WICED™ Studio

WICED Development System Manufacturing Test User Guide

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Contents

About This Document

Purpose and Scope

This document provides an overview of the Manufacturing Test application available for use with the Wireless Internet Connectivity for Embedded Devices (WICED; pronounced “wicked”) Software Development Kit. The document describes the purpose of this application and how to use it.

It is assumed that users of this guide have read the *WICED Quick Start Guide* document, *WICED-QSG2xx-R* [1], and have previously used the WICED SDK and Evaluation Board on a development computer. Users should also be familiar with the features of the WICED Evaluation Board described in the *WICED Evaluation Board User Guide, WICED-EUM2xx-R*.

For the purposes of manufacturing test, the WICED Evaluation Board may be referred to as the device under test (DUT).

Acronyms and Abbreviations

In most cases, acronyms and abbreviations are defined on first use.

For a comprehensive list of acronyms and other terms used in Cypress documents, go to www.cypress.com/glossary.

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Document Conventions

The following conventions may be used in this document

Convention	Description
Bold	Buttons, tabs, lists, and other GUI items
`Monospace`	Command lines and application outputs: `test.mfg_test-CYW943907AEVAL1F download`
Italics	Filenames and path *<WICED-SDK>\libraries\test\wl_tool\wl_<chip_name>.exe*
< >	Placeholders for required elements: <WICED-SDK>
‘ ‘	Application Names, Configuration Parameters: ‘YOUR_AP_SSID’

1 Demonstration Requirements

To demonstrate and use the WICED manufacturing test application, a computer with various software applications and radio (RF) test equipment are required. A description of how to setup individual tests using RF test equipment is not included in this document.

1.1 Computer

A computer, with at least one USB port, is required to attach to the WICED Evaluation Board and run the WICED SDK. The Cypress wireless LAN test utility may be run on various operating systems, but Cypress typically supports Windows® or Linux for manufacturing test. The commands in this document assume the computer runs the Windows operating system.

1.2 RF Test Equipment

RF Test equipment assists in taking measurements resulting from executing commands using the application. Equipment such as spectrum analyzers, signal analyzers, signal generators, power supplies, and RF cables, are required to effectively test the DUT.

2 Manufacturing Test Application

2.1 Overview

The manufacturing test application is used to test the radio performance of the DUT and to assist with regulatory certification. The application works in conjunction with a Cypress supplied wireless LAN manufacturing test utility, known as 'wl'. The wl utility is provided with the manufacturing test application as part of the WICED SDK.

The utility reads packetized IOCTL commands from the PC via a serial UART and forwards the commands to the Cypress Wi-Fi device on the WICED module. Responses to the IOCTLs from the Wi-Fi device are returned over the UART to the PC.

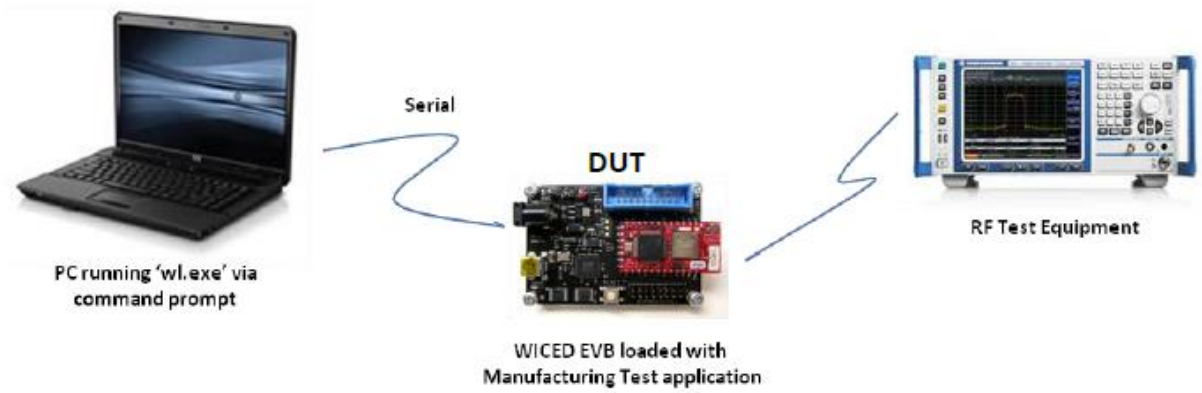

Figure 2-1. WICED Manufacturing Test Setup

2.2 Creating a Build Target

Similar to other WICED SDK example applications, the build target for the WICED manufacturing test application is constructed from a number of build components. The components used for the manufacturing test application are listed in Table 2-1.

Component	Available Options
Application Name	test.mfg_test
RTOS	ThreadX
Network Stack	NetX, NetX_Duo
Platform	CYW943907AEVAL1F and so on
Interface	SDIO
Build type	release, debug

Table 2-1. Example Manufacturing Test Application Build Target Components

The following is an example manufacturing test build target:

```
test.mfg_test-CYW943907AEVAL1F download run
```

See WICED Quick Start Guide[1] for a complete description on how to build an application and download the firmware image to the DUT.

2.3 wl PC Application

The manufacturing test application running on the DUT interacts via a serial communication interface with the Cypress wireless LAN manufacturing test utility running on a Windows PC. The wl utility is provided with the WICED Manufacturing Test SDK and is in the <*WICED-SDK*>*libraries**test**wl_tool**wl_<chip_name>.exe* subdirectory.

For further information on wl, see WL Tool for Embedded 802.11 Systems.

2.3.1 Rebuilding wl

Note: It is not necessary to rebuild wl on most Windows systems:

1. Install MinGW from http://www.mingw.org/.
2. Open a MinGW shell and navigate to the <*WICED-SDK*>*libraries**test**wl_tool* subdirectory:
3. Type: `make`.
4. This builds all of the currently supported wl<chip_name>.exe and the associated wiced_wlm_<chip_name>.dll.

2.4 Using the Application

The following steps describe how to use the manufacturing test application:

1. Make sure that the WICED Evaluation board is connected to the PC and loaded with the WICED manufacturing test application, and then press the reset button.
2. Access Windows Device Manager, check the Ports (COM & LPT) section, and note the COM port used by the WICED EVB (for instance, COM99).
3. Open a command prompt and navigate to the <*WICED-SDK*>*libraries**test**wl_tool*\ directory.
4. Enter the following command at the command prompt to verify that the application is working:

   ```
   <WICED-SDK>\libraries\test\wl_tool> wl<chip_name>.exe --serial 99 ver
   ```

   Where 99 corresponds to the COM port number of the DUT

Figure 2-2 shows a sample response to the version command.

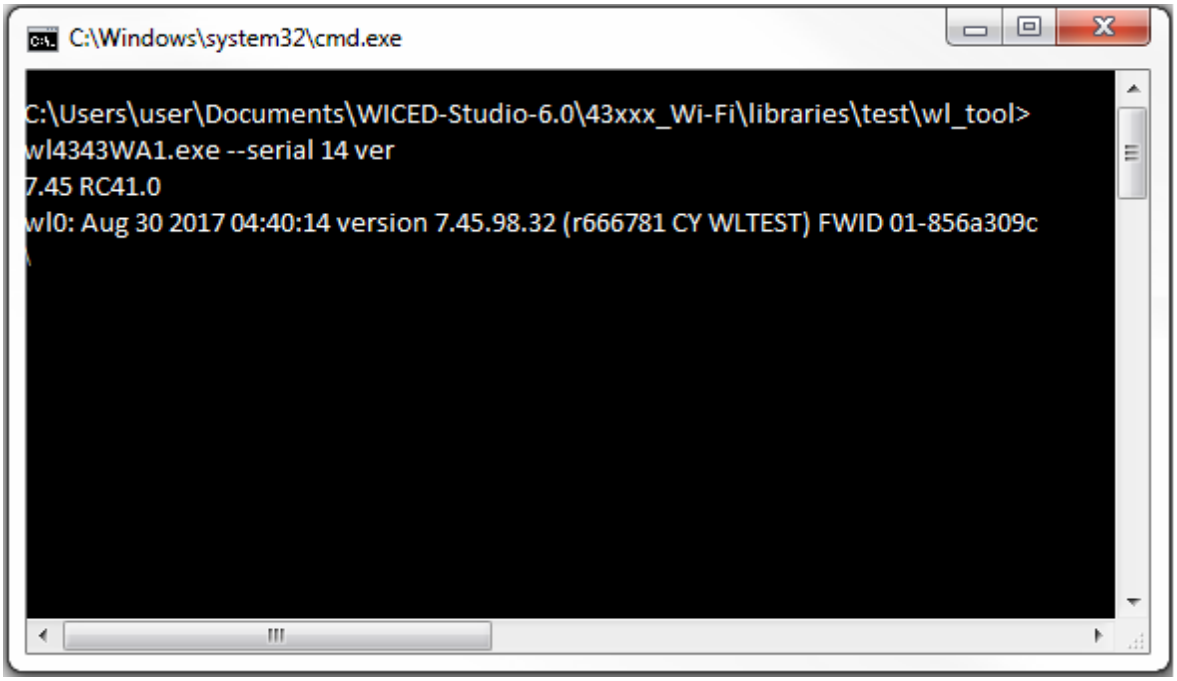

Figure 2-2. Example Manufacturing Test Output

The following command displays the list of available commands: `wl<chip_name> --serial 99 cmds`

The following command displays the detailed help: `wl<chip_name> --serial 99 -h`

Note: The wl utility was originally designed to work with high-performance host processors that have access to megabytes of memory. Accordingly, a very small subset of wl commands (the general scan command, for example) may not work on a microcontroller with a very limited amount of RAM.

For a detailed description of the Cypress wl manufacturing test utility, see the following documents:

- 802.11-TI2xx-R, WL Tool for Embedded 802.11 Systems
- 802.11-TI3xx-R, WLAN Client Utility Command Set

2.5 Interpreting wl PC Application Error Codes

For the defines associated with the *wl<chipname>.exe* command, see the associated header file:

`<WICED-SDK>\libraries\test\wl_tool\<chip_name>\include\bcmutils.h`

3 Example Commands

This section provides example command sequences with appropriate wl commands that may be used to test basic Wi-Fi transmit and receive functionality of the DUT. These commands are provided as scripts at the following location *<WICED-SDK>\libraries\test\wl_tool\scripts*.

Table 3-1 provides a brief description of commands used in the manufacturing test scripts.

Command	Brief Description
ampdu	Enables ampdu transmission. Used to maximize transmit duty cycle
antdiv	Used with `txant` command to control antenna selection
band	Sets radio band
bi	Sets beacon interval
channel	Sets radio channel
chanspec	Sets channel using chanspec. `chanspec -c 1 -b 2 -w 20 -s 0` sets channel=1, bandwidth=2.4 GHz, chan bandwidth=20 MHz, lower sideband
counters	Returns packet counter statistics (use `reset_cnts` to reset statistics)
country	Selects country specific power and channel restrictions
disassoc	Disassociates the WLAN device (if associated)
down	Brings the wireless interface down
frameburst	Used to maximize transmit duty cycle
iscanresults	Returns results of the last iscan
iscan_c	Continues an incremental scan
iscan_s	Initiates an incremental scan
fqacurcy	Used to control continuous wave (CW) transmission
mpc	Sets minimum power consumption mode
nrate	Sets band specific rate override. `nrate -m 7 -s 0` sets MCS=7, SISO PHY
phy_watchdog	Controls 802.11 PHY recalibration
pkteng_start	Starts transmission of a continuous stream of packets
pkteng_stop	Stops packet transmission
rateset	Returns or sets the supported basic 802.11 rates
scansuppress	Suppress 802.11 scanning functionality
reset_cnts	Reset packet counter statistics
txant	Used with `antdiv` command to control antenna selection
txpwr1	Sets transmit power output
Up	Brings up the wireless interface

Table 3-1. Brief Description of Manufacturing Test Commands

3.1 Transmit Testing

For 802.11b transmit testing, an example command sequence is shown in Table 3-2.

These scripts can be found in: *<WICED-SDK>\libraries\test\wl_tool\scripts.*

```
wl<chip_name> --serial 99 down
wl<chip_name> --serial 99 country ALL
wl<chip_name> --serial 99 band b
wl<chip_name> --serial 99 chanspec -c 1 -b 2 -w 20 -s 0
wl<chip_name> --serial 99 mpc 0
wl<chip_name> --serial 99 ampdu 1
wl<chip_name> --serial 99 bi 65000
wl<chip_name> --serial 99 frameburst 1
wl<chip_name> --serial 99 rateset 11b
wl<chip_name> --serial 99 up
wl<chip_name> --serial 99 txant 0
wl<chip_name> --serial 99 antdiv 0
wl<chip_name> --serial 99 nrate -r 11
wl<chip_name> --serial 99 phy_watchdog 0
wl<chip_name> --serial 99 disassoc
wl<chip_name> --serial 99 txpwr1 -1
sleep 3
wl<chip_name> --serial 99 pkteng_start 00:90:4c:aa:bb:cc tx 40 1000 0
To stop transmitting:
wl<chip_name> --serial 99 pkteng_stop tx
```

Table 3-2. Manufacturing Test Application: 802.11b Tx Test Commands

For 802.11g transmit testing, an example command sequence is shown in Table 3-3.

```
wl<chip_name> --serial 99 down
wl<chip_name> --serial 99 country ALL
wl<chip_name> --serial 99 band b
wl<chip_name> --serial 99 chanspec -c 6 -b 2 -w 20 -s 0
wl<chip_name> --serial 99 mpc 0
wl<chip_name> --serial 99 ampdu 1
wl<chip_name> --serial 99 bi 65000
wl<chip_name> --serial 99 frameburst 1
wl<chip_name> --serial 99 rateset 11b
wl<chip_name> --serial 99 up
wl<chip_name> --serial 99 txant 0
wl<chip_name> --serial 99 antdiv 0
wl<chip_name> --serial 99 nrate -r 54
wl<chip_name> --serial 99 phy_watchdog 0
wl<chip_name> --serial 99 disassoc
wl<chip_name> --serial 99 txpwr1 -1
sleep 3
wl<chip_name> --serial 99 pkteng_start 00:90:4c:aa:bb:cc tx 40 1000 0
To stop transmitting:
wl<chip_name> --serial 99 pkteng_stop tx
```

Table 3-3. Manufacturing Test Application: 802.11g Tx Test Commands

For 802.11n transmit testing, an example command sequence is shown in Table 3-4.

```
wl<chip_name> --serial 99 down
wl<chip_name> --serial 99 country ALL
wl<chip_name> --serial 99 band b
wl<chip_name> --serial 99 chanspec -c 11 -b 2 -w 20 -s 0
wl<chip_name> --serial 99 mpc 0
wl<chip_name> --serial 99 ampdu 1
wl<chip_name> --serial 99 bi 65000
wl<chip_name> --serial 99 frameburst 1
wl<chip_name> --serial 99 rateset 11b
wl<chip_name> --serial 99 up
wl<chip_name> --serial 99 txant 0
wl<chip_name> --serial 99 antdiv 0
wl<chip_name> --serial 99 nrate -m 7 -s 0
wl<chip_name> --serial 99 phy_watchdog 0
wl<chip_name> --serial 99 disassoc
wl<chip_name> --serial 99 txpwr1 -1
sleep 3
wl<chip_name> --serial 99 pkteng_start 00:90:4c:aa:bb:cc tx 40 1000 0
To stop transmitting:
wl<chip_name> --serial 99 pkteng_stop tx
```

Table 3-4. Manufacturing Test Application: 802.11n Tx Test Commands

3.2 Receive Testing

For receive testing, an example command sequence is shown in Table 3-5.

```
wl<chip_name> --serial 99 down
wl<chip_name> --serial 99 mpc 0
wl<chip_name> --serial 99 country ALL
wl<chip_name> --serial 99 scansuppress 1
wl<chip_name> --serial 99 channel 1
wl<chip_name> --serial 99 bi 65535
wl<chip_name> --serial 99 up
sleep 10
wl<chip_name> --serial 99 counters
```

Table 3-5. Manufacturing Test Application: 802.11 Rx Test Commands

3.3 Carrier Wave

To transmit a carrier wave, an example command sequence is shown in Table 3-6.

```
wl<chip_name> --serial 99 down
wl<chip_name> --serial 99 country ALL
wl<chip_name> --serial 99 band b
wl<chip_name> --serial 99 mpc 0
wl<chip_name> --serial 99 up
wl<chip_name> --serial 99 out
wl<chip_name> --serial 99 fqacurcy 6
[To stop transmitting]
wl<chip_name> --serial 99 fqacurcy 0
wl<chip_name> --serial 99 down
wl<chip_name> --serial 99 up
```

Table 3-6. Manufacturing Test Application: Carrier Wave Commands

3.4 Antenna Selection

Antenna selection and diversity is controlled using the `txant` and `antdiv` commands as shown in Table 3-7.

```
[Select antenna 0]
wl<chip_name> --serial 99 txant 0
wl<chip_name> --serial 99 antdiv 0
[Select antenna 1]
wl<chip_name> --serial 99 txant 1
wl<chip_name> --serial 99 antdiv 1
[Enable antenna diversity]
wl<chip_name> --serial 99 txant 3
wl<chip_name> --serial 99 antdiv 3
```

Table 3-7. Manufacturing Test Application: Antenna Selection

Note: The `txant` and `antdiv` commands will not have any effect unless the NVRAM (Wi-Fi variable image) and Wi-Fi firmware image are enabled for diversity.

3.5 Other

Here are some commands that might be useful:

- To scan for an Access Point with an SSID = YOUR_AP_SSID:

  ```
  >wl<chip_name> --serial 99 iscan_s YOUR_AP_SSID
  ```

- To retrieve iscan_s results:

  ```
  >wl<chip_name> --serial 99 iscanresults
  ```

- To get the MAC address of the WICED module:

  ```
  >wl<chip_name> --serial 99 cur_etheraddr
  ```

- To associate with an open Access Point:

  ```
  >wl<chip_name> --serial 99 join <SSID_OF_AP>
  ```

- To verify association status:

  ```
  >wl<chip_name> --serial 99 status
  ```

- To get the received signal strength (RSSI) after association, use:

  ```
  >wl<chip_name> --serial 99 rssi
  ```

- To disassociate from Access Point:

  ```
  >wl<chip_name> --serial 99 disassoc
  ```

- To set the transmit power to +15dBm:

  ```
  >wl<chip_name> --serial 99 txpwr1 -d 15
  ```

- To read the contents of the NVRAM:

  ```
  >wl<chip_name> --serial 99 nvram_dump
  ```

Note: After executing the `wl<chip_name> --serial 99 mpc 0` command, make sure that a subsequent `wl<chip_name> --serial 99 up` command is issued. To verify that the device is up, check if a value of `1` is returned when a `wl<chip_name> --serial 99 isup` command is executed.

References

Note: Cypress provides customer access to technical documentation and software through the WICED website (community.cypress.com). Additional restricted material may be provided through the Customer Support Portal (CSP) and Downloads.

Document (or Item) Name	Number	Source
[1] WICED Quick Start Guide	WICED-QSG.pdf	${WICED Studio INSTALLDIR}\43xxx_Wi-Fi\doc\

Document Revision History

Document Title: WICED Development System Manufacturing Test User Guide

Document Number: 002-22439

Revision	ECN	Issue Date	Description of Change
**	5999132	12/22/2017	**WICED-MFG203-R** : Added iscan command Updated for WICED-SDK-6.1
*A	6456662	01/23/2019	**WICED-MFG203-R** : Updated for WICED-SDK-6.4 (wl<chip>.exe build command) Added section pointing to wl PC app error codes

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