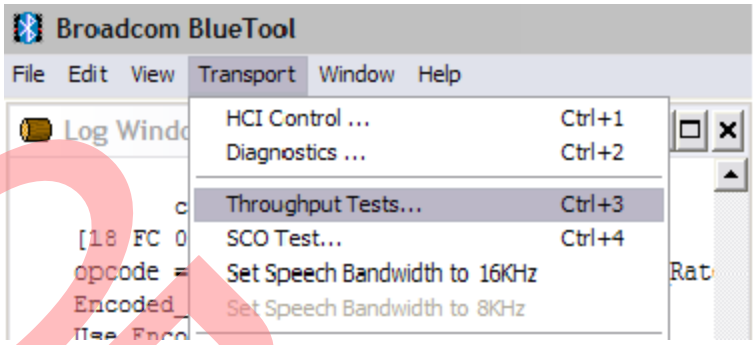


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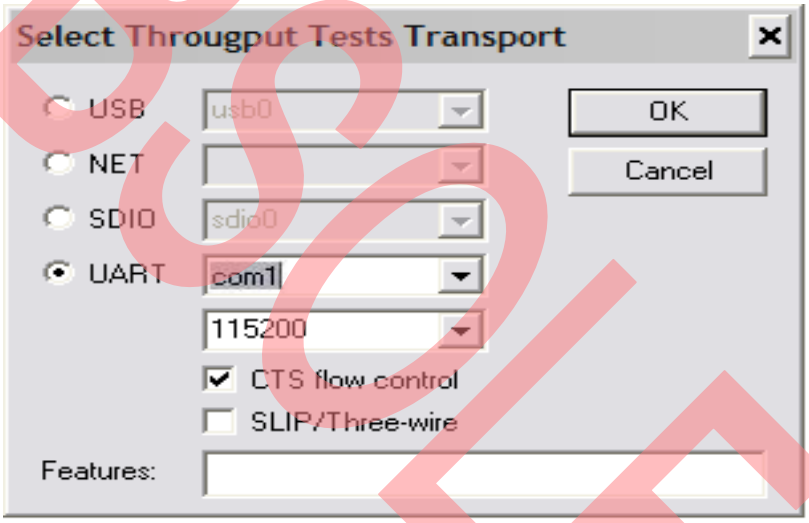
6.3 Setting Up for Remote Loopback Throughput Testing

6.3.1 Setting Up Device 1 for Remote Loopback Throughput Testing

1. Click **Transport>Throughput Tests...** (keyboard shortcut **CTRL+3**).

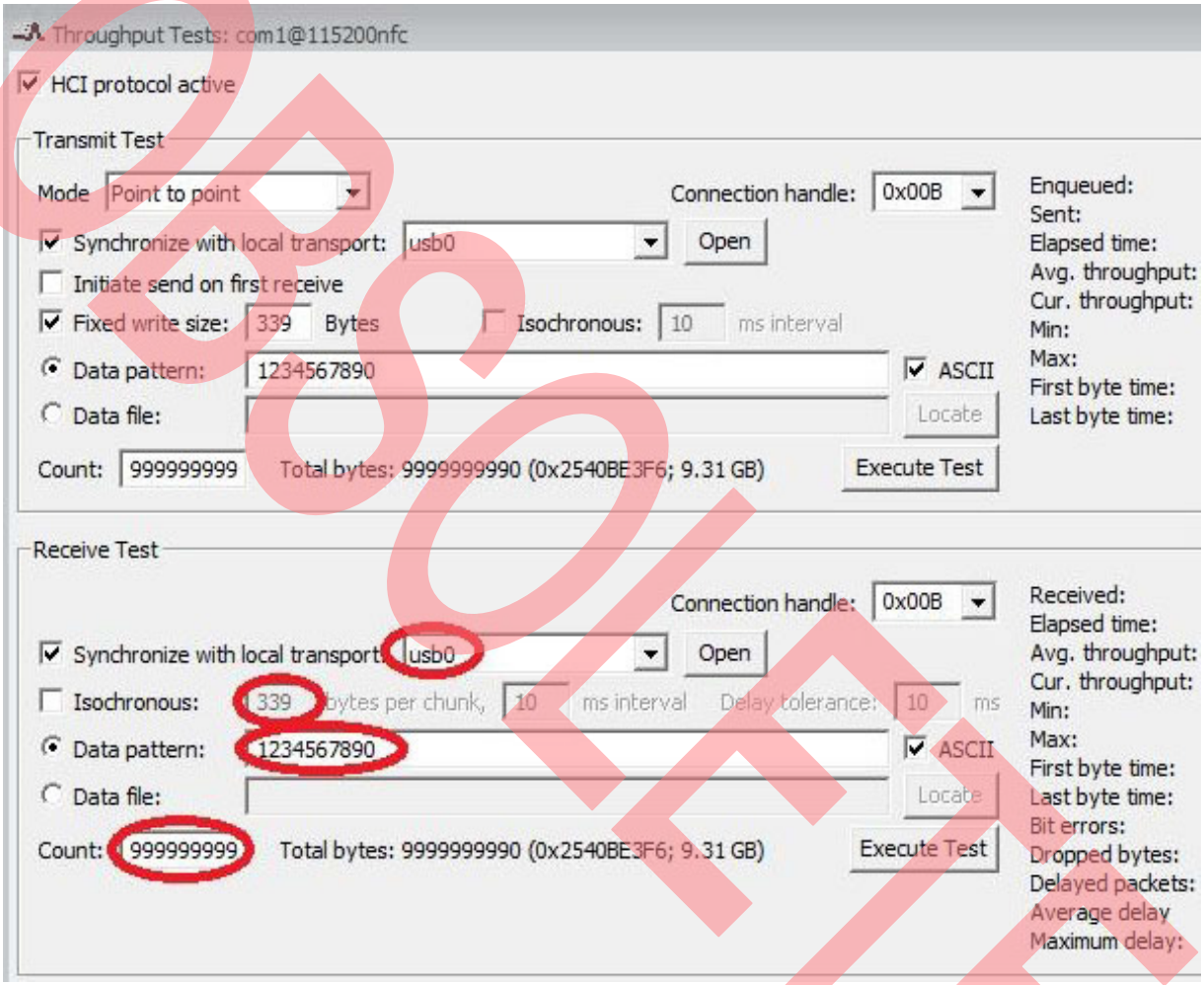


2. In the Select Throughput Tests Transport window, choose **UART**, select or type the device 1 COM port, and then click **OK**.



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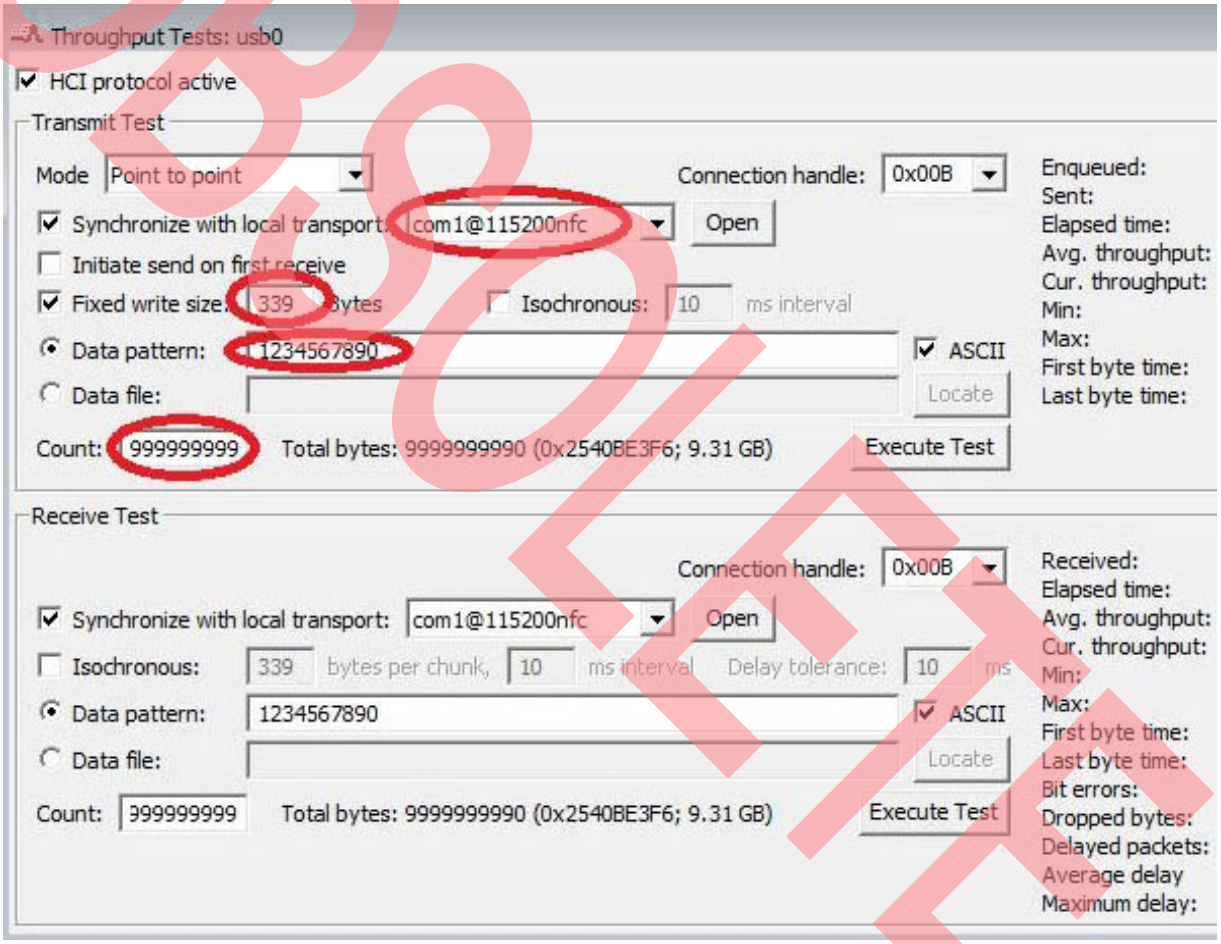
3. In the Throughput Tests window, do the following in both the Transmit Test and Receive Test panes:
   a. Verify that a value is generated for the connection handle.
   b. Select **Synchronize with local transport**, and then select **usb0** from the list.
   c. Select **Fixed write size** and enter **339** bytes.
   d. Select the **Data pattern** option.
   e. If not already selected, select **ASCII**, and then enter the desired data pattern (a typical ASCII data pattern is a string of alphanumeric characters).
   f. In the Count field, enter the number of bytes to be sent, being sure not to exceed the total byte limitations of the host PC.



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6.3.2 Setting Up Device 2 and Starting Remote Loopback Throughput Testing

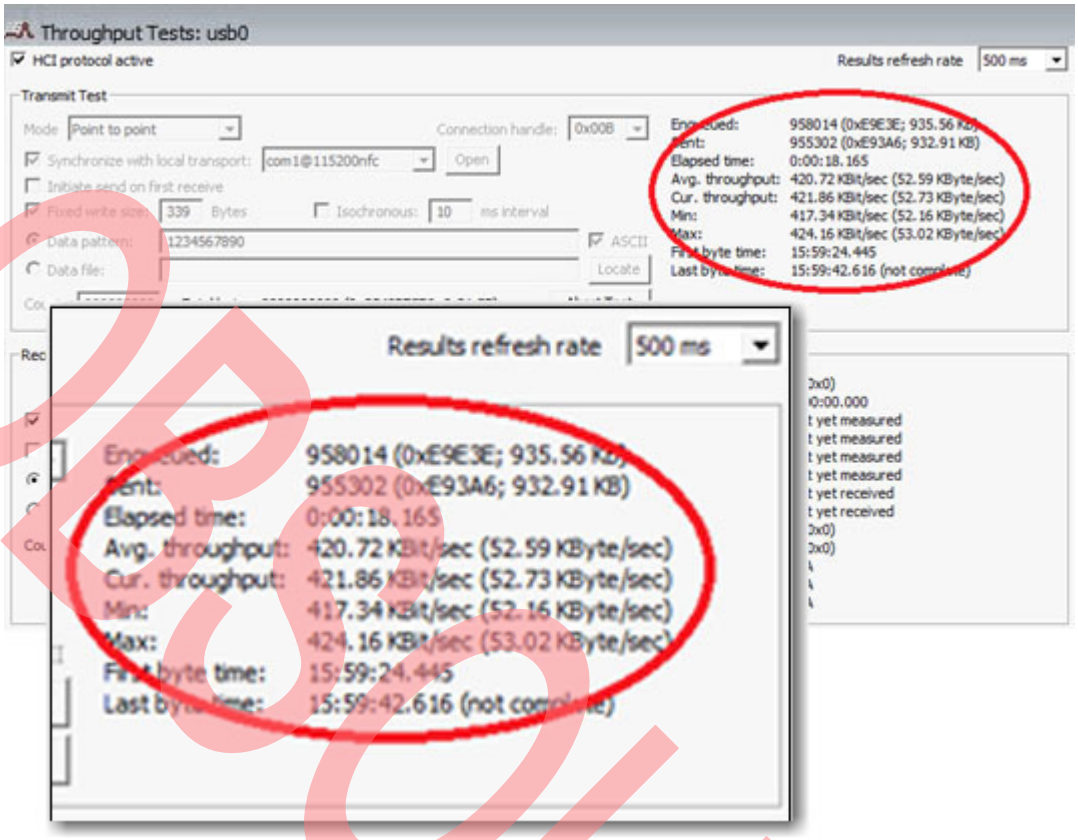
1. Click **Transport>Throughput Tests...** (keyboard shortcut **CTRL+3**).
2. In the Select Throughput Tests Transport window, choose **USB**, select **usb0**, and then click **OK**.
3. In the Throughput Tests window, do the following in both the Transmit Test and Receive Test panes:
   a. Verify that a value is generated for the connection handle.
   b. Select **Synchronize with local transport**, and then select the transport port name of device 1 from the list (which is com1@115200nfc in the example of the following screenshot).
   c. Select **Fixed write size** and enter **339** bytes.
   d. Select the **Data pattern** option.
   e. If not already selected, select **ASCII**, and then enter the desired data pattern (a typical ASCII data pattern is a string of alphanumeric characters).
   f. In the Count field, enter the number of bytes to be sent, being sure not to exceed the total byte limitations of the host PC.
   g. To start the remote loopback throughout test, click on **Execute Test** in the Transmit Test pane.



Note: Clicking the Execute Test button in the Transmit Test pane automatically selects the Receive Test settings associated with the device 1 transport port (which is com1@115200nfc in the previous screenshot).

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In the Throughput Test window of the transmitting device (device 2, which is controlled via the USB HCI), throughput statistics, such as those shown here, are displayed on the right side of the Transmit Test pane.



Note: Clicking on **Abort Test** in the Transmit Test pane of the Throughput Test window ends the test.

7 BlueTool Support for Perl Scripts

The BlueTool application Bluetooth support (BTSP) Perl module provides an interface for automating BlueTool operations using Perl scripts. To use BlueTool scripting capabilities, ActivePerl 5.8.4 (or higher) must be installed on the host PC prior to installing BlueTool.

Sample scripts are included with BlueTool installation software. These files are saved to the following folder during BlueTool installation:
\\Cypress BlueTool\Scripts

During installation, the *BTSP User Guide* is saved to the **Cypress\BlueTool** folder. This user guide describes the fundamentals of automating BlueTool with Perl. A PDF file reader is required to view this guide.

Note: ActivePerl software is available from ActiveState at www.activestate.com.

Note: References to general information on using Perl are provided in “References”.

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8 Additional Information

8.1 Acronyms and Abbreviations

In most cases, acronyms and abbreviations are defined upon first use. For a more complete list of acronyms and other terms used in Cypress documents, go to: http://www.cypress.com/glossary.

8.2 References

This section lists documents and resources that may be useful to understanding the information contained in this document. The information contained in the listed references is optional and is not required to successfully complete the tasks described in this application note. In some cases, links to key third-party web sites are provided.

Note: The “xx” suffix applied to Cypress document numbers represents the revision. When downloading Cypress documents, select the document number with the highest revision number to ensure that you have the most current version of the document.

Document Name	Document Number	Source
Cypress Documents		
BTSP User’s Guide	–	Bundled with the BlueTool software package
Software for Exercising, Testing, Scripting, Debugging, and Programming Devices	BlueTool-QSG1xx-R	Cypress Developer Community
Other Documents		
ActivePerl Documentation	–	ActiveState Docs @ http://docs.activestate.com
General information on Perl	–	http://www.perl.org http://www.activestate.com http://perl.oreilly.com

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Document History Page

Document Title: AN214823 - Over-The-Air Remote Loopback Throughput Testing Using Cypress BlueTool™ Software Document Number: 002-14823				
Rev.	**ECN No.**	**Orig. of Change**	**Submission Date**	**Description of Change**
**	–	–	01/12/2012	20730-AN300-R Initial release.
*A	5466573	UTSV	10/13/2016	Updated About BlueTool on page 1: Added Cypress Part Numbering Scheme on page 1. Updated to Cypress template.
*B	5883795	AESATMP8	09/14/2017	Updated logo and Copyright.
*C	6438896	SELE	01/11/2019	Obsolete document. Completing Sunset Review.

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