ATWINC/ATWILC

MCHPRT2 User Guide

Introduction

This document provides detailed information about the MCHPRT2 tool, which allows the user to easily configure, evaluate and test an RF system. This tool simplifies the effort during the early stage of development, regulatory certification and production testing. The MCHPRT2 tool with v1.0 is used for this demonstration. MCHPRT2 is a Windows®-based software program.

Notes: The ATWINC and ATWILC denote the following:

- ATWINC15x0
- ATWINC3400
- ATWILC1000
- ATWILC3000

Features

The MCHPRT2 tool includes the following functions for the ATWINC/ATWILC devices:

- Flexible Graphical User Interface (GUI) Configuration Options
- Inbuilt Command Line Interpreter (CLI)
- Wi-Fi® RF Performance Evaluation
- Bluetooth® Low Energy (BLE) RF Performance Evaluation
- Continuous Wave (CW) Transmitter
- RF Frequency Offset Calibration
- e-Fuse Programming
- Register Read/Write
- Register Range Dump
- Received Signal Strength Indicator (RSSI) Reading
- Firmware (FW) Upgrade
- Gain Table Update
- Webpage Upgrade

Table of Contents

1. Prerequisite

This chapter provides the hardware and software prerequisites for using the MCHPRT2 tool with the ATWINC/ATWILC series.

1.1 Hardware Prerequisites

This section provides the hardware tools that are required to test the RF system. ATWINC/ATWILC is connected to the GUI using Aardvark™ or serial bridge.

1.1.1 Aadvark I²C Host Adapter

Aardvark I2C/HCI Host adapter is used to interface PC via USB to I²C pins of ATWINC/ATWILC. The same is shown in the following figure. For more information, refer to http://www.totalphase.com/products/aardvark-i2cspi/.

Figure 1-1. Aardvark I2C/HCI Host Adapter

1.1.2 USB-UART Converter

This USB-UART converter (MCP2200 Breakout Module) will be used to interface the PC to the UART DTM interface of the ATWINC3XXX devices. Any generic USB-UART converter can also be used.

Figure 1-2. USB-UART Converter

1.2 Software Prerequisite

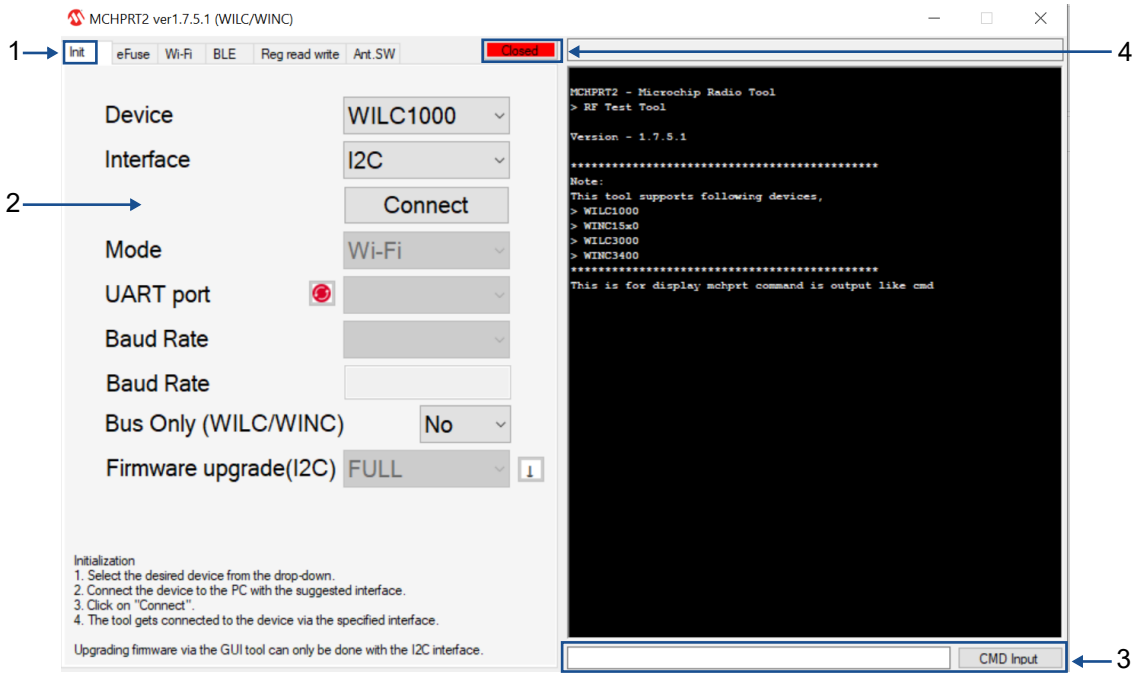
1.2.1 Serial Bridge Connection (ATWILC/ATWINC)

MCHPRT2 GUI can be operated without the Aadvark tool with the help of the serial bridge application from Microchip Studio. In the GUI, instead of I^2C, select UART. Enter the valid Com port, baud rate and click **Init** to start evaluating the RF test system. For more information, see the Serial Bridge Application Note.

1.2.2 MCHPRT2 GUI Tool

The MCHPRT2 tool allows the user to easily configure, evaluate and test an RF system. It simplifies the effort during the early stage of development. The later sections have a detailed explanation on how the tool is used to test the RF system.

Figure 1-3. MCHPRT2 GUI Tool



1. Click the tab for Initialization, eFuse, Wi-Fi, BLE or Register read and write option.
2. Function block for the selected tab.
3. CMD command line block.
4. Device connectivity status:
   - Closed – Sub process MCHPRT2 tool is closed
   - Ready – MCHPRT2 tool is waiting for the command
   - Processing – MCHPRT2 tool is running

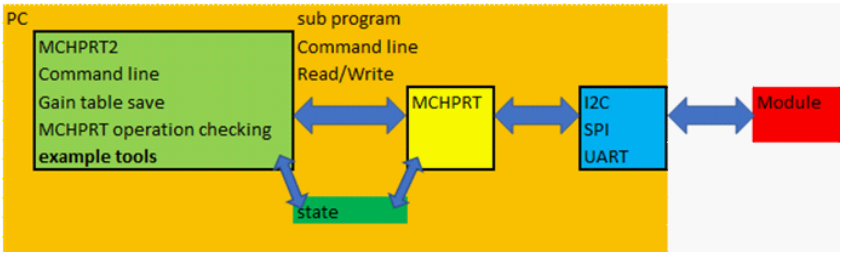
1.2.2.1 MCHPRT2 Software Architecture

MCHPRT2 is a C# program using MCHPRT command line function for RF test or automation test example. The following link has an example of process function to open, send and receive the command.

https://docs.microsoft.com/en-us/dotnet/api/system.diagnostics.process?redirectedfrom=MSDN&view=netframework-4.7.2.

The following is the architecture of MCHPRT2.

Figure 1-4. MCHPRT2



For MCHPRT2 source code contact Microchip sales.

1.3 UART/I²C Pin Details

Connect the UART or I²C to the PC, and power on the ATWINC/ATWILC. Ensure that the ATWINC/ATWILC is in the right test mode with the correct pins.

The following table provides the I²C connection for ATWINC/ATWILC 1XXX and 3XXX series.

Table 1-1. I²C Connection

Connections	1XXX Module series	1XXX Chip series	3XXX Module series	3XXX Chip series
I2C Slave Data	Pin 3	Pin 33	Pin 10	Pin 16
I2C Slave clock	Pin 2	Pin 32	Pin 11	Pin 17
BT_TXD	NA	NA	Pin 8	Pin 14
BT_RXD	NA	NA	Pin 9	Pin 15

1.4 Power-Up/Down Sequence

This section provides the power-up/down sequence for the ATWINC/ATWILC devices.

1.4.1 Power-up/down Sequence (ATWINC/ATWILC)

The power-up/down sequence for ATWINC/ATWILC is shown in the following figure. The timing parameters are provided in following the table.

Figure 1-5. Power-up/down Sequence (ATWINC/ATWILC)

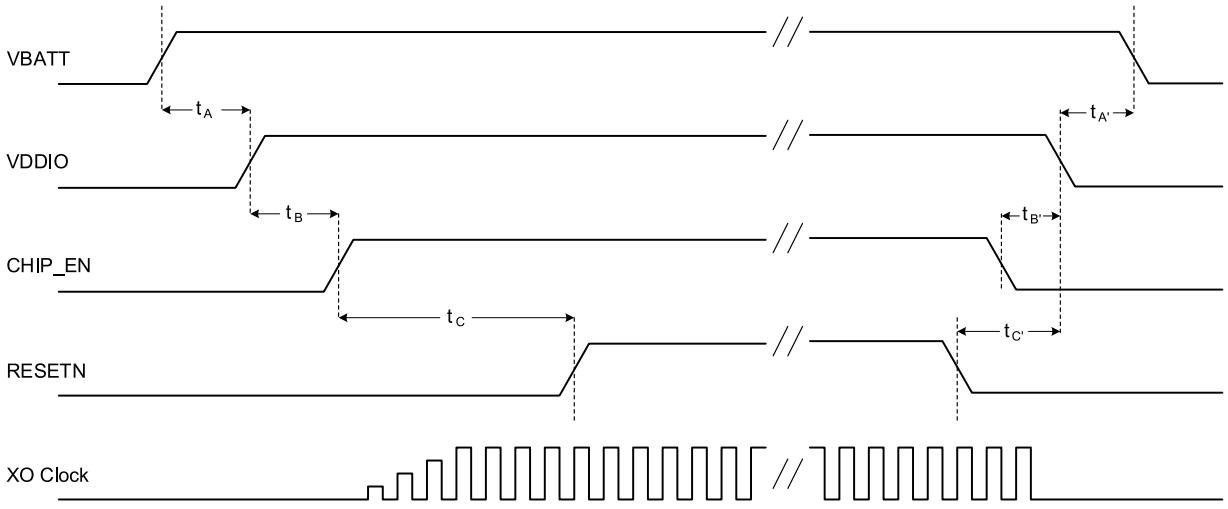


Table 1-2. Power-up/down Sequence Timing Parameters

Parameter	Min.	Units	Description
t_A	0	ms	• VBATT rise to VDDIO rise • VBATT and VDDIO can rise simultaneously or can be tied together. VDDIO must not rise before VBATT.
t_B	0	ms	• VDDIO rise to CHIP_EN rise • CHIP_EN must not rise before VDDIO. CHIP_EN must be driven high or low, not left floating.
t_C	5	ms	• CHIP_EN rise to RESETN rise • This delay is needed because the XO clock must stabilize before RESETN removal. RESETN must be driven high or low, not left floating.
$t_{A'}$	0	ms	• VDDIO fall to VBATT fall • VBATT and VDDIO can fall simultaneously or can be tied together. VBATT must not fall before VDDIO.
$t_{B'}$	0	ms	• CHIP_EN fall to VDDIO fall • VDDIO must not fall before CHIP_EN. CHIP_EN and RESETN can fall simultaneously.
$t_{C'}$	0	ms	• RESETN fall to VDDIO fall • VDDIO must not fall before RESETN. RESETN and CHIP_EN can fall simultaneously.

It is mandatory that the ATWINC/ATWILC chip is in the right bootloader state for establishing connection from GUI through I2C. To do that, the host MCU must power-up the ATWINC/ATWILC chip and then perform the reset sequence as defined in the figure Power-up/down Sequence (ATWINC/ATWILC). This is done very easily from the host MCU by calling the nm_bsp_init() and nm_bsp_reset() function. The code snippet for the same is as shown below,

```
int main(void)
{/* Initialize the board. */
system_init();
/* Initialize the BSP. */
nm_bsp_init();
nm_bsp_reset();
while(1) {
}
}
```

1.5 Hardware Setup

The following figures illustrate the block diagram of the test setup using ATWINC.

Figure 1-6. ATWINC1500 Hardware Setup

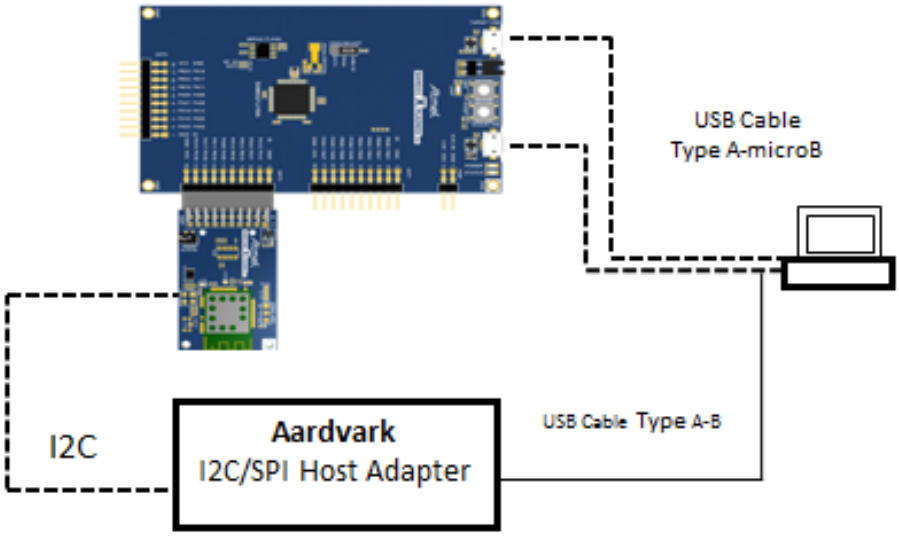
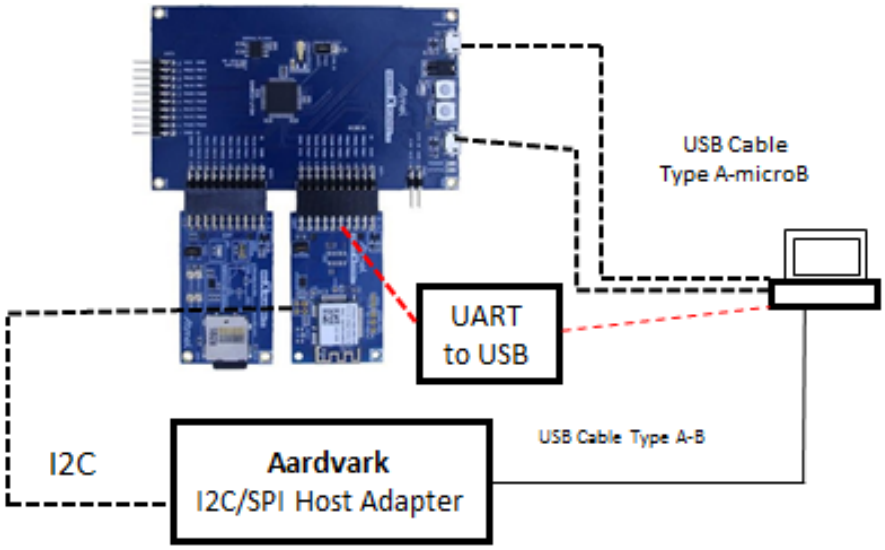


Figure 1-7. ATWINC3400 Hardware Setup



2. Graphical User Interface

This chapter provides the steps to follow to put the device in Wi-Fi and Bluetooth test mode, and set registers, eFuse bits and perform firmware upgrade using the MCHPRT2 tool.

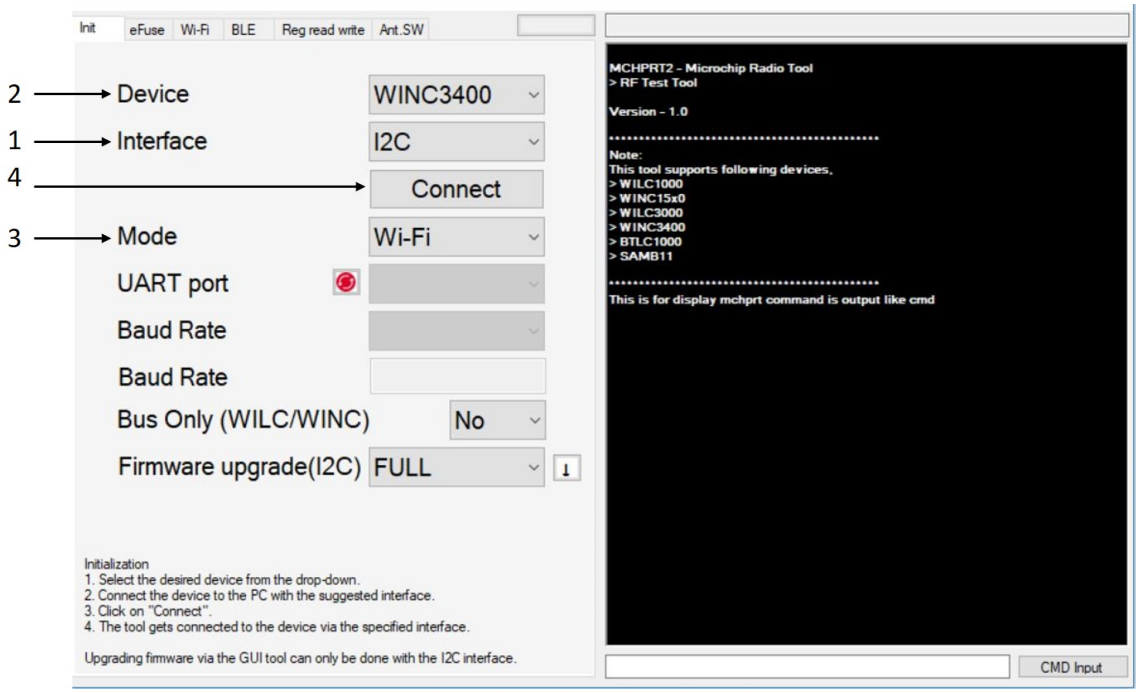
2.1 Wi-Fi

2.1.1 Initialization

Perform the following steps for Wi-Fi initialization.

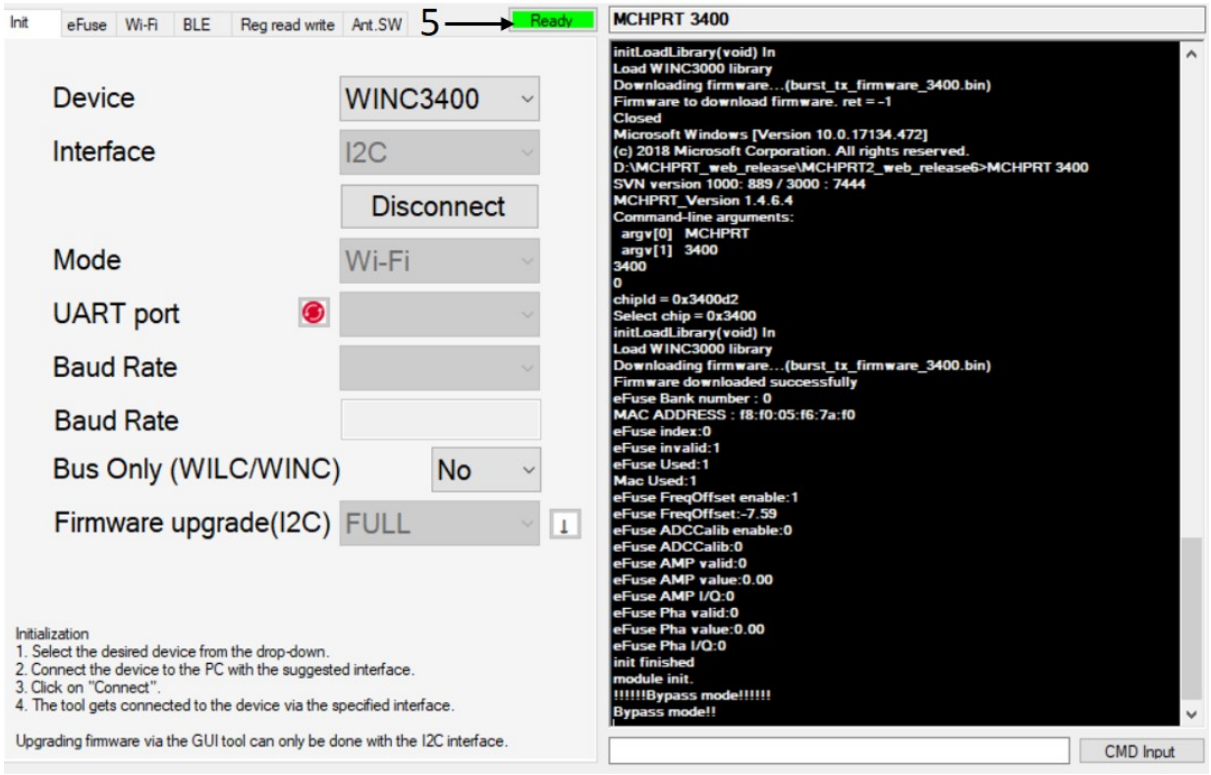
1. Double-click to open the `MCHPRT2.exe` executable file and, select the interface as “I2C” when using “I2C” connection. Select the interface as ‘UART’ when using serial bridge UART connection.
2. Select the device from the Device series drop down box.
3. Choose Wi-Fi as the mode from the drop down box.
4. Click **Connect** to initialize the device.
5. After initialization is complete, the status of the process bar displays Ready.

Figure 2-1. Wi-Fi Initialization



Note: The CLI information is displayed on the right hand side.

Figure 2-2. Wi-Fi Initialization



2.1.2 Transmission (TX)

2.1.2.1 Start TX – Gain, Channel, Data Rate

Set the following parameters to Start TX:

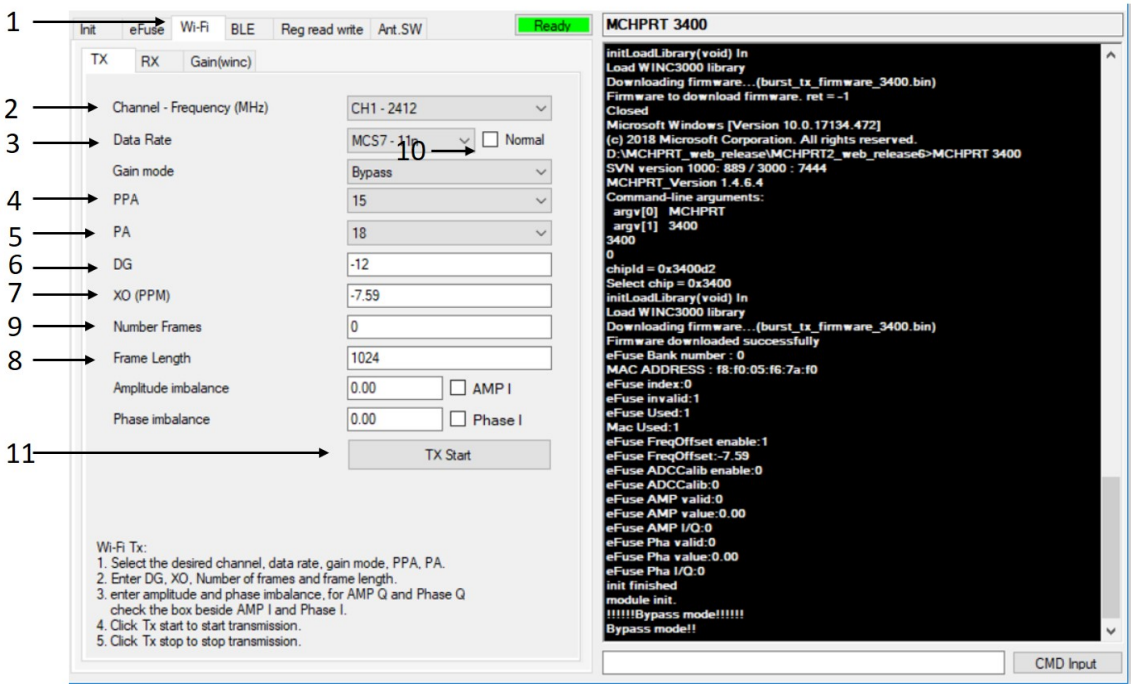
1. Navigate to the **Wi-Fi** tab.
2. Select the desired channel **CH** for testing.
3. Select the desired data rate from the drop-down box, and choose the Gain mode (Dynamic/Bypass/FLASH(WINC1500/WINC3400 only).
   Note: In Bypass mode, PPA, PA and Digital Gain are enabled. The value is set within the specified value besides PPA, PA and Digital Gain. In Dynamic and Flash gain mode, PPA, PA and Digital Gain are disabled.
4. Enter PPA.
5. Enter PA.
6. Enter Digital Gain (-7 ~ -15).
   Note: The following table provides the details about the recommended values of the PA and PPA gain values. The user can only customize the DG gain values to meet the gain value requirements.

Table 2-1. Recommended PA and PPA Gain Values

Device	PA	PPA	DG
WILC1000	18	6	Customizable within the provided range
WINC1500	18	6	Customizable within the provided range
WILC3000	Wi-Fi –18 BLE – 6	Wi-Fi –15 BLE – 6	Customizable within the provided range
WINC3400	Wi-Fi –18 BLE – 6	Wi-Fi –15 BLE – 6	Customizable within the provided range

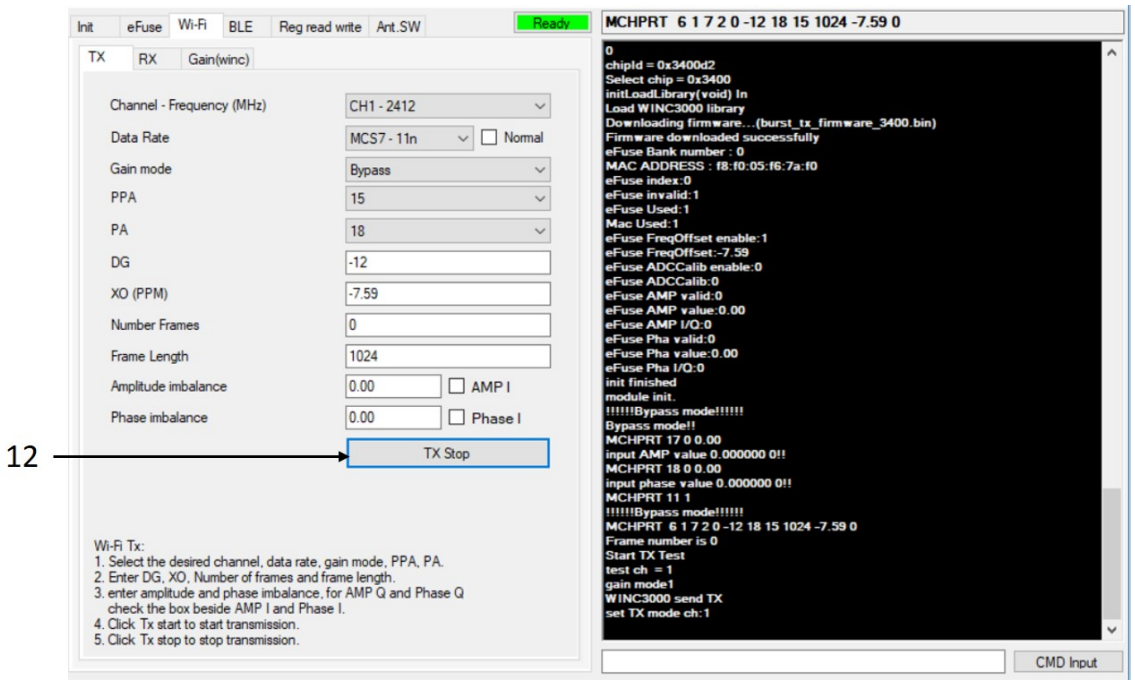
7. XO offset.
8. Length (0~1024).
9. Frames (0 for continuous TX mode).
10. For CW mode of transmission, select the check box before Normal to enter CW mode.
11. Click **TX start** to Start TX.

Figure 2-3. Start TX



12. Click **TX stop** to Stop TX.

Figure 2-4. Stop TX



Note: The value that is written to amplitude and phase imbalance in the Wi-Fi tab is used for testing. It is not written into the eFuse.

Notes:

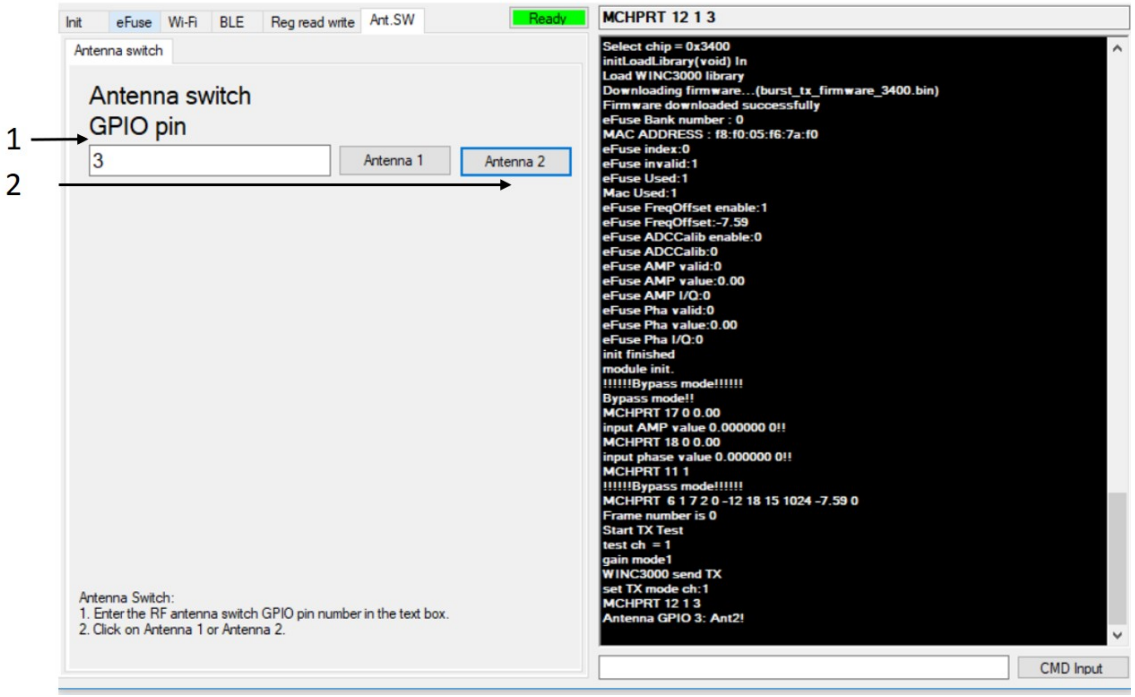
- Bypass mode: Gain values are used from the value entered in the GUI.
- Dynamic mode: Gain Values are used from the loaded test firmware (`.bin` gain table).
- Flash mode (For WINC devices): Gain values are used from Flash memory.

2.1.2.2 Antenna Switch

Set the following parameters for Antenna switch (ATWILC1000/ATWINC15x0).

1. Enter the GPIO number for switching the antenna.
2. Click on the Antenna 2 button for switching.

Figure 2-5. Enable Antenna Switch



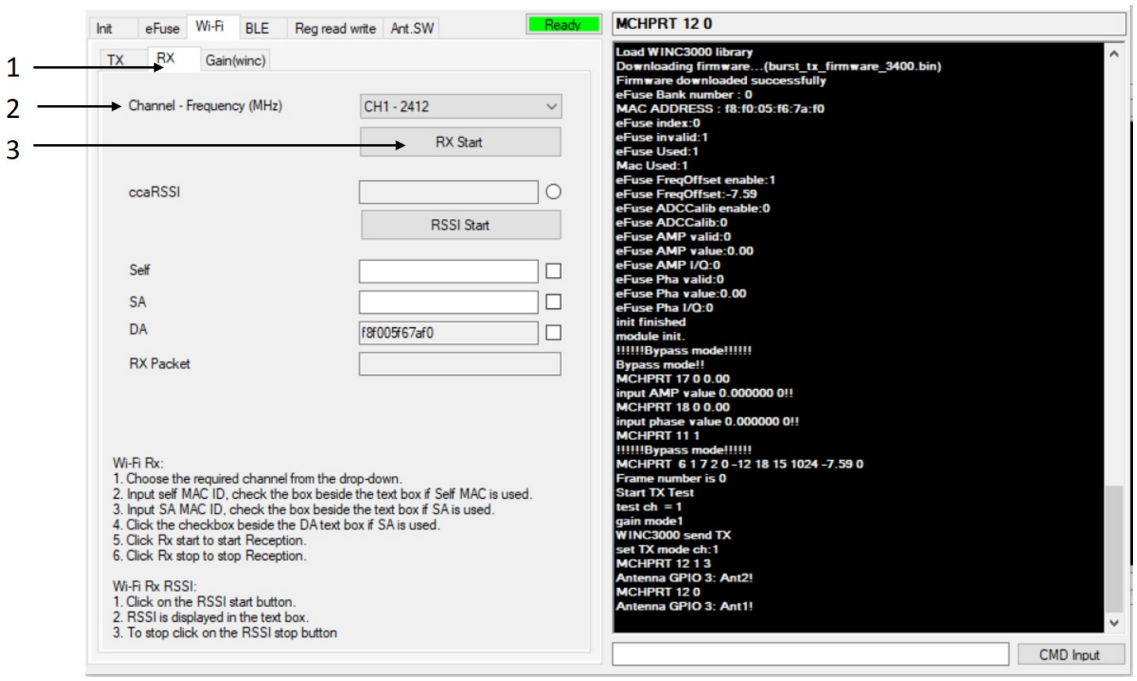
2.1.3 Receive (RX)

2.1.3.1 Start RX

Perform the following steps to Start RX:

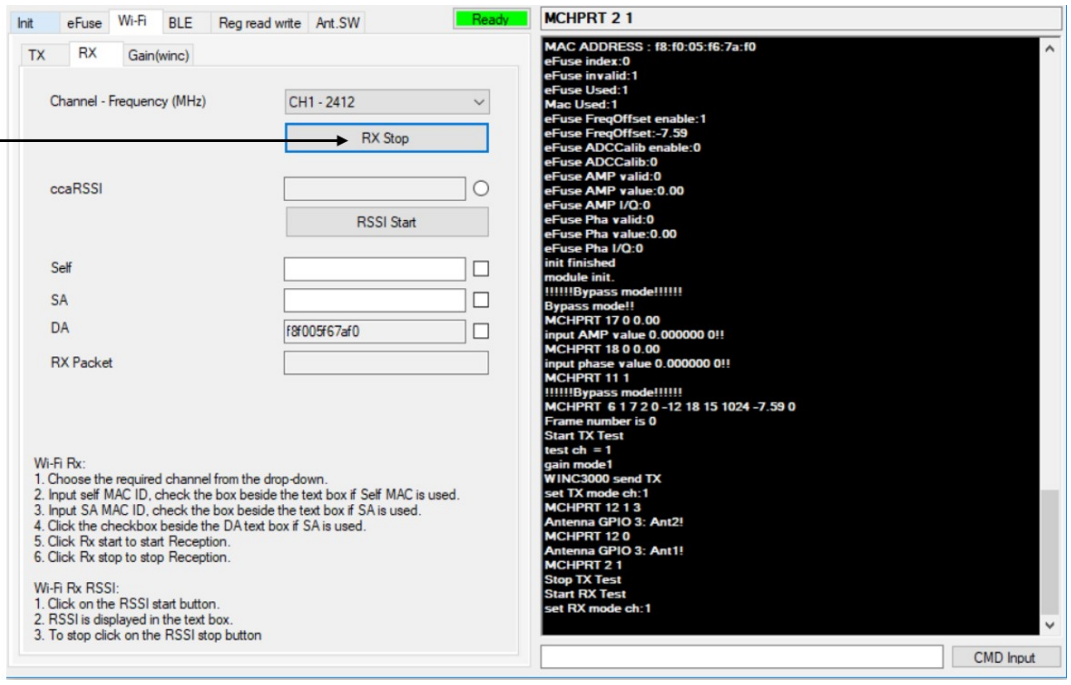
1. Navigate to the **RX** tab, under the **Wi-Fi** tab.
2. Select the required channel from the Channel - Frequency (MHz) drop down box.
3. Click **RX start** to start the receive test.

Figure 2-6. Start RX Test



4. Click **RX stop** to stop receiving and the number of received packets is shown in RX packet text box.

Figure 2-7. Stop RX



2.1.3.2 RX MAC Filter Control

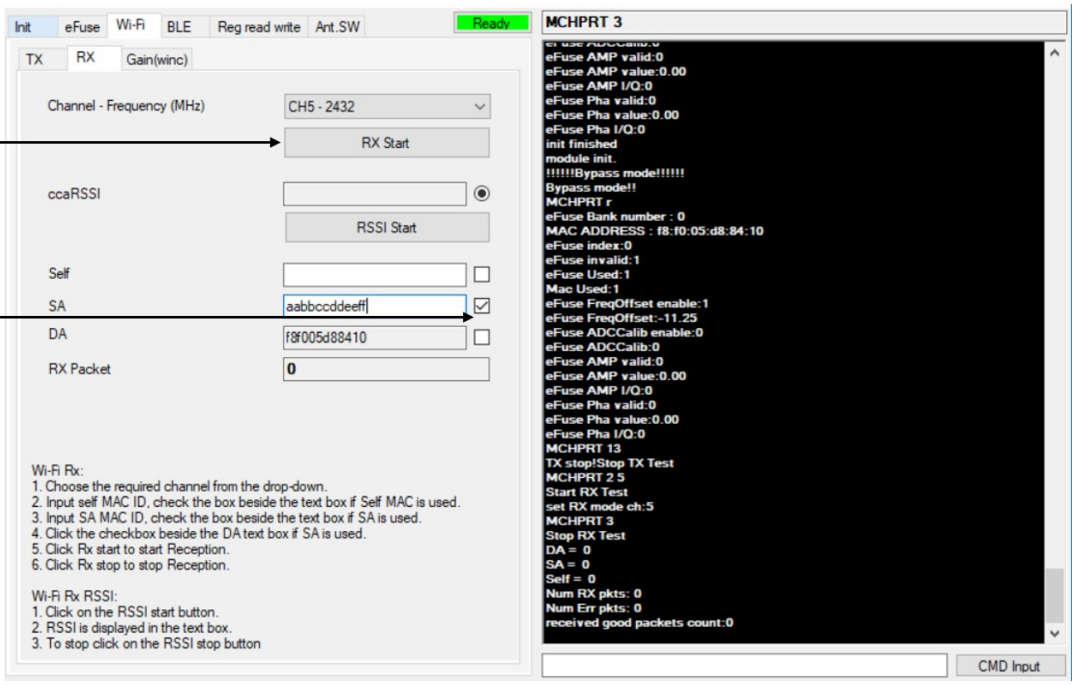
2.1.3.2.1 Enable RX MAC Filter SA (Source)

Perform the following steps to enable RX MAC filter for SA.

1. Click on the **SA** check box and input Source MAC address in the text box.

2. Click **RX start** to start the RX test.

Figure 2-8. Enable RX MAC Filter SA

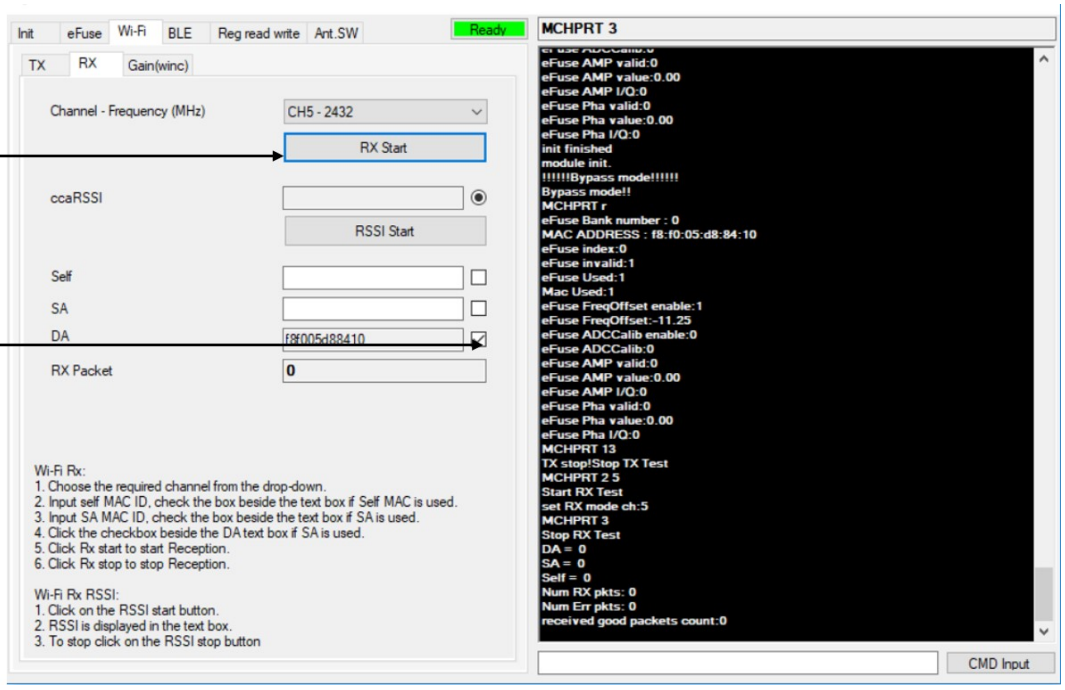


2.1.3.2.2 Enable RX MAC Filter DA (Destination)

Perform the following steps to enable RX MAC filter for DA.

1. Click the **DA** check box to enable RX MAC filter for DA.
2. Click on **RX start** to start the RX test.

Figure 2-9. Enable RX MAC Filter DA

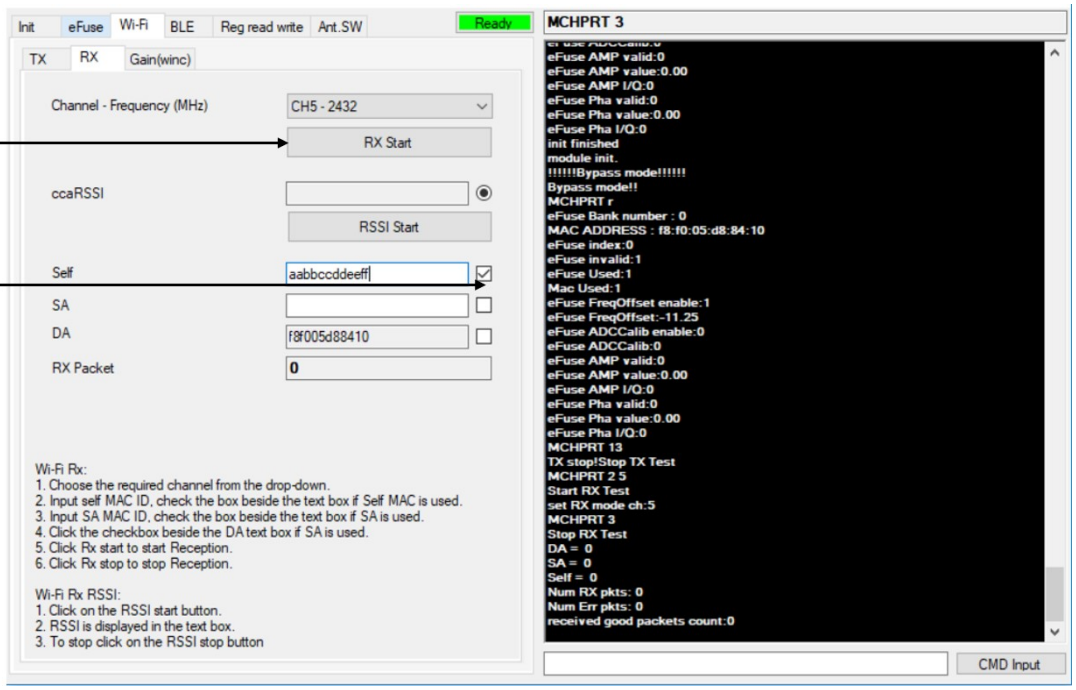


2.1.3.2.3 Enable Override Self MAC Address

Perform the following steps to enable override self MAC address.

1. Click on **Self** check box and input Self MAC address in the text box.
2. Click **RX start** to start the RX test.

Figure 2-10. Enable Override Self MAC Address

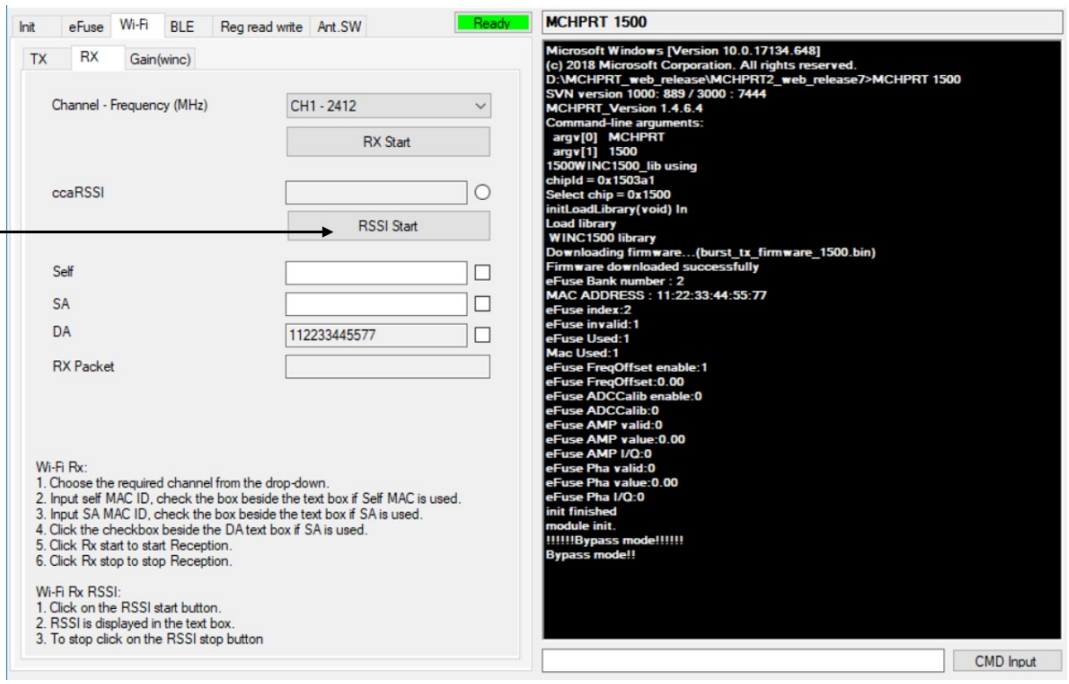


2.1.3.3 ccaRSSI

Perform the following steps to start RSSI test:

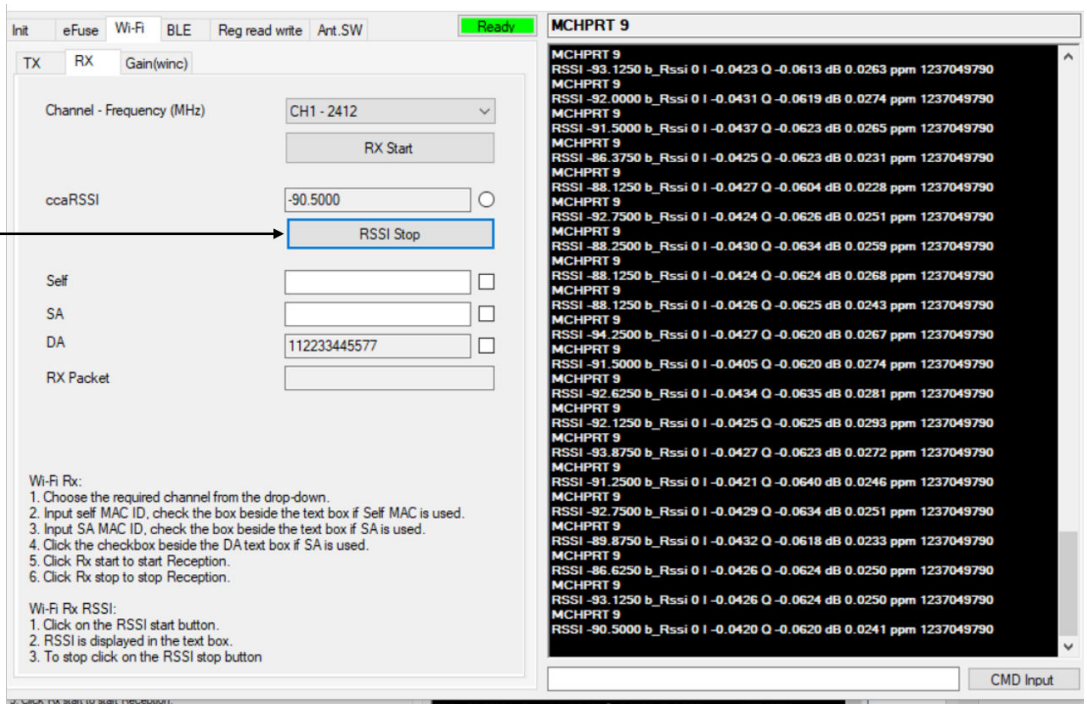
1. Click **RSSI start** to start receiving the signal strength displayed in the tab next to ccaRSSI.
   Note: If a valid Wi-Fi packet is received, the indicator next to the ccaRSSI text box displays as selected.

Figure 2-11. Start RSSI



2. Click **RSSI stop** to stop measuring RSSI.

Figure 2-12. Stop RSSI



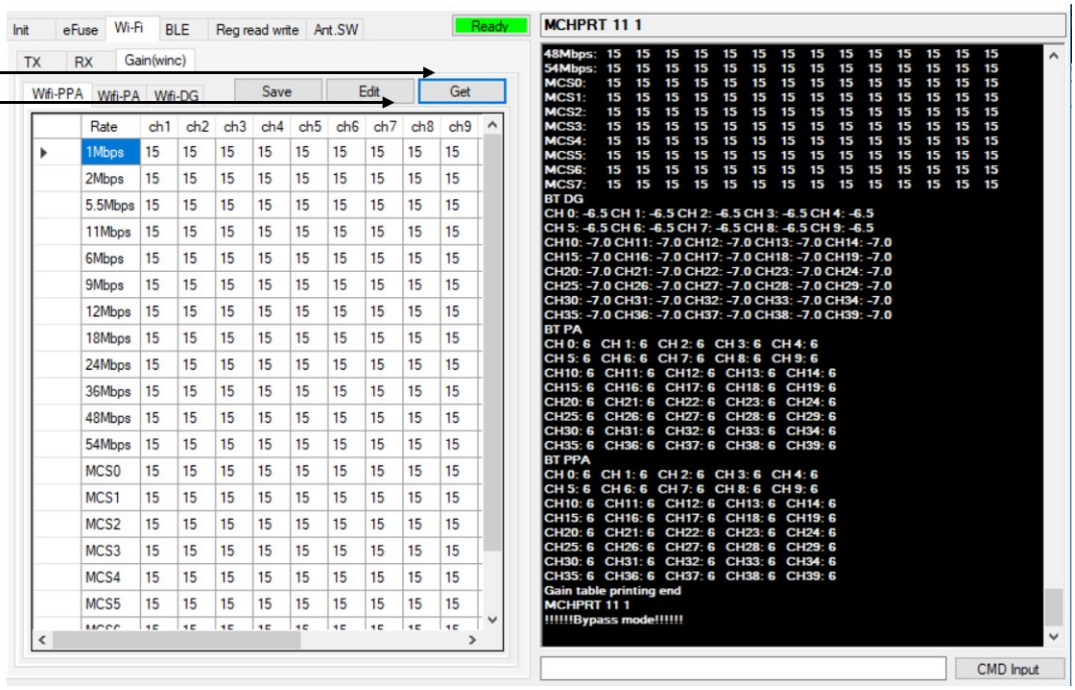
2.1.4 Gain Table

Perform the following steps for Gain table settings:

1. Navigate to **Gain(winc)** under **Wi-Fi** tab and, click **Get** to get the Wifi-PPA, Wifi-PA and Wifi-DG.

2. Click **Edit** to change the values of PPA, PA and DG. Click **Save** to apply the changes.

Figure 2-13. Gain Table Update



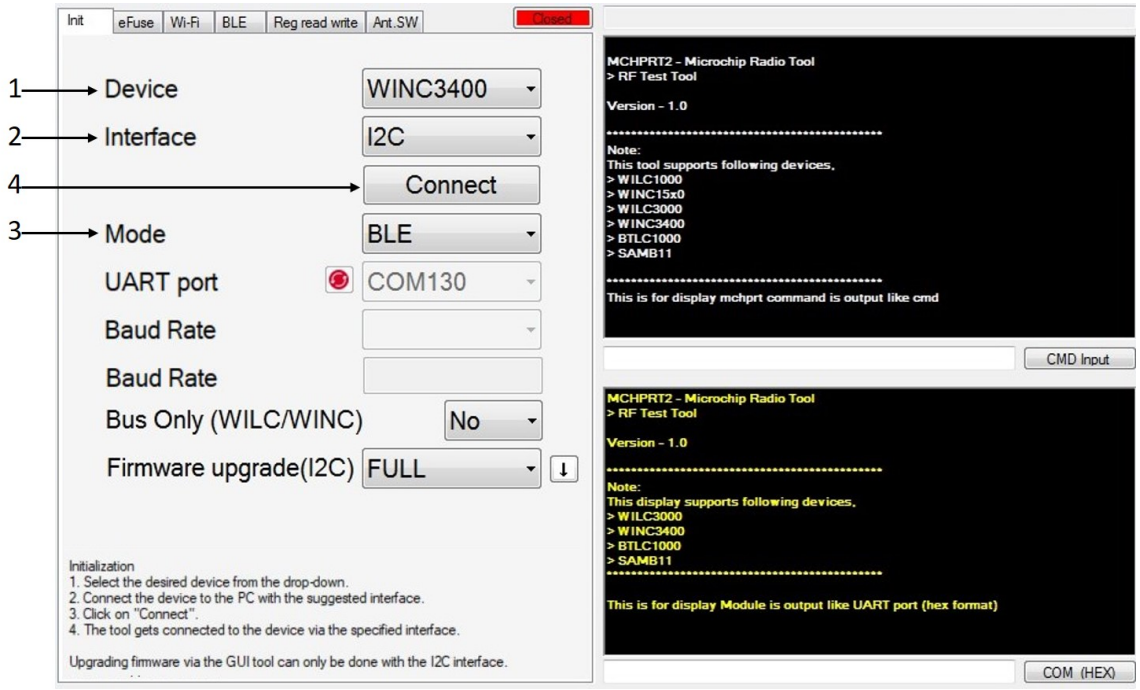
2.2 Bluetooth Low Energy (ATWILC3000/ATWINC3400)

2.2.1 Initialization

Perform the following steps for Bluetooth initialization.

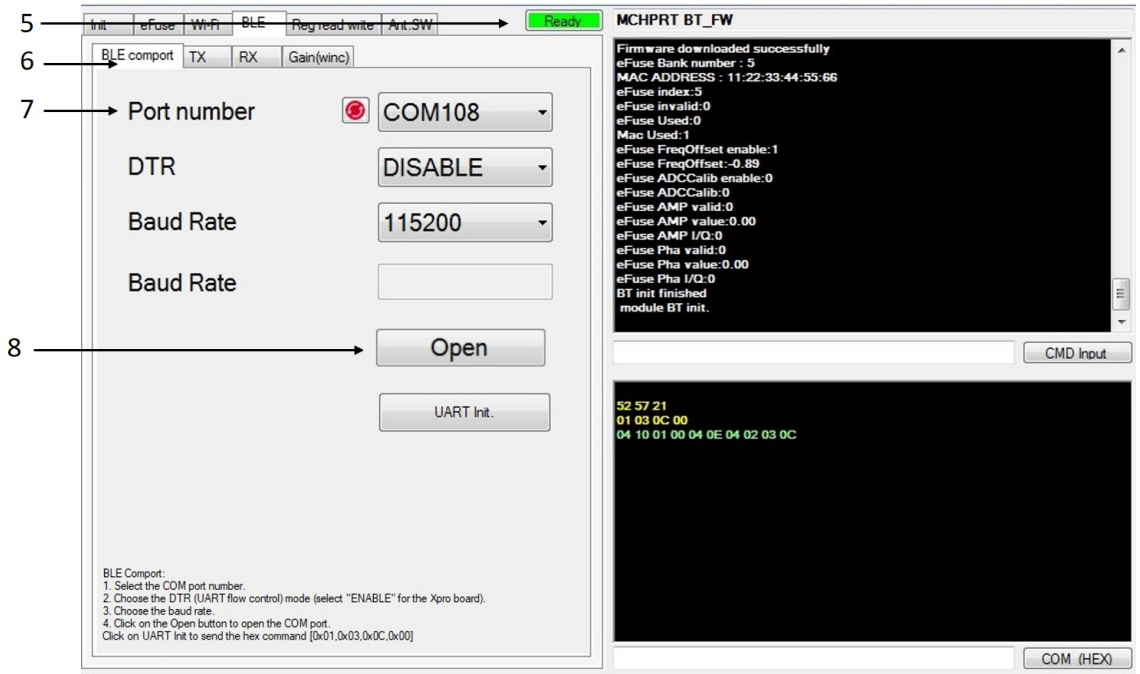
1. Double-click on `MCHPRT2.exe` to open the GUI tool and select the device from the drop down box.
2. Select the interface as “I2C” when using “I2C” connection, and as “UART” when using serial bridge UART connection.
3. Select the Mode as BLE from the drop down box, next to Mode.
4. Click **Connect**.

Figure 2-14. Bluetooth Initialization



5. The process bar status displays Ready, after the initialization completes.
6. Navigate to **BLE comport** tab under **BLE**.
7. Select the COM port number and, select Baud rate as 115200.
8. Click **Open** to connect to the selected COM port.

Figure 2-15. Selecting COM Port



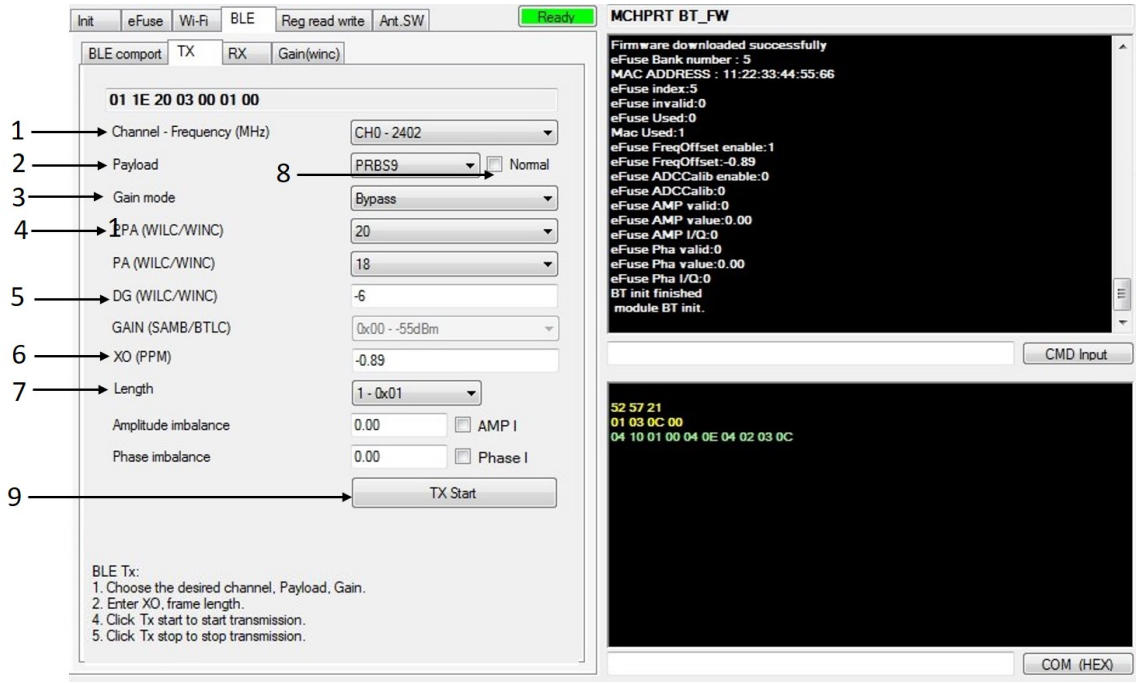
To check if DTR is enabled, see 1.3. UART/I2C Pin Details .

2.2.2 TX

Set the following parameters for Bluetooth TX.

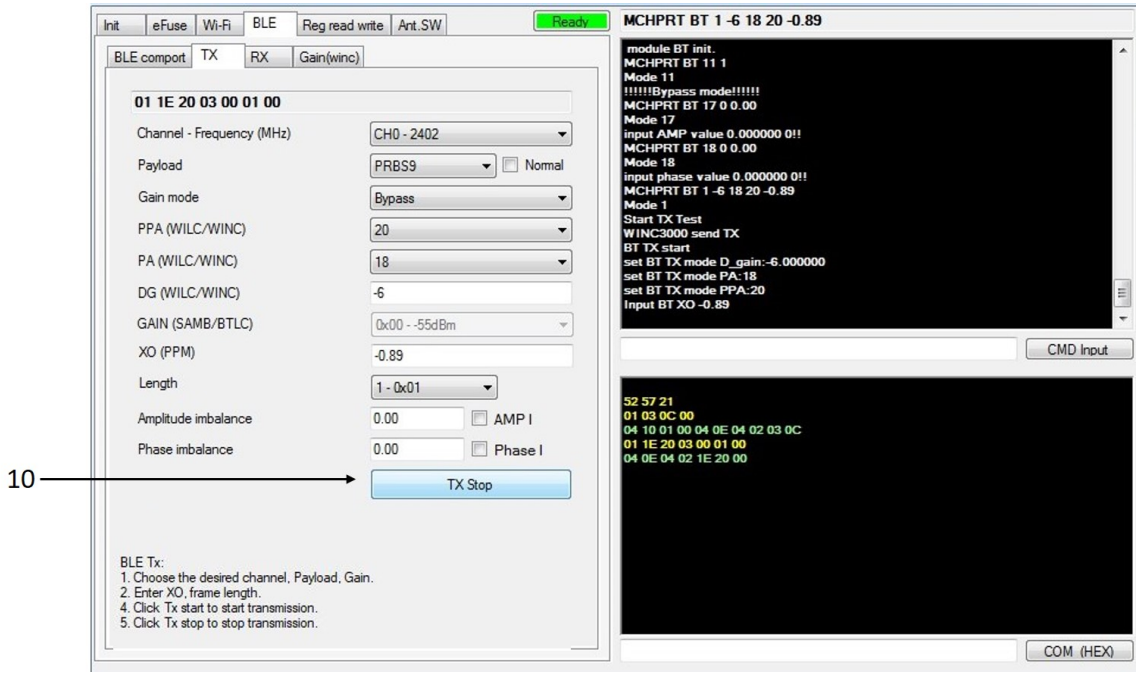
1. Navigate to TX tab under BLE and choose the desired channel from Channel-Frequency drop-down.
2. Select the payload.
3. Select gain mode.
4. Select PPA and PA values from the drop down box.
5. Enter Digital gain.
6. Enter XO offset.
7. Select Frame Length.
8. Select the check box next to payload drop down box, to enable CW mode.
9. Click **TX Start** to start transmission.

Figure 2-16. Start TX for Bluetooth



10. Click **TX Stop** to stop transmission.

Figure 2-17. Stop TX for Bluetooth

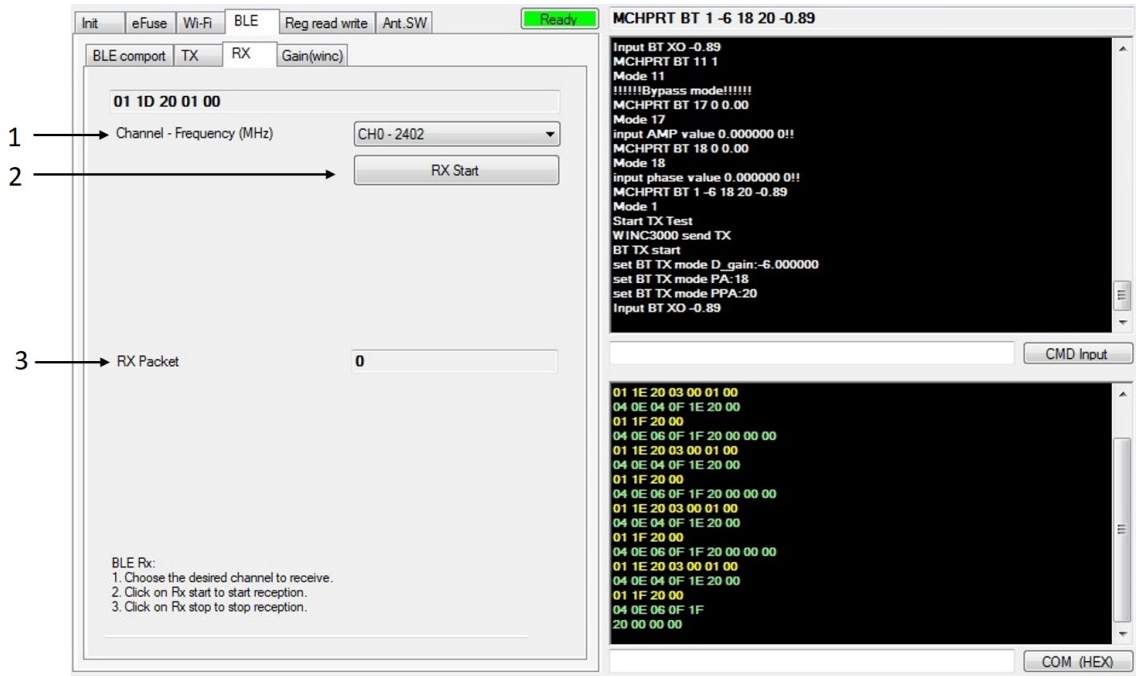


2.2.3 RX

Set the following parameters for RX test:

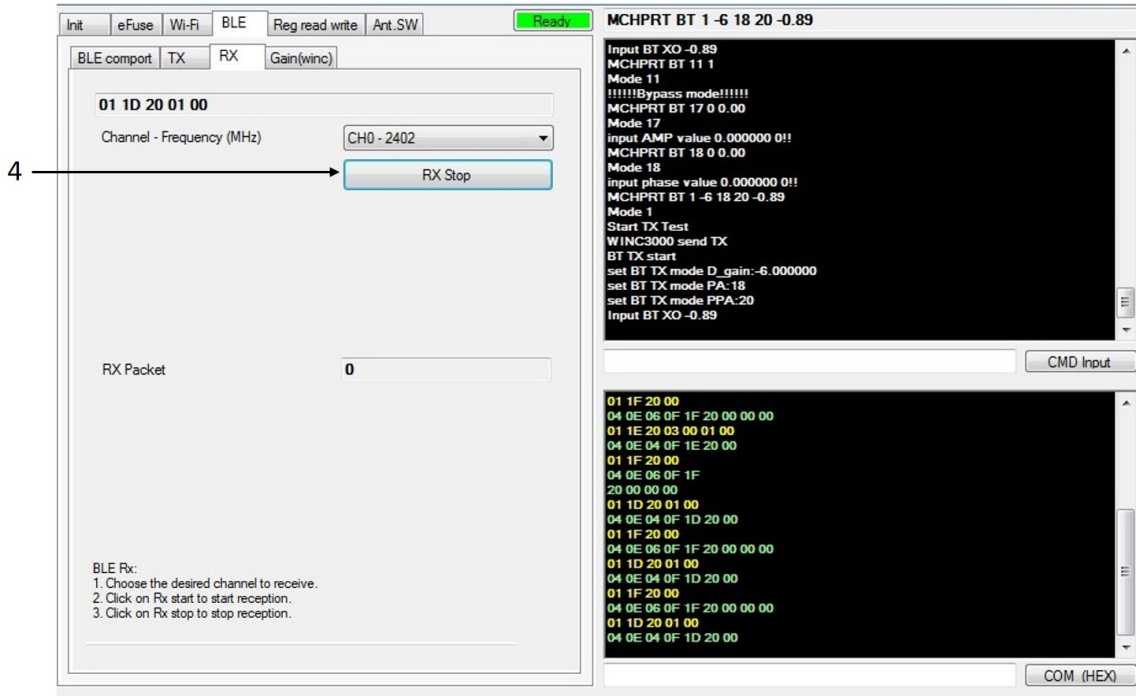
1. Navigate to RX tab under BLE and choose the required channel from the Channel-Frequency drop down box.
2. Click **RX start** to start the reception.
3. Rx packet shows the number of successful packets received.

Figure 2-18. Start Bluetooth RX Test



4. Click **RX stop** to stop the reception.

Figure 2-19. Stop Bluetooth RX Test



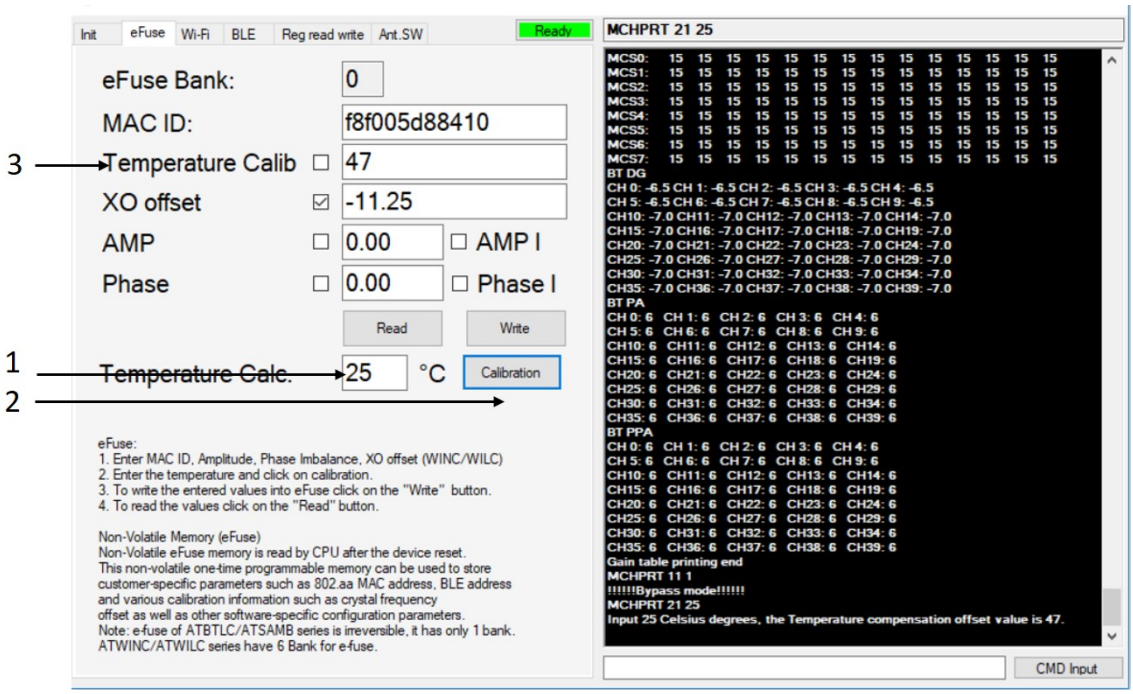
2.2.4 Direct Test Mode

1. Stop all the Tx or Rx tests before starting DTM mode.
2. After the BLE initialization, reconnect the COM port to the testing equipment.

2.3 Temperature Calibration Calculator

1. Navigate to eFuse and type the current temperature value in the text box.
2. Click **Calibration**.
3. The calibrated temperature value is displayed in the text box beside Temperature Calib.

Figure 2-20. Temperature calibration procedure



Note: Temperature calibration only works in Dynamic mode. The current WILC/WINC firmware doesn't support this feature. It is for future reference.

2.4 Register

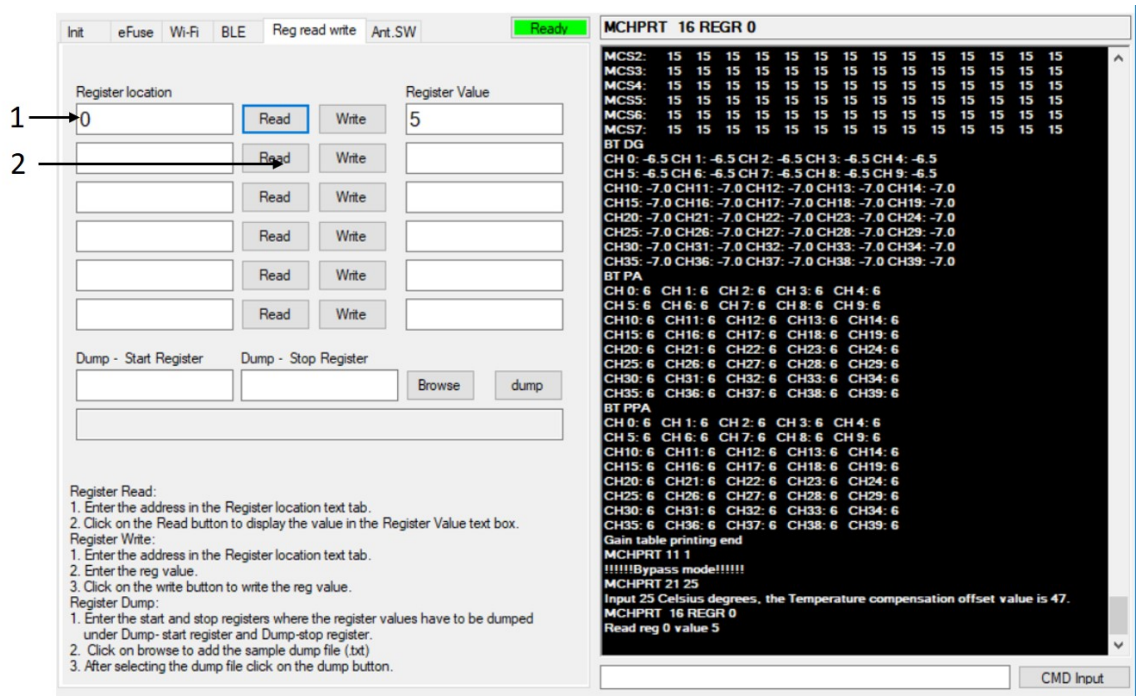
Navigate to **Reg read and write** tab.

2.4.1 Read

Perform the following steps to read the register values.

1. Enter the address in the Register location text tab, as shown in the following figure.
2. Click **Read** button to display value in the Register Value text box.

Figure 2-21. Read Reg Value

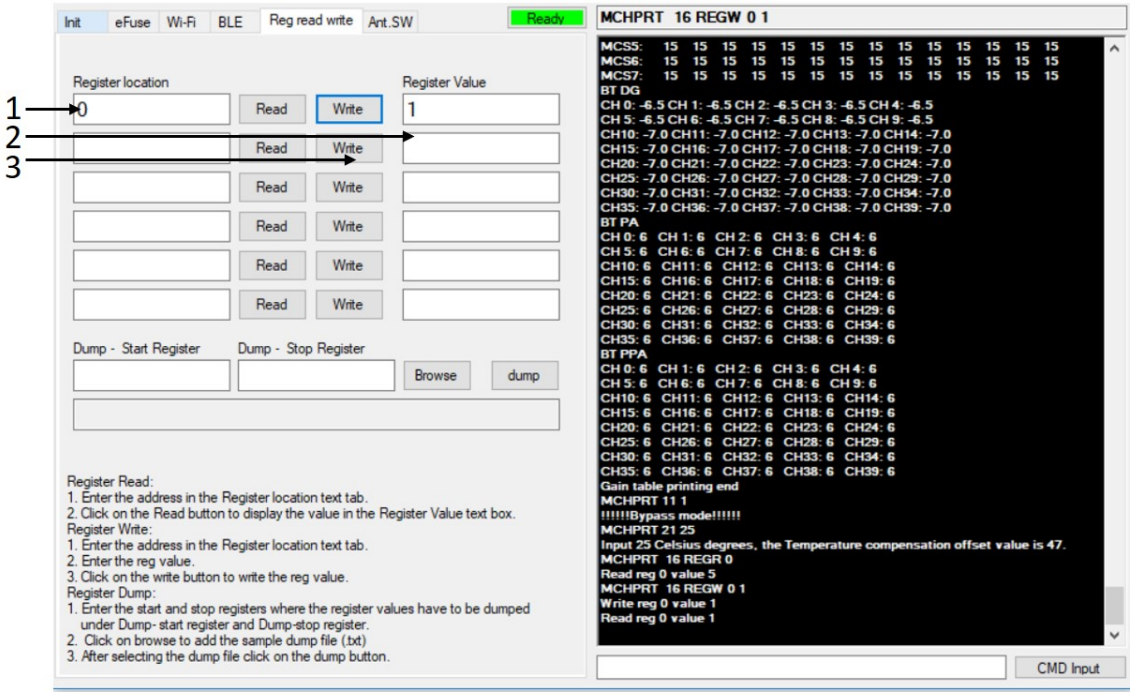


2.4.2 Write

Perform the following steps to write the register values.

1. Type the register location.
2. Type the register value in the Register value text box.
3. Click **Write** to write into the specified location.

Figure 2-22. Write Reg Value

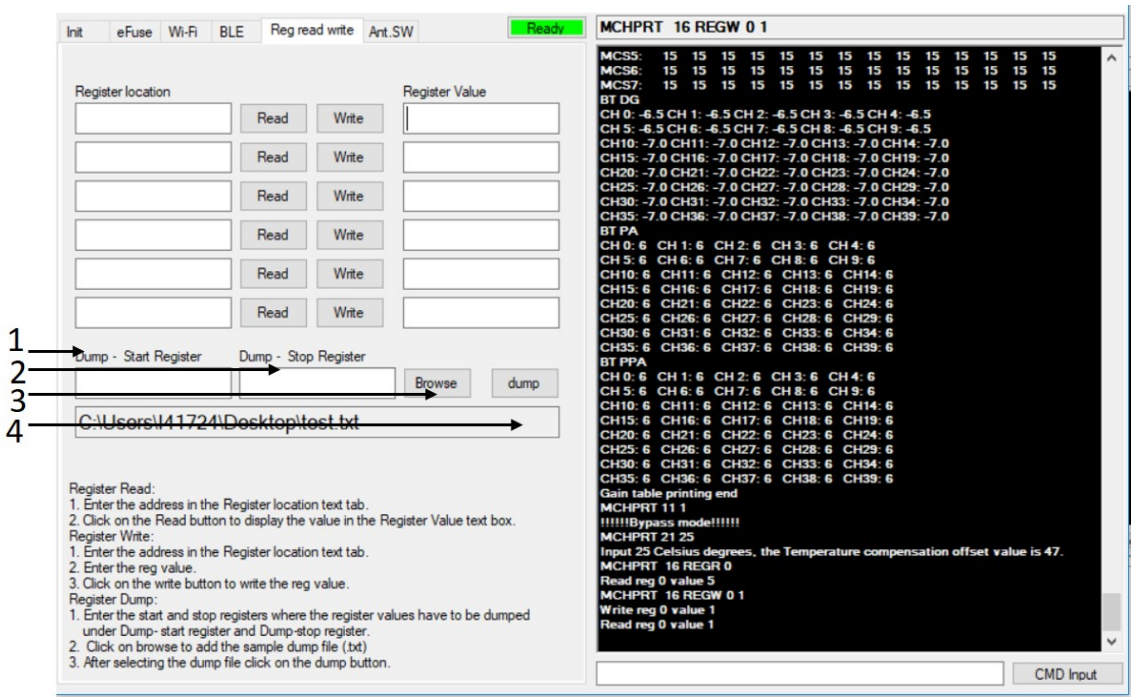


2.4.3 Register Dump

Perform the following steps to dump the registers.

1. Enter the start and stop registers where the register values has to be dumped under Dump- start register and Dump-stop register.
2. Click Browse to add the sample dump file (.txt).
3. After selecting the dump file click **Dump**.

Figure 2-23. Adding the Sample Dump File



Note: The format for dump file is `.txt`.

4. After dumping the registers, the process bar indicates blue color.

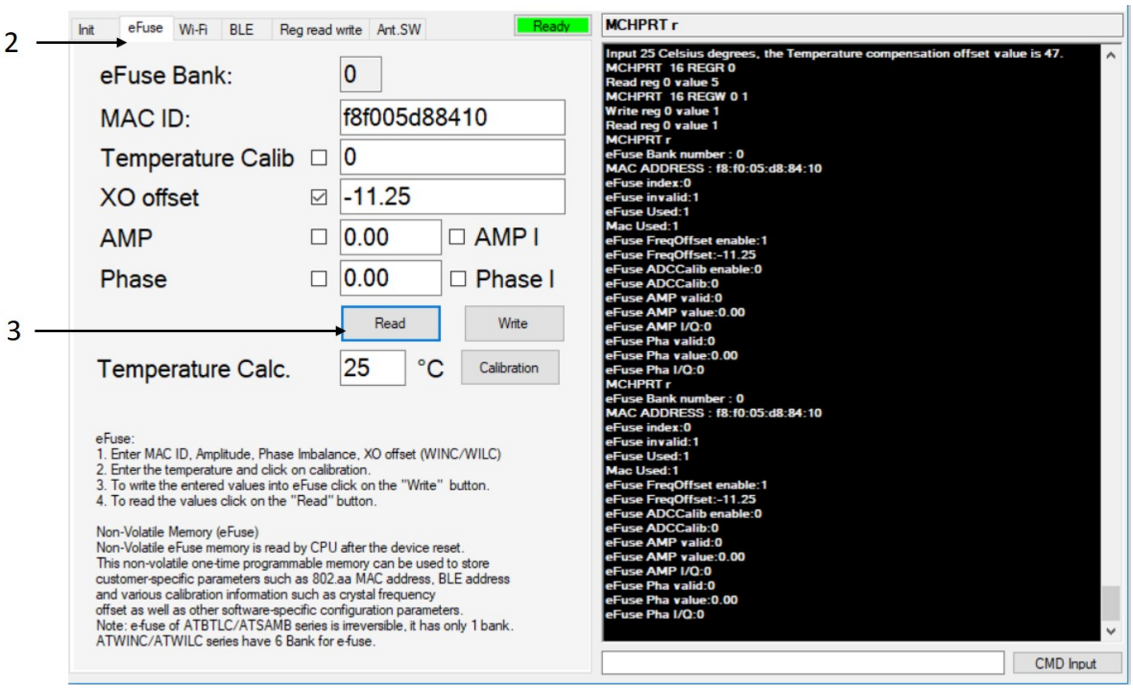
2.5 eFuse

2.5.1 Read

Perform the following steps to read eFuse.

1. Open MCHPRT2 GUI tool.
2. After initialization, navigate to eFuse tab.
3. Click **Read** to see the written parameters.

Figure 2-24. Read eFuse



2.5.2 Write

Perform the following steps to write eFuse:

1. Navigate to eFuse tab. To update gain correction, XO offset , AMP and Phase imbalance enter the respective values.
2. Click **Write** to write efuse.
3. If only a few parameters are required to be written to eFuse, then the other parameter follows the previous eFuse information. To confirm this enter letter "Y" in the CMD Input text box and click on CMD Input. After the eFuse is written, "eFuse write finish" displays in the command window.
4. The eFuse bank number automatically updates by +1. If the module is new, the bank will be Null. On first write, the bank number gets incremented by +1 until it reaches 5. (0-5 banks).

Figure 2-25. Enable eFuse Write

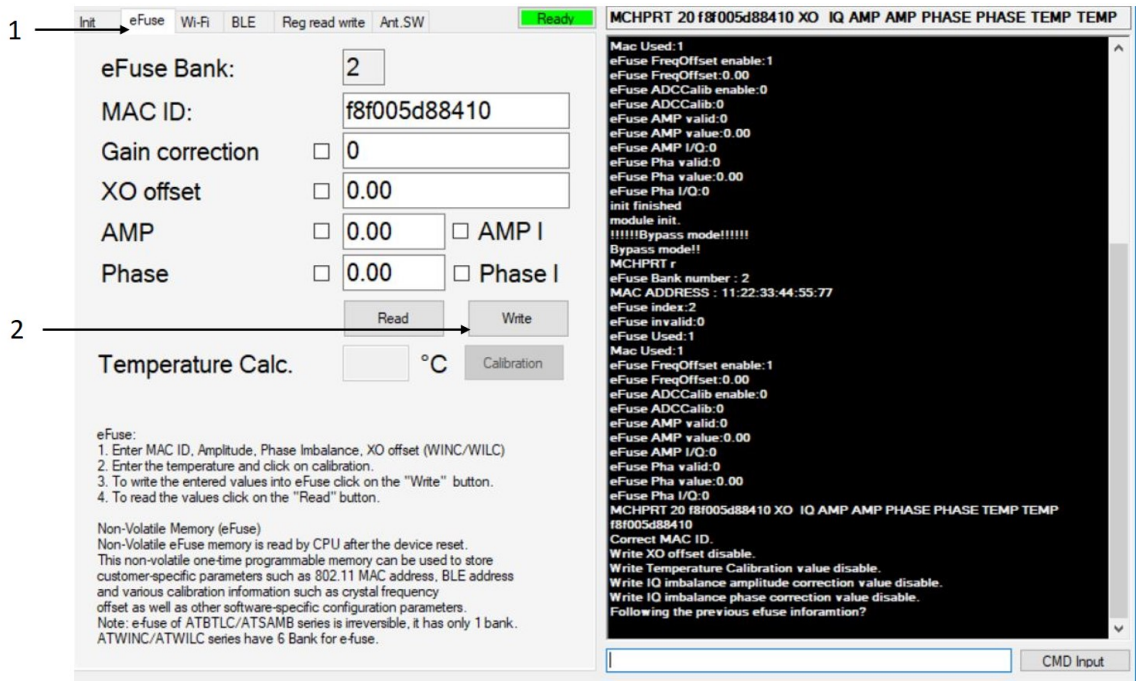
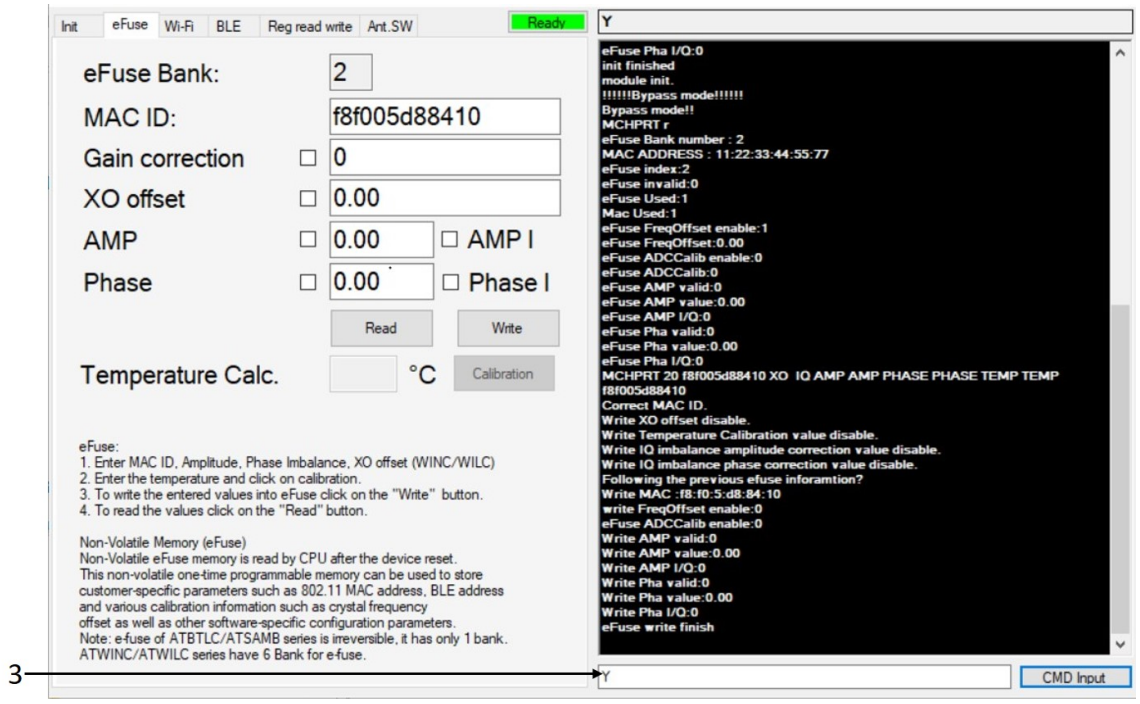


Figure 2-26. Enter Y



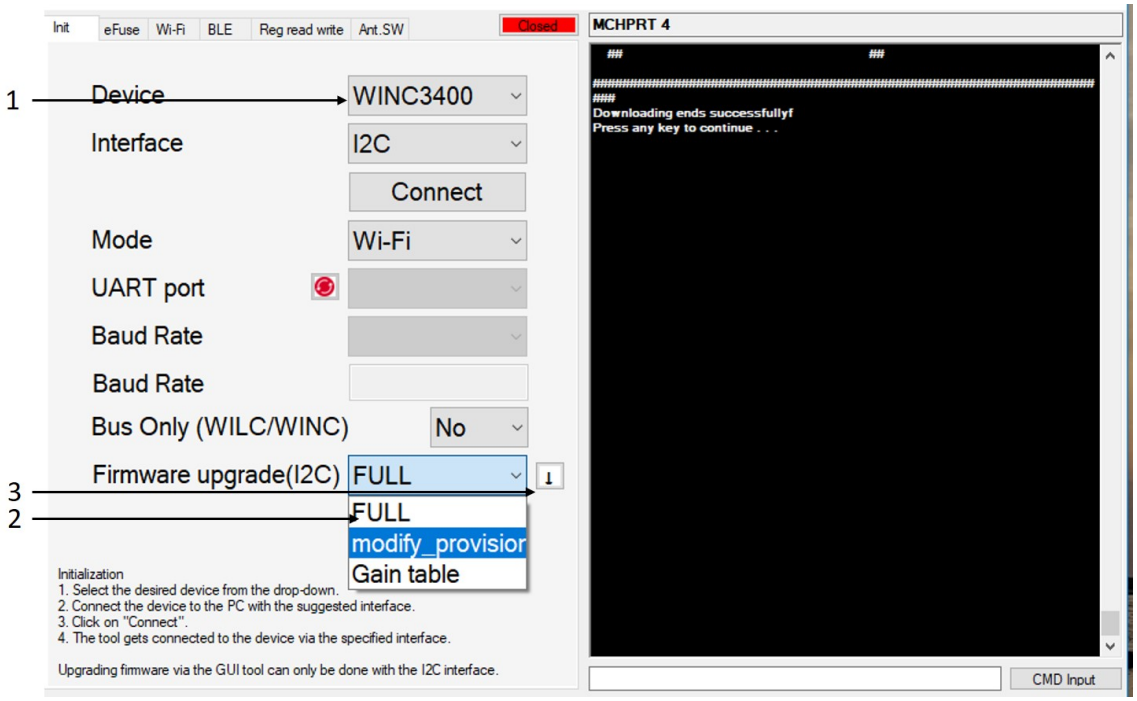
2.6 Firmware Upgrade

Perform the following steps to upgrade the firmware using the MCHPRT2 Tool. It is the same firmware upgrade example that is available in Microchip Studio. See 6. Appendix C – Firmware Update for details.

Important: Before the FW upgrade, update the firmware files in following folder:
- ..\MCHPRT\upgrade_1500\firmware\firmware (for ATWINC1500)
- ..\MCHPRT\upgrade_3400\firmware\firmware (for ATWINC3400)

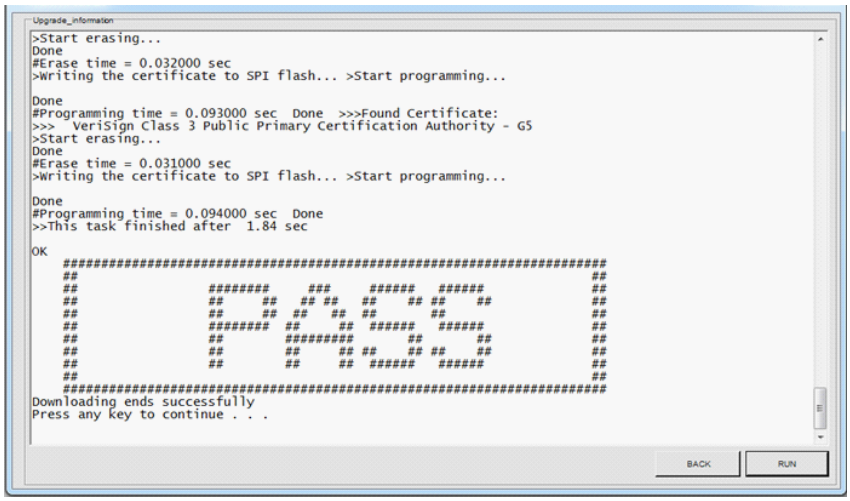
1. Select the chip from the drop-down menu.
2. Select the upgrade items from the list.
3. Click  to start the firmware upgrade.

Figure 2-27. FW Upgrade



4. After the upgrade is successful, the log displays as “PASS” (see the following figure).

Figure 2-28. Successful Upgrade



Note: ASF has the latest firmware. For information on how to add the upgrade file into the MCHPRT2 tool folder, see the Firmware upgrade folder in MCHPRT2 package.

3. Command Line

The commands that are sent using command line can also be sent from the GUI by entering the command in the CMD Input text box.

3.1 Wi-Fi

3.1.1 Initialization

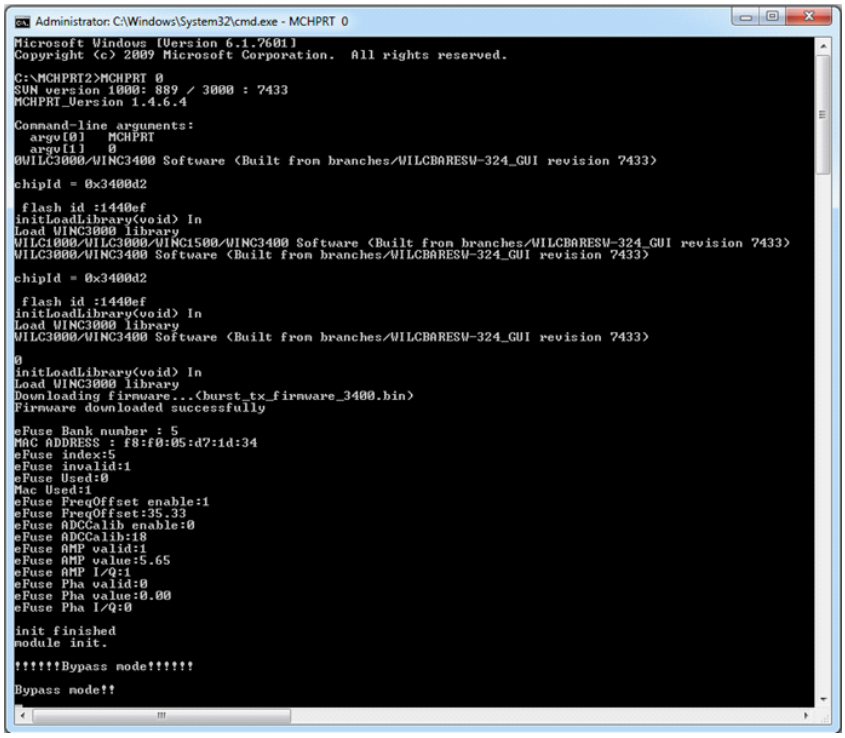
The following table provides the command syntax for Wi-Fi initialization.

Table 3-1. Wi-Fi Initialization

Command Syntax	MCHPRT X
X	X refers to Chip selection: **Fast Connection** • 1000 – ATWILC1000 series with I^2C • 1000_UART – ATWILC1000 series with UART • 1500 – ATWINC15X0 series with I^2C • 1500_UART – ATWINC15X0 series with UART • 3000 – ATWILC3000 series with I^2C • 3000_UART – ATWILC3000 series with UART • 3400 – ATWINC3400 series with I^2C • 3400_UART – ATWINC3400 series with UART
Example	**MCHPRT 0** Auto-detect Chip with I^2C connector **MCHPRT 0_UART** Auto-detect Chip with UART connector

The following figure illustrates the Wi-Fi initialization.

Figure 3-1. Console Log of Wi-Fi Initialization (MCHPRT 0)



3.1.2 IQ Amplitude and Phase Imbalance Calibration

Before running the TX test, read the IQ Amplitude and Phase imbalance calibration value from the eFuse memory, then set it using the following commands:

Set Amplitude Imbalance Calibration Value

Command – `MCHPRT 17 IQ AMP`

- IQ – Real (0) or Imaginary (1)
- AMP – Amplitude imbalance correction value. The range is -6 dB to 6 dB.

Set Phase Imbalance Calibration Value

Command – `MCHPRT 18 IQ PHA`

- IQ – Real (0) or Imaginary (1)
- PHA – Phase imbalance correction value. The range is -10 degrees to +10 degrees.

Notes:

- After running the `MCHPRT 17 IQ AMP` and the `MCHPRT 18 IQ PHA` commands, run the `MCHPRT 11 1` command so the MCHPRT2 tool uses this value.
- By default, IQ calibration values are programmed into the eFuse bank in the factory. So, the user is not required to run the IQ calibration.

3.1.3 TX

3.1.3.1 Start TX – Gain, Channel, Data Rate

The following table provides the command syntax for gain, channel and data rate of the TX test.

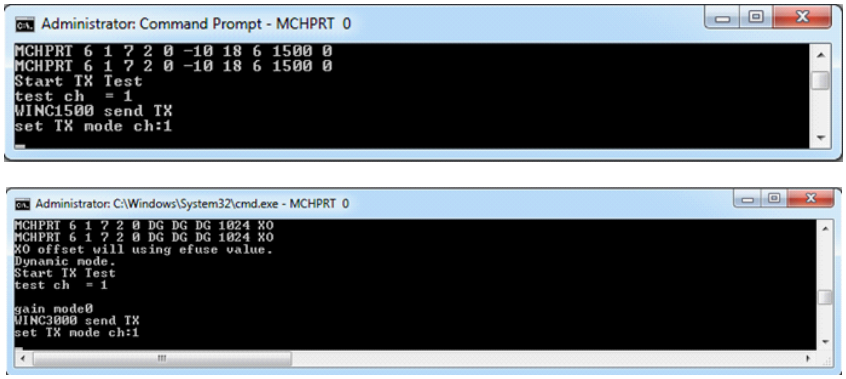
Table 3-2. Start TX: After Initialization

Command Syntax	MCHPRT 6 X Y Z A B C D L F				
X	X refers to TX channel: 1 to 14 • 1 – Channel 1 (2412 MHz) • 6 – Channel 6 (2437 MHz) • 14 – Channel 14 (2484 MHz)				
Y Z	Y refer to Rate, Z refers to Preamble:				
	Rate = 0	Preamble = 0	11b	1 Mbps	—
	Rate = 1	Preamble = 0	11b	2 Mbps	—
	Rate = 2	Preamble = 0	11b	5.5 Mbps	—
	Rate = 3	Preamble = 0	11b	11 Mbps	—
	Rate = 0	Preamble = 1	11g	6 Mbps	—
	Rate = 1	Preamble = 1	11g	9 Mbps	—
	Rate = 2	Preamble = 1	11g	12 Mbps	—
	Rate = 3	Preamble = 1	11g	18 Mbps	—
	Rate = 4	Preamble = 1	11g	24 Mbps	—
	Rate = 5	Preamble = 1	11g	36 Mbps	—
	Rate = 6	Preamble = 1	11g	48 Mbps	—
	Rate = 7	Preamble = 1	11g	54 Mbps	—
	Rate = 0	Preamble = 2	11n	MCS - 0	0x80
	Rate = 1	Preamble = 2	11n	MCS - 1	0x81
	Rate = 2	Preamble = 2	11n	MCS - 2	0x82
	Rate = 3	Preamble = 2	11n	MCS - 3	0x83
	Rate = 4	Preamble = 2	11n	MCS - 4	0x84
	Rate = 5	Preamble = 2	11n	MCS - 5	0x85
	Rate = 6	Preamble = 2	11n	MCS - 6	0x86
	Rate = 7	Preamble = 2	11n	MCS - 7	0x87
A	A refers to bandwidth: 0/1 – 20 MHz				
B	B refers to Digital Gain (Bypass mode): Range: -20 to 0 DG: Dynamic Gain				
C	C refers to PA gain (Bypass mode): • ATWILC1000/ATWINC15X0 – 18, 15, 12, 9, 6, 3 • ATWILC3000/ATWINC3400 – 18, 15, 12, 9, 6, 3 DG: Dynamic Gain				

.....continued		
Command Syntax	**MCHPRT 6 X Y Z A B C D L F**	
D	D refers to PPA gain (Bypass mode): • ATWILC1000/ATWINC15X0 – 9, 6, 3, 0 • ATWILC3000/ATWINC3400 – 20, 18, 15, 12, 6, 0 DG: Dynamic Gain	
L	L refers to length: 0 – 1500 Maximum limit is 1500	
F	F refers Frequency offset: -50 to +50 base on Crystal XO: eFuse XO value	
Example	**MCHPRT 6 1 7 2 0 -10 18 6 1500 0** Channel 1. MCS 7 – 20 MHz, length 1500, 0 ppm, offset DG – 10, PPA 6 , PA 18	

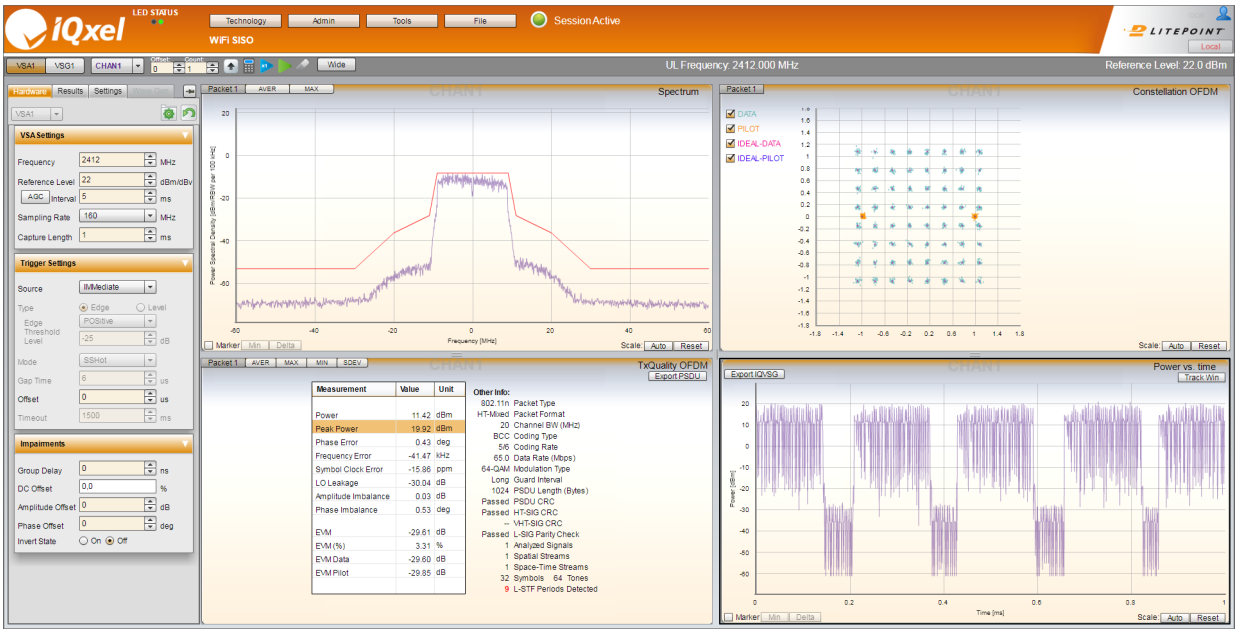
The following figure shows the example start TX test.

Figure 3-2. Console Log of TX Test Mode



The Wi-Fi TX mode starts as shown in the following figure.

Figure 3-3. TX Mode Start



3.1.3.2 CW

The following table provides the command syntax for CW TX mode.

Table 3-3. Start TX CW: After Initialization

Command Syntax	MCHPRT 8 X Y Z A B C D L F
X	X refers to TX channel: 1 to 14 • 1 – Channel 1 (2412 MHz) • 6 – Channel 6 (2437 MHz) • 14 – Channel 14 (2484 MHz)

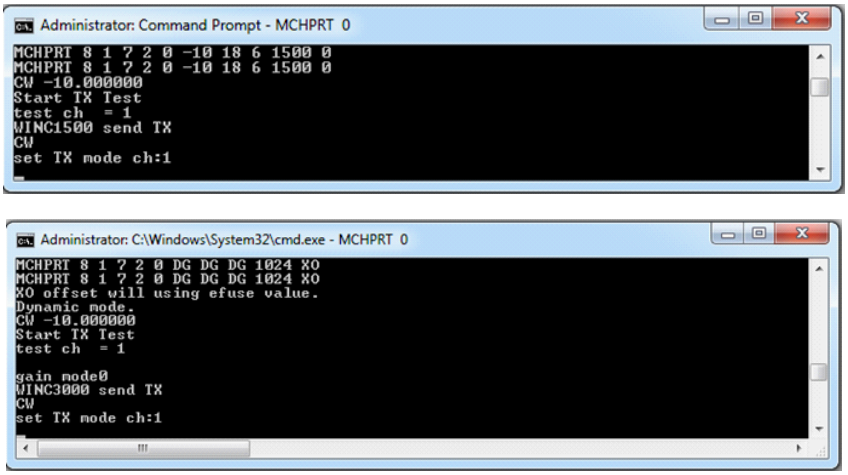
.....continued

Command Syntax	MCHPRT 8 X Y Z A B C D L F				
Y Z	Y refer to Rate, Z refers to Preamble:				
	Rate = 0	Preamble = 0	11b	1 Mbps	—
	Rate = 1	Preamble = 0	11b	2 Mbps	—
	Rate = 2	Preamble = 0	11b	5.5 Mbps	—
	Rate = 3	Preamble = 0	11b	11 Mbps	—
	Rate = 0	Preamble = 1	11g	6 Mbps	—
	Rate = 1	Preamble = 1	11g	9 Mbps	—
	Rate = 2	Preamble = 1	11g	12 Mbps	—
	Rate = 3	Preamble = 1	11g	18 Mbps	—
	Rate = 4	Preamble = 1	11g	24 Mbps	—
	Rate = 5	Preamble = 1	11g	36 Mbps	—
	Rate = 6	Preamble = 1	11g	48 Mbps	—
	Rate = 7	Preamble = 1	11g	54 Mbps	—
	Rate = 0	Preamble = 2	11n	MCS - 0	0x80
	Rate = 1	Preamble = 2	11n	MCS - 1	0x81
	Rate = 2	Preamble = 2	11n	MCS - 2	0x82
	Rate = 3	Preamble = 2	11n	MCS - 3	0x83
	Rate = 4	Preamble = 2	11n	MCS - 4	0x84
	Rate = 5	Preamble = 2	11n	MCS - 5	0x85
	Rate = 6	Preamble = 2	11n	MCS - 6	0x86
	Rate = 7	Preamble = 2	11n	MCS - 7	0x87
A	A refers to bandwidth: 0/1 – 20 MHz				
B	B refers to Digital Gain (Bypass mode): Range: -20 to 0 DG: Dynamic Gain				
C	C refers to PA gain (Bypass mode): • ATWILC1000/ATWINC15X0 – 18, 15, 12, 9, 6, 3 • ATWILC3000/ATWINC3400 – 18, 15, 12, 9, 6, 3 DG: Dynamic Gain				
D	D refers to PPA gain (Bypass mode): • ATWILC1000/ATWINC15X0 – 9, 6, 3, 0 • ATWILC3000/ATWINC3400 – 20, 18, 15, 12, 6, 0 DG: Dynamic Gain				
L	L refers to length: 0 – 1500 Maximum limit is 1500				

.....continued	
Command Syntax	**MCHPRT 8 X Y Z A B C D L F**
F	F mean Frequency offset : -50 to +50 base on Crystal XO: eFuse XO value
Example	**MCHPRT 8 1 7 2 0 -10 18 6 1500 0** Channel 1. MCS 7 – 20 MHz, length 1500, 0 ppm offset DG – 10, PPA 6, PA 18 CW mode

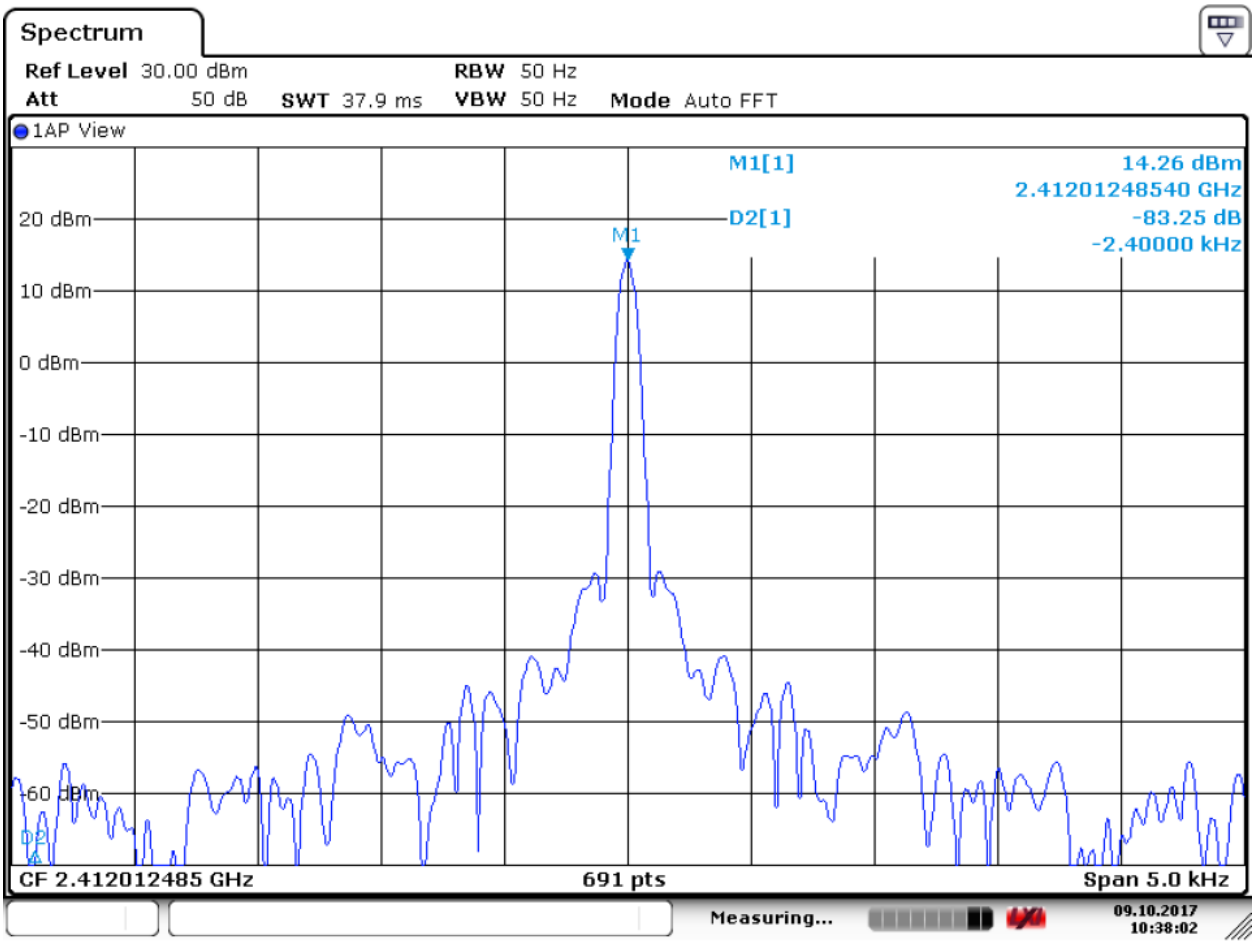
The following figure shows the example of start CW TX mode.

Figure 3-4. Console Log of CW TX Mode



The CW TX mode starts as shown in the following figure.

Figure 3-5. CW TX Mode Start



3.1.3.3 Gain Mode

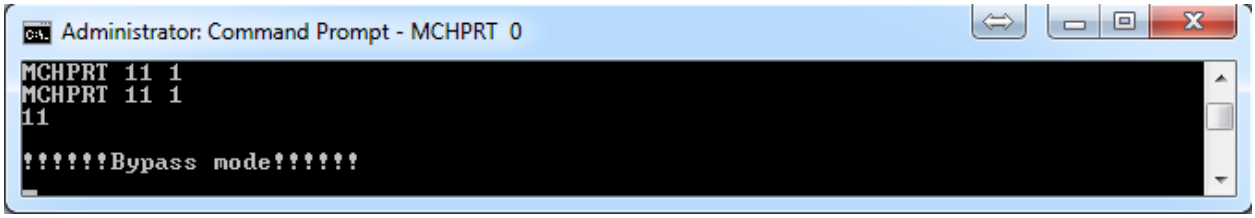
The following table provides the command syntax for Gain mode settings.

Table 3-4. Gain Mode setting: After Initialization, Before TX Start

Command Syntax	MCHPRT 11 X
X	X refers to Gain mode: • 0 – Dynamic gain mode • 1 – Bypass gain mode (default) • 2 – Flash gain mode
Example	**MCHPRT 11 1** Bypass mode

The following figure shows the example of Gain mode.

Figure 3-6. Console Log of Gain Mode



3.1.3.4 Antenna Switch

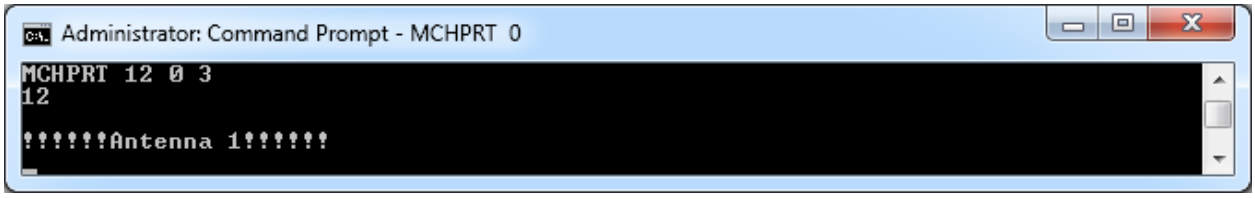
The following table provides the command syntax for Antenna switch (ATWILC1000/ATWINC15X0).

Table 3-5. Antenna Switching: After Initialization

Command Syntax	MCHPRT 12 X Y
X	X refers to Antenna: • 0 – antenna 1 (default) • 1 – antenna 2
Y	Y refers to GPIO pin: • 3 – GPIO3
Example	**MCHPRT 12 0 3** Antenna switching A

The following figure shows the example of Antenna switch.

Figure 3-7. Console Log of Antenna Switch



3.1.3.5 Stop TX

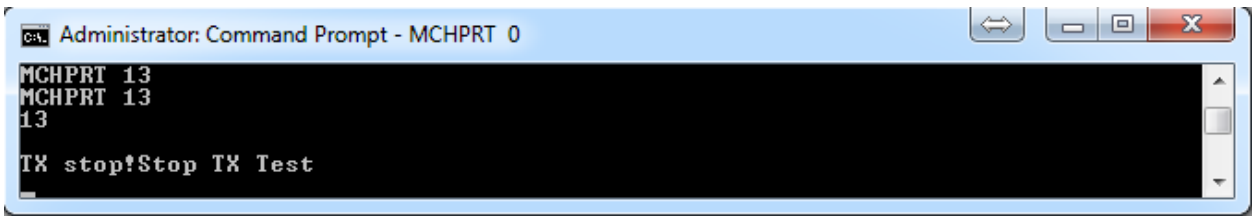
The following table provides the command syntax for Stop TX test.

Table 3-6. Stop TX: After Initialization and TX Start

Command Syntax	MCHPRT 13
Example	**MCHPRT 13** Stop TX

The following figure shows the example of Stop TX test.

Figure 3-8. Console Log of Stop TX Test Mode



3.1.4 RX

3.1.4.1 Start RX

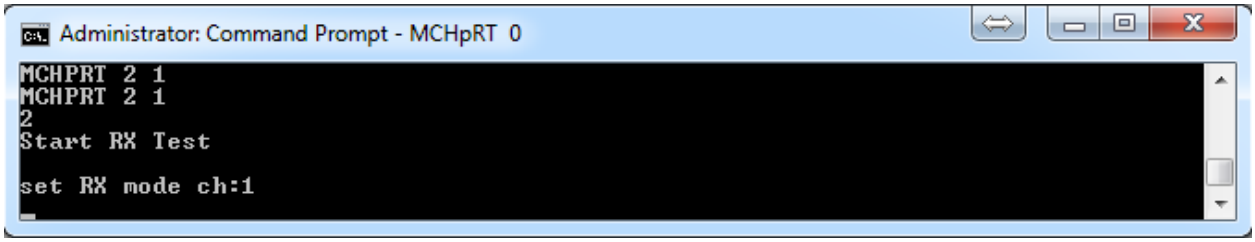
The following table provides the command syntax for RX test.

Table 3-7. Start RX: After Initialization

Command Syntax	MCHPRT 2 X
X	X refers to TX channel: 1 to 14 • 1 – Channel 1 (2412 MHz) • 6 – Channel 6 (2437 MHz) • 14 – Channel 14 (2484 MHz)
Example	**MCHPRT 2 1** RX mode in Channel 1 Start with reset the count

The following figure shows the example of start RX test.

Figure 3-9. Console Log of RX Test Mode



3.1.4.2 Start RX with MAC Filter Selection

The following table provides the command syntax for RX test with MAC filter selection.

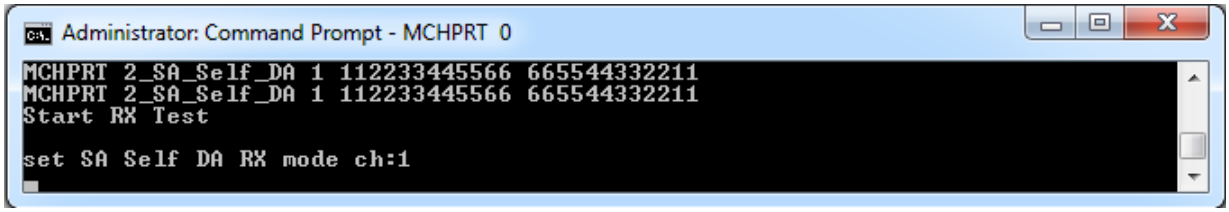
Table 3-8. Start RX with MAC Filter selection: After Initialization

Command Syntax	MCHPRT X Y Z A
X	X refers to RX mode: • 2_DA – Destination Filter • 2_SA – Source Filter • 2_Self – Override self MAC address • 2_SA_DA – SA with DA • 2_Self_DA – Self with DA • 2_SA_Self – SA with Self • 2_SA_Self_DA – All MAC filter apply
Y	Y refers to TX channel: 1 to 14 • 1 – Channel 1 (2412 MHz) • 6 – Channel 6 (2437 MHz) • 14 – Channel 14 (2484 MHz)
Z	In “2_SA”, “2_SA_DA”, “2_SA_Self”, “2_SA_Self_DA” Source MAC address In “2_Self”, “2_Self_DA” Self MAC address
A	In “2_SA_Self_DA” Self MAC address

.....continued	
Command Syntax	**MCHPRT X Y Z A**
Example	**MCHPRT 2_SA_Self_DA 1 112233445566 665544332211** RX with Source MAC filter: 112233445566 and DA MAC filter and Self MAC address: 665544332211 in Channel 1 Start with reset the count **MCHPRT 2_SA_DA 12 112233445566** RX with Source MAC filter: 112233445566 in Channel 12 Start with reset the count **MCHPRT 2_Self_DA 13 665544332211** RX with DA MAC filter and Self MAC address: 665544332211 in Channel 13 Start with reset the count

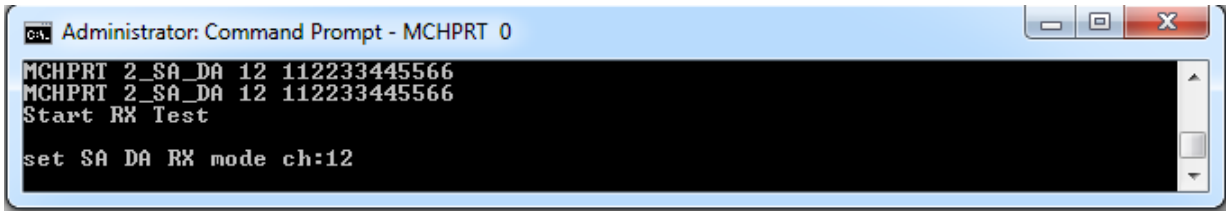
The following figure shows the example of RX with Source MAC filter: 112233445566 and DA MAC filter and Self MAC address: 665544332211 in Channel 1 Start with reset the count.

Figure 3-10. Console Log of RX with Source MAC Filter (Channel 1)



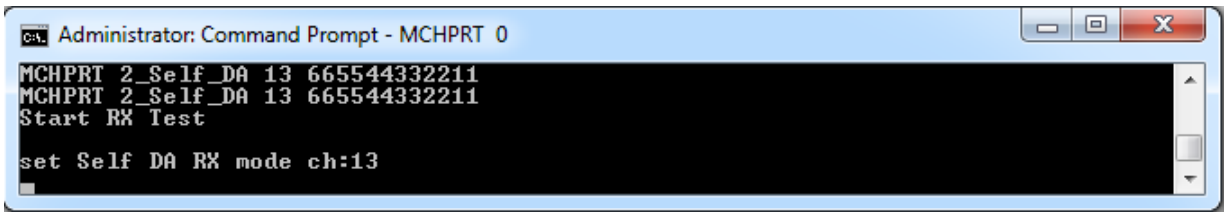
The following figure shows the example of RX with Source MAC filter: 112233445566 in Channel 12 Start with reset the count.

Figure 3-11. Console Log of RX with Source MAC Filter (Channel 12)



The following figure shows the example of RX with DA MAC filter and Self MAC address: 665544332211 in Channel 13 Start with reset the count.

Figure 3-12. Console Log of RX with Source MAC Filter (Channel 13)



3.1.4.3 RX Package Report

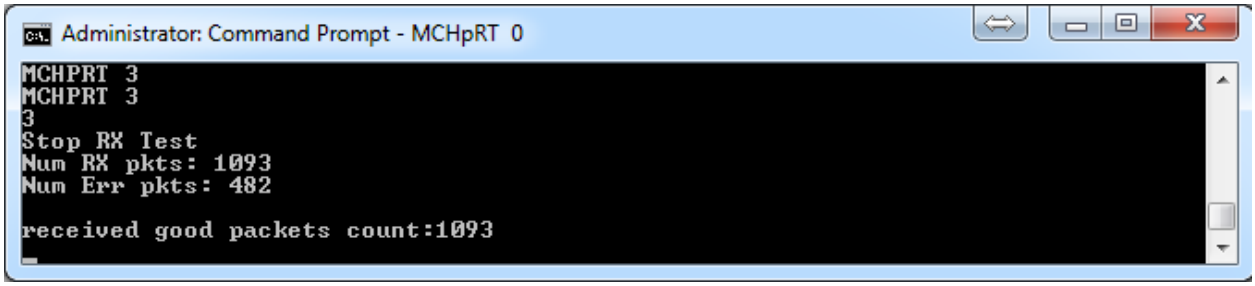
The following table provides the command syntax for RX package report.

Table 3-9. RX Package Report: After Initialization and Start RX

Command Syntax	MCHPRT 3
Example	**MCHPRT 3** Report the package number (package count will not reset)

The following figure shows the example of RX package report.

Figure 3-13. Console Log of RX Package Report



3.1.4.4 RSSI Reading

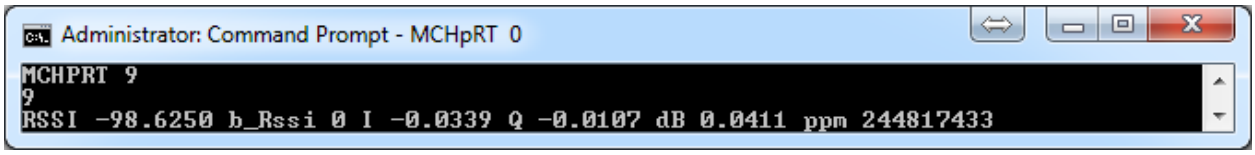
The following table provides the command syntax for RSSI reading once.

Table 3-10. RX Package Report Once: After Initialization and Start RX

Command Syntax	MCHPRT 9
Example	**MCHPRT 9** Report the RSSI reading once

The following figure shows the example of RSSI reading once.

Figure 3-14. Console Log of RSSI Reading Once



3.1.4.5 RSSI Reading in Seconds

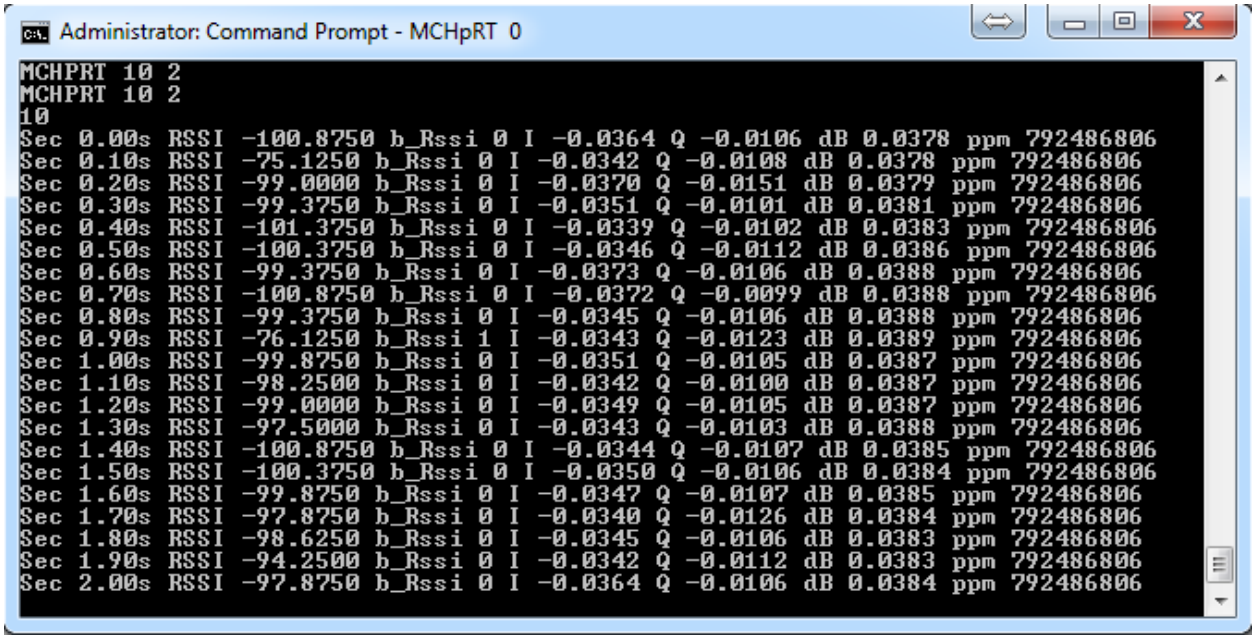
The following table provides the command syntax for RSSI reading in seconds.

Table 3-11. RX Package Report: After Initialization and Start RX

Command Syntax	MCHPRT 10 X
X	X refers to the number of sec report the RSSI reading
Example	**MCHPRT 10 2** Report the RX RSSI reading in 10 sec

The following figure shows the example of RSSI reading.

Figure 3-15. Console Log of RSSI Reading



3.1.4.6 Auto Reset Mode

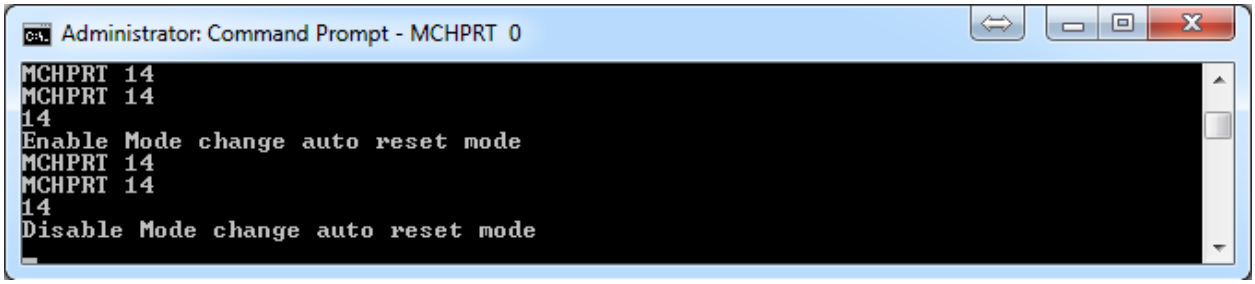
The following table provides the command syntax for Auto Reset mode.

Table 3-12. Auto Reset Mode

Command Syntax	MCHPRT 14
Enable	Enable refers to that the MCHPRT will auto reset with the mode change For example: MCHPRT 8 1 7 7 0 -10 18 6 1500 0 (Module auto reset) MCHPRT 6 1 7 7 0 -10 18 6 1500 0 (Module auto reset) MCHPRT 2 1
Disable (default)	Disable refers that the MCHPRT will not auto reset with the mode change. Command flow must follow the correct step. For example: MCHPRT 8 1 7 7 0 -10 18 6 1500 0 MCHPRT 13 MCHPRT 6 1 7 7 0 -10 18 6 1500 0 MCHPRT 13 MCHPRT 2 1 Each TX information change or change to RX mode, requires to send stop TX command.
Example	**MCHPRT 14**

The following figure shows the example of Auto Reset mode.

Figure 3-16. Console Log of Auto Reset Mode



3.1.4.7 Digital Gain Table Printing

The following table provides the command syntax for Digital Gain Table Printing.

Table 3-13. Digital Gain Table Printing: After Initialization and Before TX and RX

Command Syntax	MCHPRT 19
Example	**MCHPRT 19** Module will start TX from Channel 1 to Channel 14 for checking gain table and then printing the gain table in current Gain mode. This is not applicable for Bypass mode.

The following figure shows the example of Digital Gain Table Printing.

Figure 3-17. Console Log of Digital Gain Table Printing

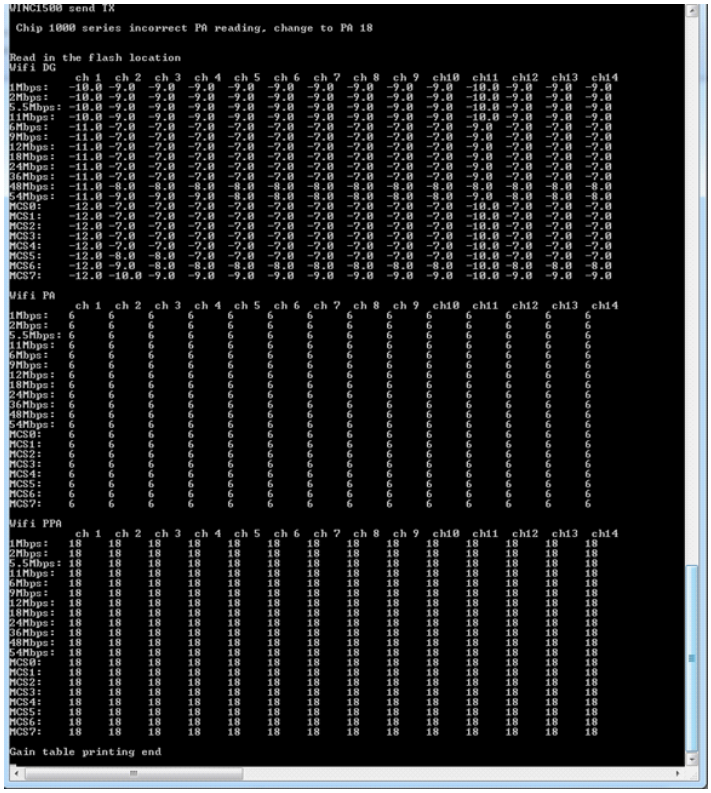
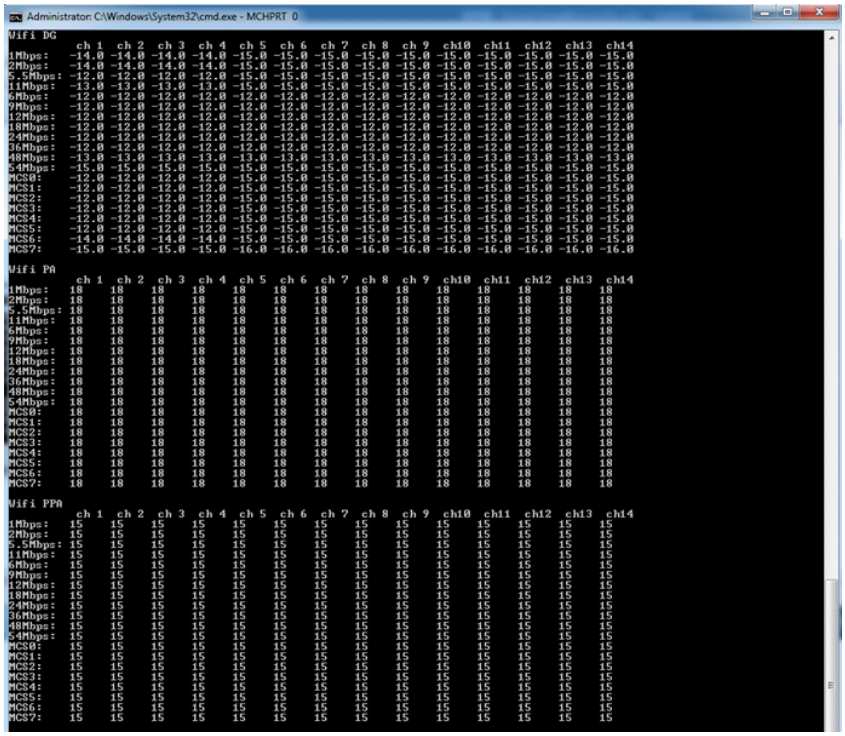
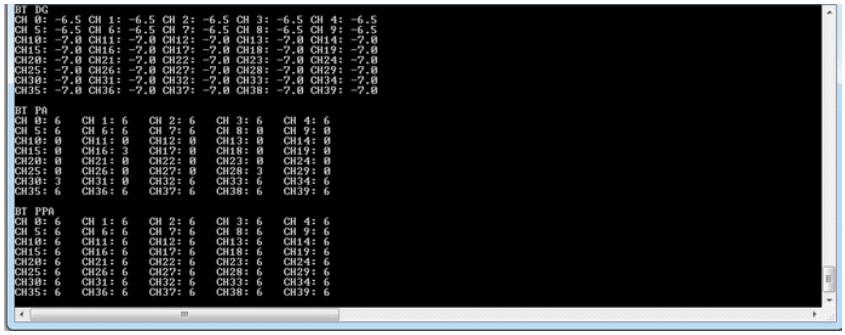


Figure 3-18. Console Log of Display Gain Table Printing WINC3400





3.1.4.8 Deinitialization

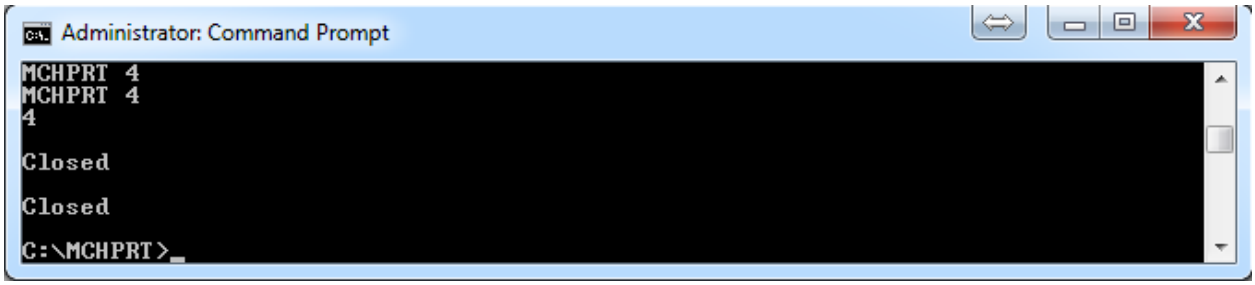
The following table provides the command syntax for deinitialization.

Table 3-14. Deinitialization: After Initialization

Command Syntax	MCHPRT 4
Example	**MCHPRT 4** Deinitialization

The following figure shows the example of deinitialization.

Figure 3-19. Console Log of Deinitialization



3.2 Bluetooth (ATWILC3000/ATWINC3400)

3.2.1 Bluetooth Initialization

The following table provides the command syntax for Bluetooth initialization. Refer to 1.3. UART/I2C Pin Details to check if DTR is enabled or not.

Table 3-15. Initialization

Command Syntax	MCHPRT BT X
BT	• BT refers to I2C • BT_UART refers to UART connect • BT_DTR refers to I2C and DTR enable • BT_UART_DTR refers to UART connect and DTR enable • BT_FW refers to firmware upload
X	X refers to the port number for Bluetooth UART
Example	**MCHPRT BT 90**

The following figure shows the example of Bluetooth initialization.

Figure 3-20. Console Log of Bluetooth Initialization

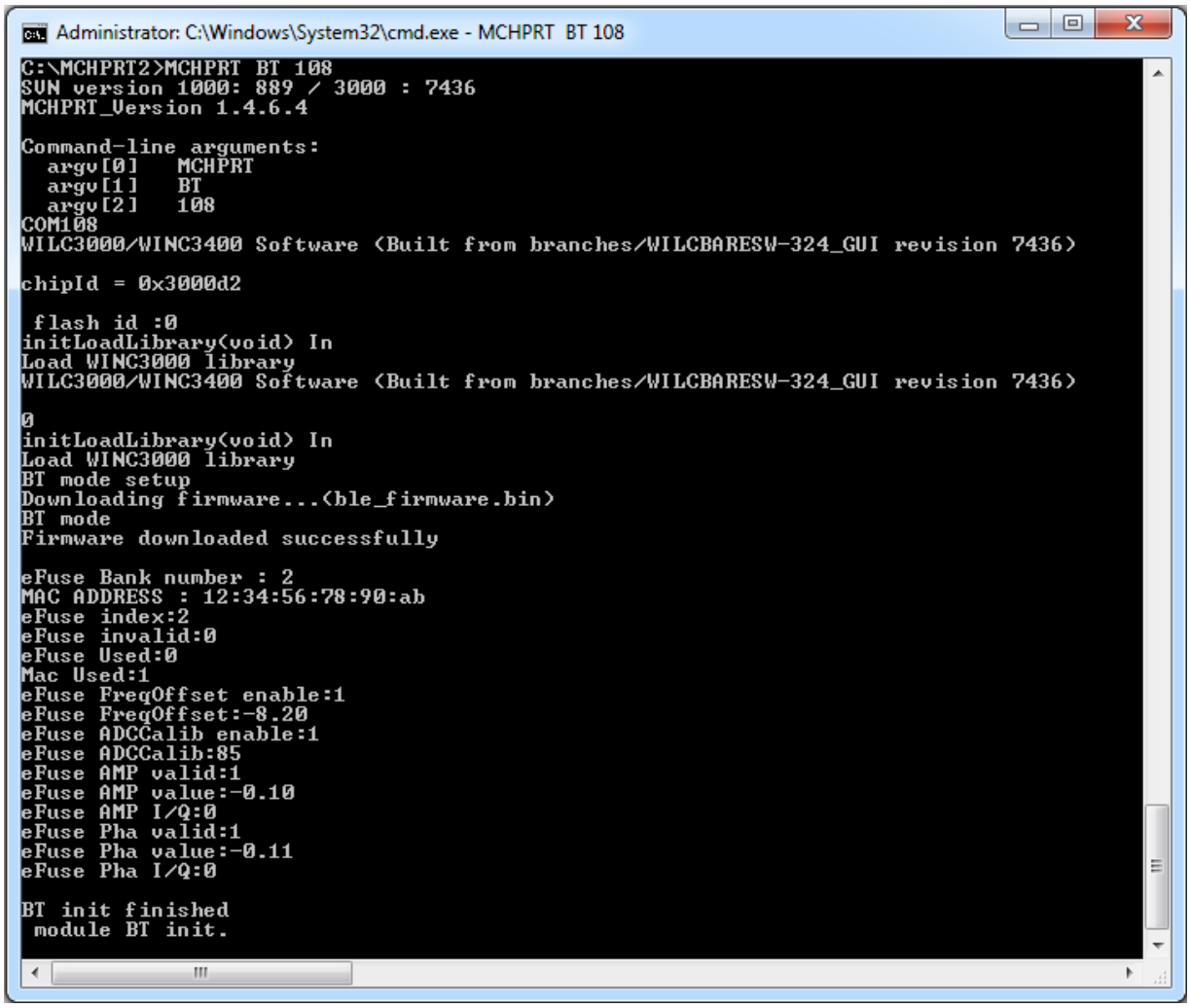
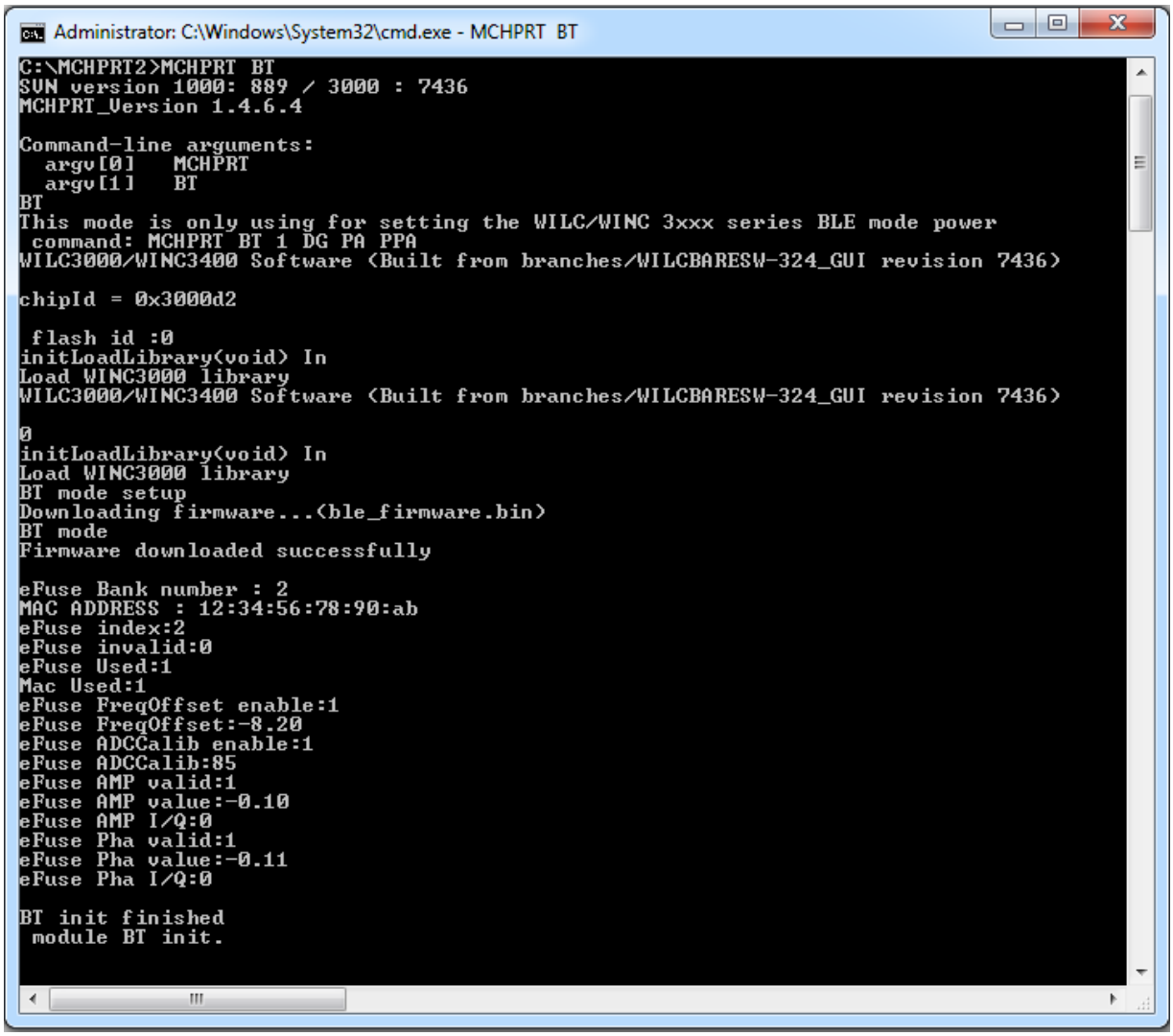


Table 3-16. Bluetooth initialization without serial port

Command Syntax	MCHPRT BT
BT	• BT refers to I2C • BT_UART refers to UART connect • BT_DTR refers to I2C and DTR enable • BT_UART_DTR refers to UART connect and DTR enable • BT_FW refers to firmware upload
Example	**MCHPRT BT**

Figure 3-21. Console Log of Bluetooth Initialization without Serial Port



3.2.2 Bluetooth DTM

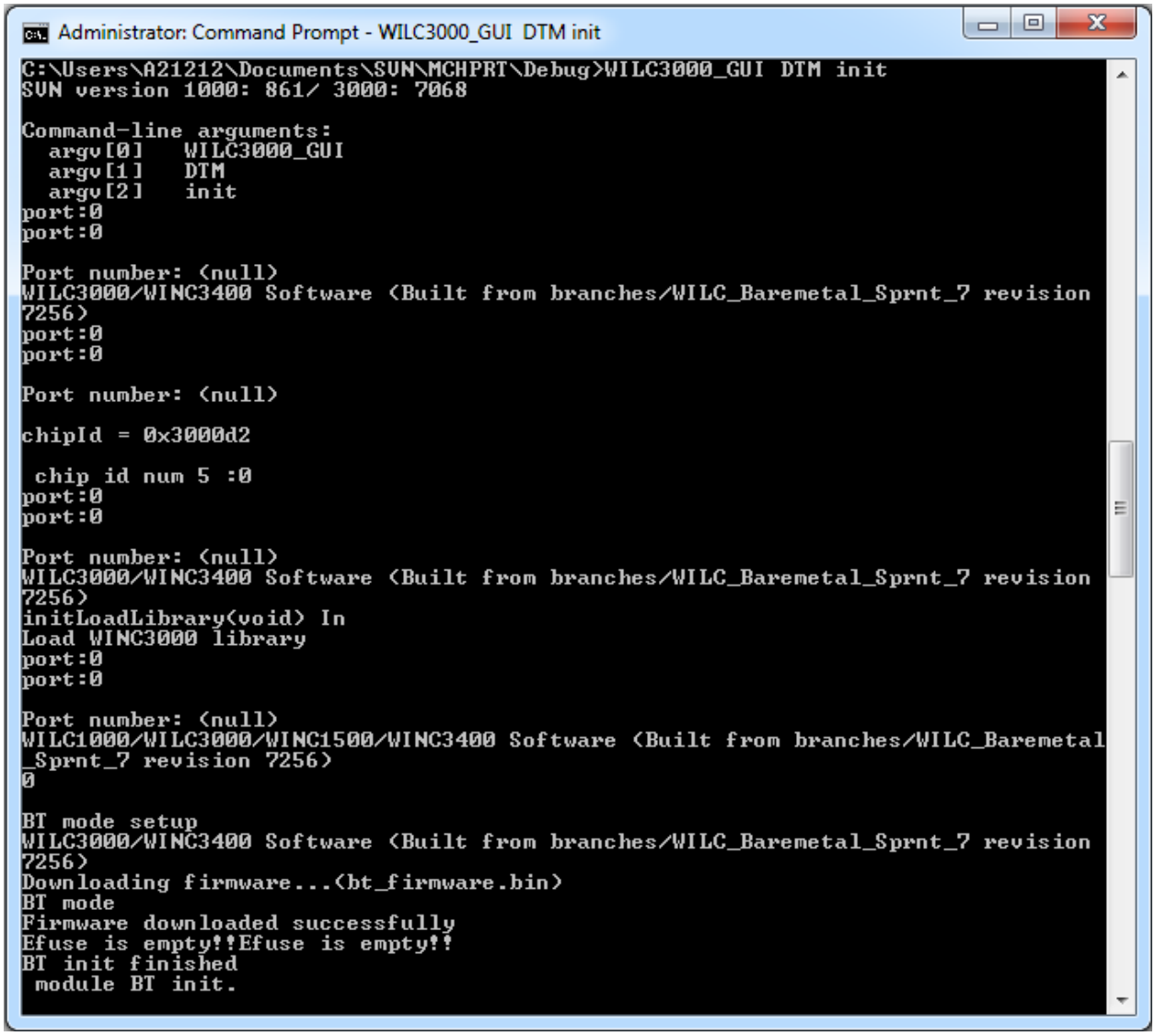
The following table provides the command syntax for Bluetooth DTM mode initialization.

Table 3-17. Initialization of DTM Mode

Command Syntax	MCHPRT DTM init
Example	**MCHPRT DTM init**

The following figure shows the example of DTM initialization.

Figure 3-22. Console Log of DTM Initialization



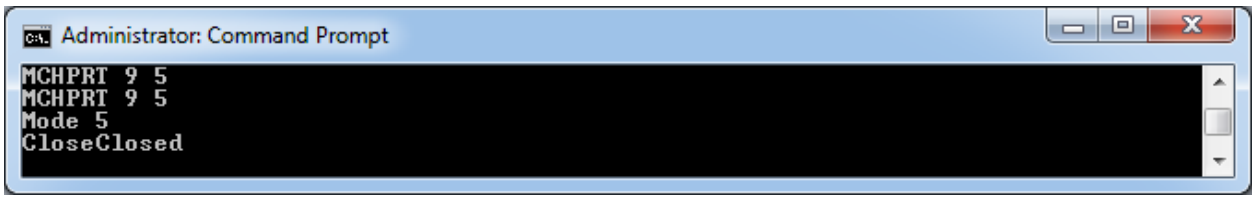
The following table provides the command syntax for DTM mode exit.

Table 3-18. Exit DTM Mode

Command Syntax	MCHPRT 9 5
Example	**MCHPRT 9 5**

The following figure shows the example of DTM mode exit.

Figure 3-23. Console Log of DTM Mode Exit



3.2.3 Bluetooth TX

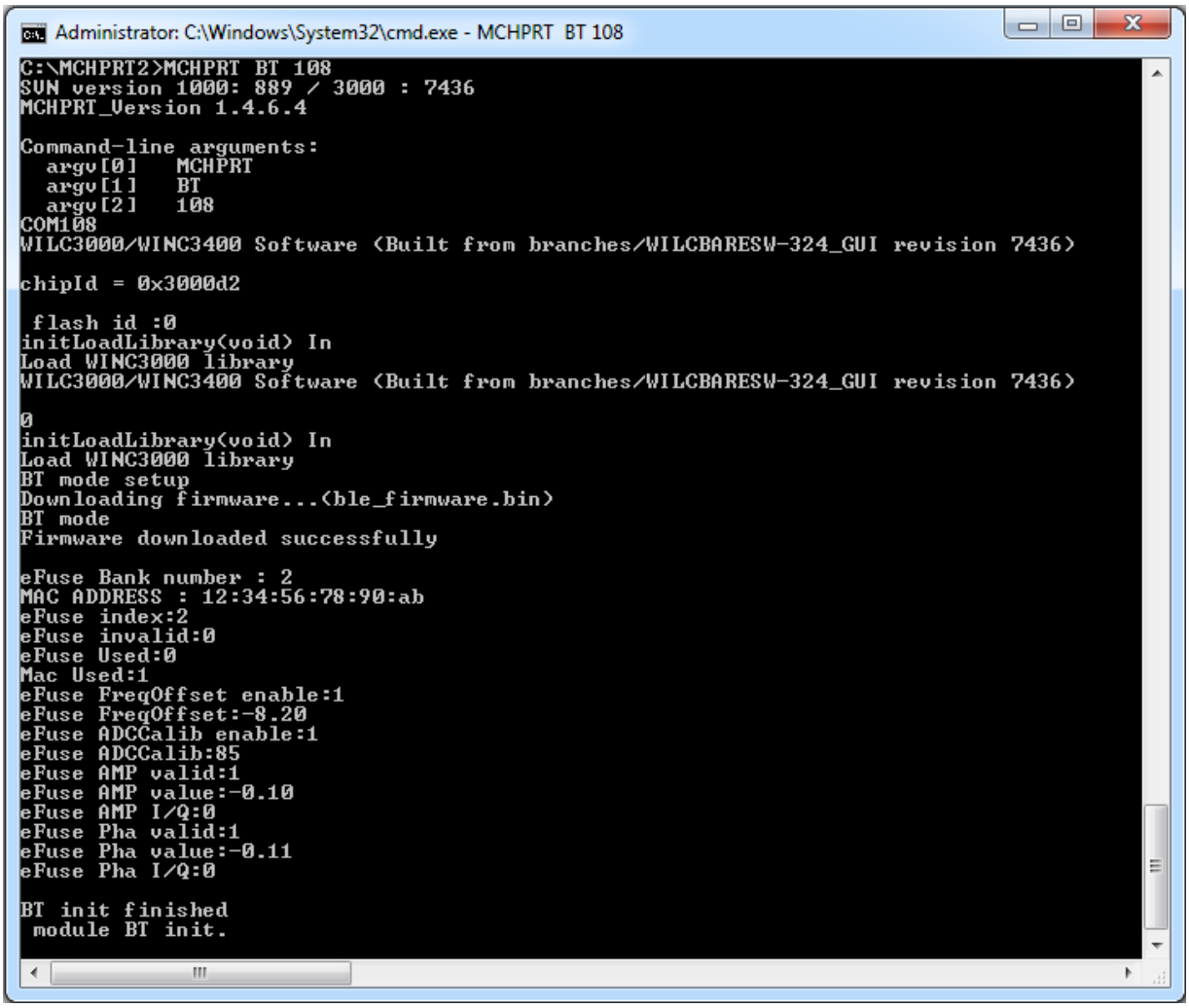
The following table provides the command syntax for the Bluetooth TX test.

Table 3-19. Start Bluetooth TX: After Bluetooth Initialization

Command Syntax	MCHPRT BT 1 X Y Z A B C F
X	X refer to TX channel: 0 to 39 • 0 – Channel 0 (2402 MHz) • 39 – Channel 39 (2480 MHz)
Y	Y refers to Length: 0 – 37 • 1 – 0x1 • 37 – 0x25
Z	Z refers to Payload: 1 – 8 • 1 – PRBS9 • 2 – 11110000 • 3 – 10101010 • 4 – PRBS15 • 5 – 11111111 • 6 – 00000000 • 7 – 00001111 • 8 – 01010101
A	A refers to Digital Gain (Bypass mode): Range: -20 to 0 DG: Dynamic Gain
B	B refers PA gain (Bypass mode): • ATWILC1000/ATWINC15X0 – 18, 15, 12, 9, 6, 3 • ATWILC3000/ATWINC3400 – 18, 15, 12, 9, 6, 3 DG: Dynamic Gain
C	C refers to PPA gain (Bypass mode): • ATWILC1000/ATWINC15X0 – 9, 6, 3, 0 • ATWILC3000/ATWINC3400 – 20, 18, 15, 12, 6, 0 Dynamic Gain
F	F refers to Frequency offset: -50 to +50 base on Crystal XO: eFuse XO value
Example	**MCHPRT BT 1 0 37 0 -6 6 6 XO** Channel 0. 0x25 length, PRBS9 DG – 10, PPA 6 , PA 6

The following figure shows the example of Bluetooth TX test mode.

Figure 3-24. Console Log of Bluetooth TX Test Mode



The Bluetooth TX mode starts as shown in the following figure.

Figure 3-25. BT TX Mode Start

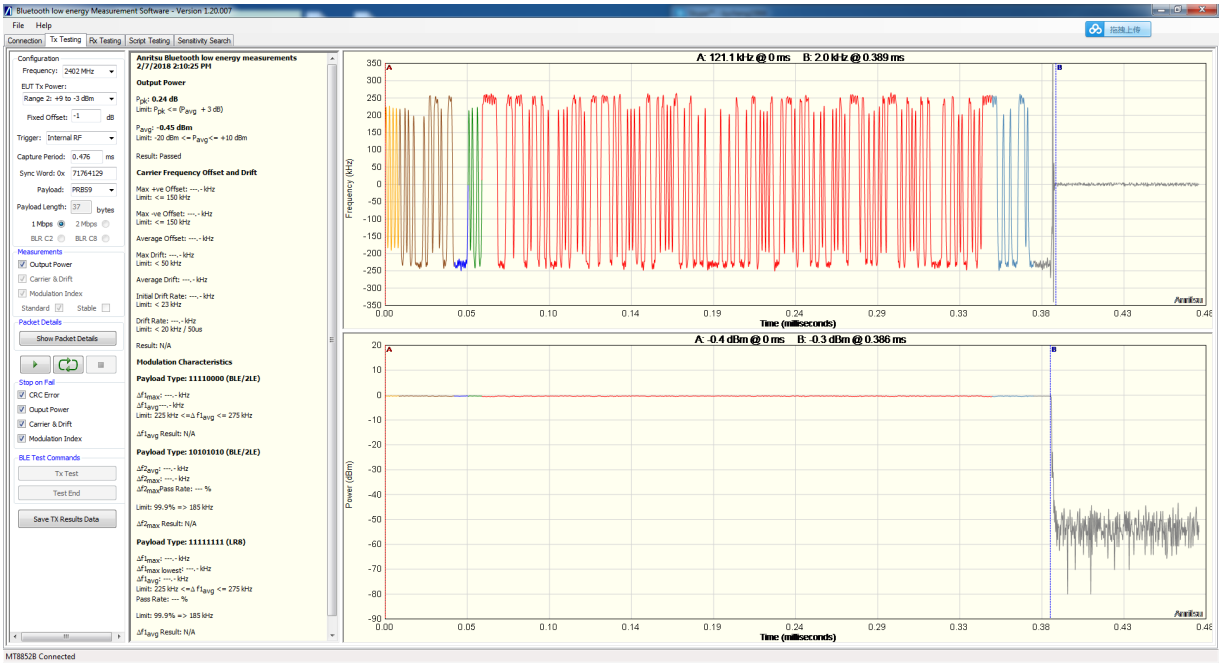
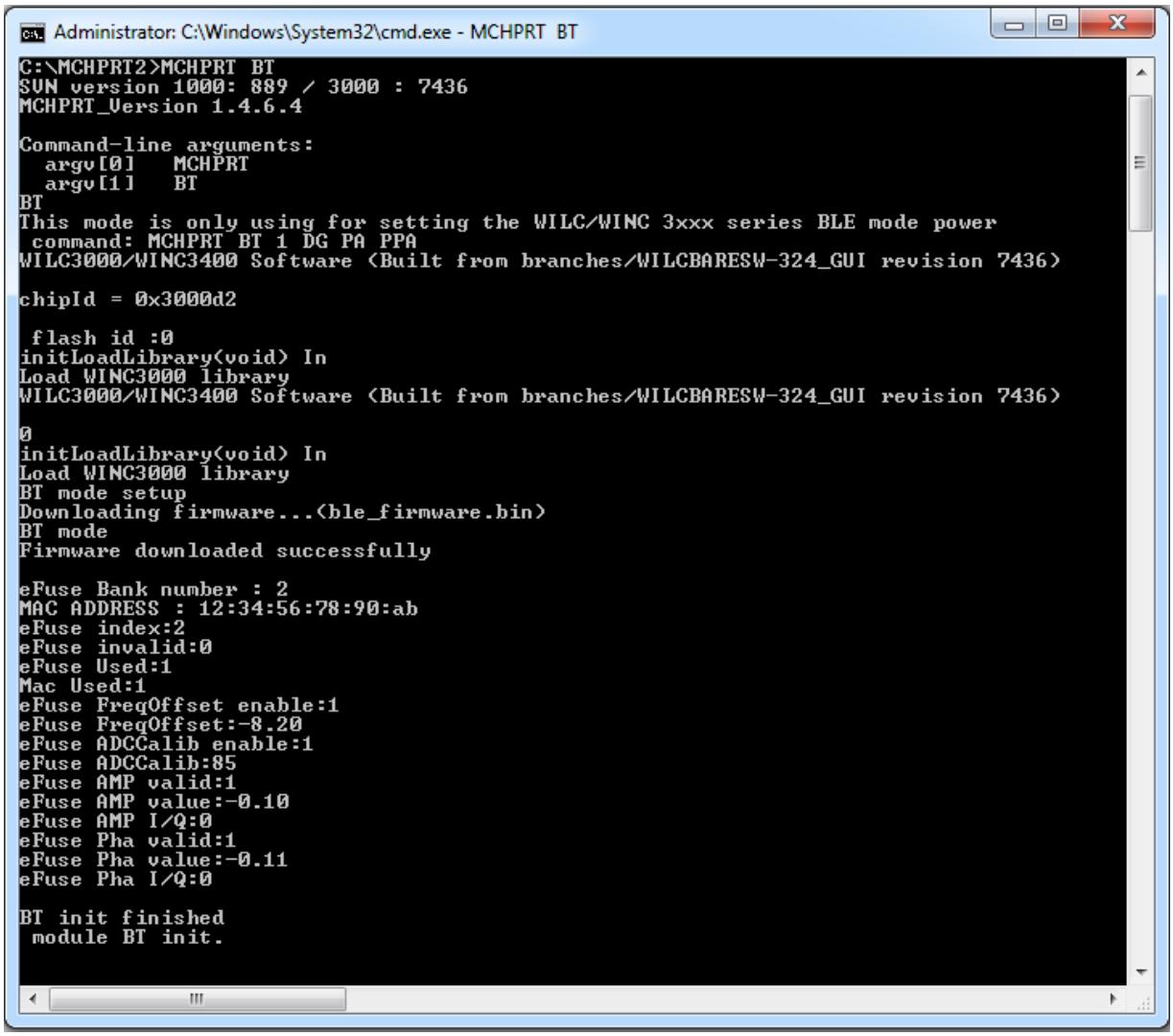


Table 3-20. Start Bluetooth TX: After Bluetooth Initialization without Serial Port Connection

Command Syntax	MCHPRT BT 1 X Y Z A B C F
A	A refers to Digital Gain (Bypass mode): Range: -20 to 0 DG: Dynamic Gain
B	B refers PA gain (Bypass mode): • ATWILC1000/ATWINC15X0 – 18, 15, 12, 9, 6, 3 • ATWILC3000/ATWINC3400 – 18, 15, 12, 9, 6, 3 Dynamic Gain
C	C refers to PPA gain (Bypass mode): • ATWILC1000/ATWINC15X0 – 9, 6, 3, 0 • ATWILC3000/ATWINC3400 – 20, 18, 15, 12, 6, 0 Dynamic Gain
F	F refers to Frequency offset: -50 to +50 base on Crystal XO: eFuse XO value
Example	**MCHPRT BT 1 -6 6 6 XO** DG – 10, PPA 6 , PA 6

Figure 3-26. Bluetooth TX Log without Serial Port Connection



3.2.3.1 CW

The following table provides the command syntax for the Bluetooth TX CW mode.

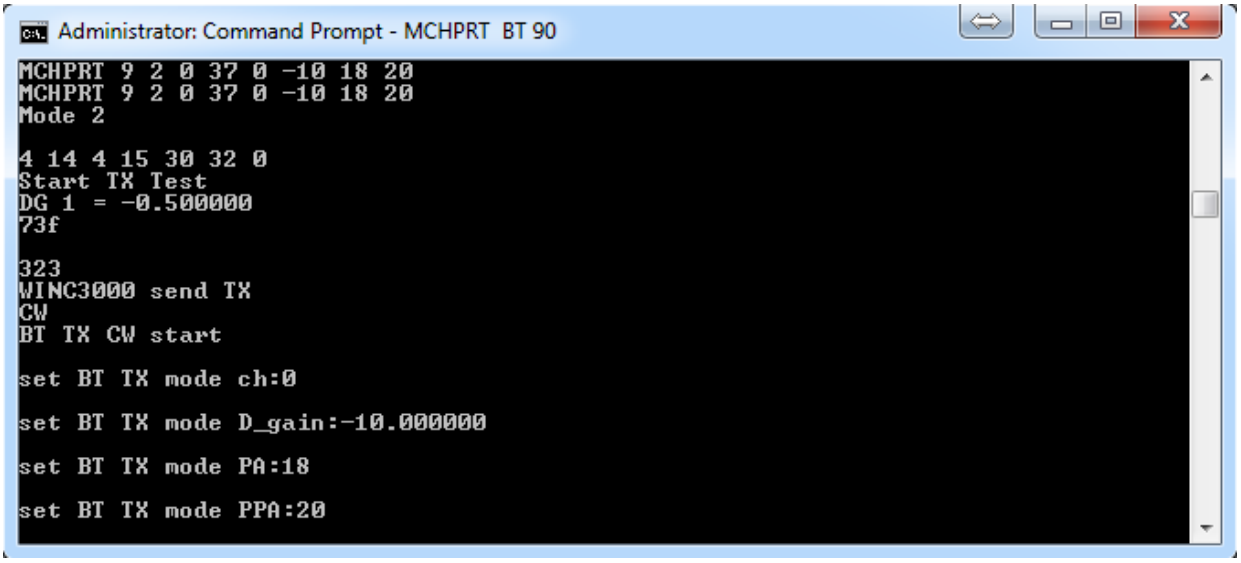
Table 3-21. Start Bluetooth TX CW: After Bluetooth Initialization with Serial Port

Command Syntax	MCHPRT BT 2 X Y Z A B C F
X	X refer to TX channel: 0 to 39 • 0 – Channel 0 (2402 MHz) • 39 – Channel 39 (2480 MHz)
Y	Y refers to Length: 0 – 37 • 1 – 0x1 • 37 – 0x25

.....continued	
Command Syntax	**MCHPRT BT 2 X Y Z A B C F**
Z	Z refers to Payload: 1 – 8 • 1 – PRBS9 • 2 – 11110000 • 3 – 10101010 • 4 – PRBS15 • 5 – 11111111 • 6 – 00000000 • 7 – 00001111 • 8 – 01010101
A	A refers to Digital Gain (Bypass mode): Range: -20 to 0 DG: Dynamic Gain
B	B refers PA gain (Bypass mode): • ATWILC1000/ATWINC15X0 – 18, 15, 12, 9, 6, 3 • ATWILC3000/ATWINC3400 – 18, 15, 12, 9, 6, 3 DG: Dynamic Gain
C	C refers to PPA gain (Bypass mode): • ATWILC1000/ATWINC15X0 – 9, 6, 3, 0 • ATWILC3000/ATWINC3400 – 20, 18, 15, 12, 6, 0 DG: Dynamic Gain
Example	**MCHPRT BT 2 0 37 0 -6 6 6 18 20** Channel 0. 0x25 length, PRBS9 DG – 6, PPA 6 , PA 6 CW mode

The following figure shows the example of Bluetooth CW mode.

Figure 3-27. Console Log of Bluetooth CW Mode



The Bluetooth CW mode starts as shown in the following figure.

Figure 3-28. BT CW Mode Start

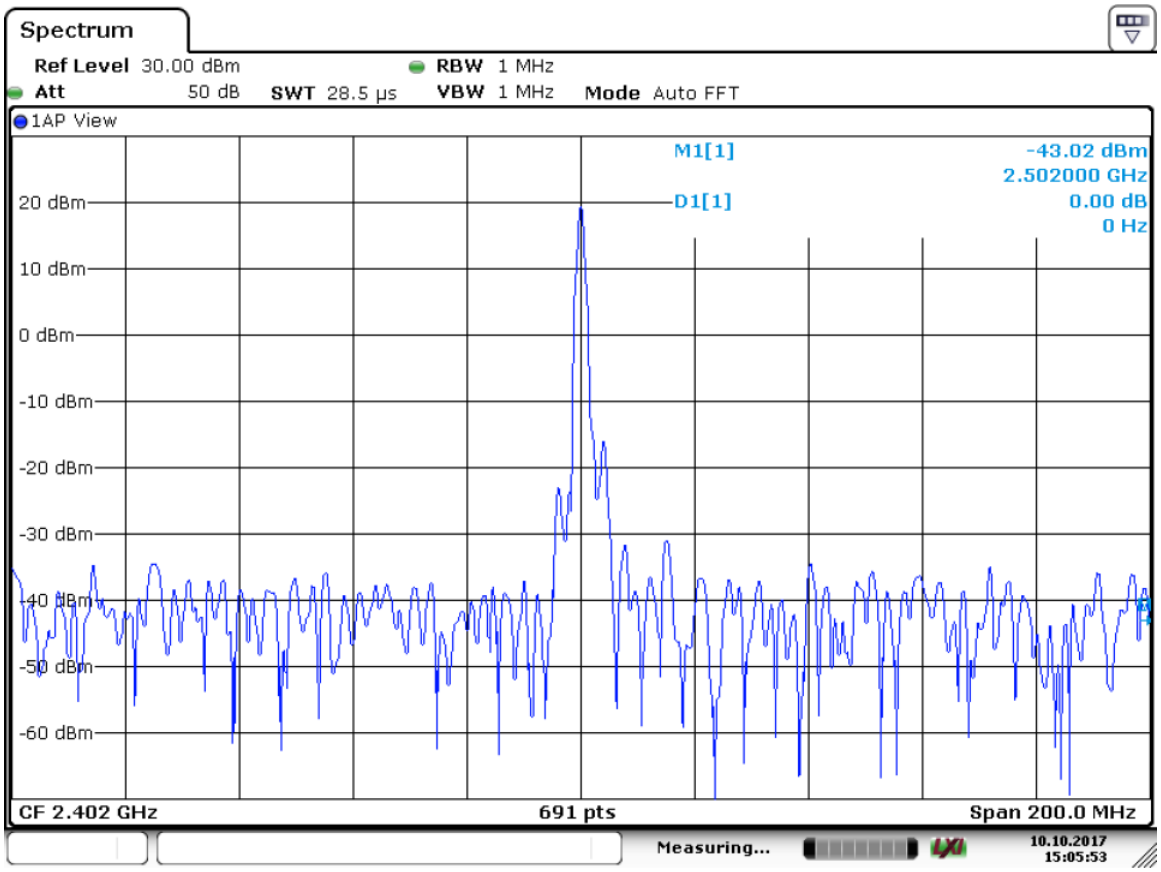
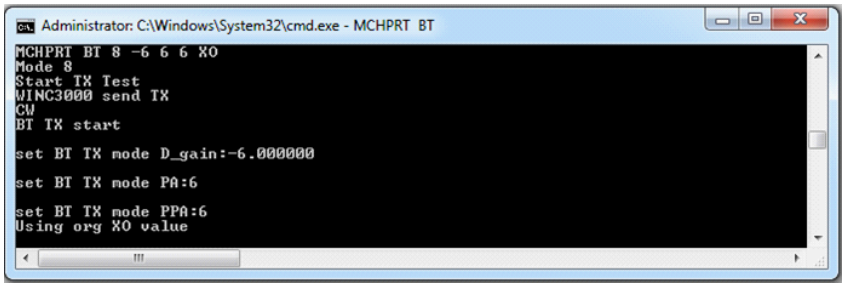


Table 3-22. Start Bluetooth TX CW: After Bluetooth Initialization without Serial Port

Command Syntax	MCHPRT BT 8 A B C F
A	A refers to Digital Gain (Bypass mode): Range: -20 to 0 DG: Dynamic Gain
B	B refers PA gain (Bypass mode): • ATWILC1000/ATWINC15X0 – 18, 15, 12, 9, 6, 3 • ATWILC3000/ATWINC3400 – 18, 15, 12, 9, 6, 3 Dynamic Gain
C	C refers to PPA gain (Bypass mode): • ATWILC1000/ATWINC15X0 – 9, 6, 3, 0 • ATWILC3000/ATWINC3400 – 20, 18, 15, 12, 6, 0 Dynamic Gain
F	F refers to Frequency offset: -50 to +50 base on Crystal XO: eFuse XO value
Example	**MCHPRT BT 8 -6 6 6 XO** DG – 6, PPA 6 , PA 6 CW mode

Figure 3-29. Console Log of Bluetooth CW Mode without Serial Port



3.2.4 Bluetooth Start RX

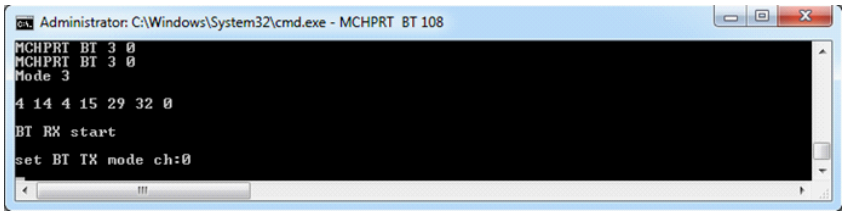
The following table provides the command syntax for Bluetooth RX test.

Table 3-23. Start Bluetooth RX: After Bluetooth Initialization with Serial Port

Command Syntax	MCHPRT BT 3 X
X	X refers to TX channel: 0 to 39 • 0 – Channel 0 (2402 MHz) • 39 – Channel 39 (2480 MHz)
Example	**MCHPRT BT 3 0** RX mode in Channel 1 Start with reset the count

The following figure shows the example of start Bluetooth RX test.

Figure 3-30. Console Log of Bluetooth RX Mode



3.2.5 Bluetooth RX Package Count

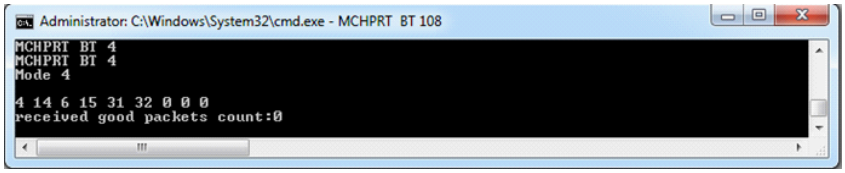
The following table provides the command syntax for Bluetooth RX package count.

Table 3-24. Start Bluetooth RX Package Count: After Bluetooth Initialization with Serial Port

Command Syntax	MCHPRT BT 4
Example	**MCHPRT BT 4** Print out good package number

The following figure shows the example of Bluetooth RX package count.

Figure 3-31. Console Log of Bluetooth RX Package Count



3.2.6 BLE Deinitialization

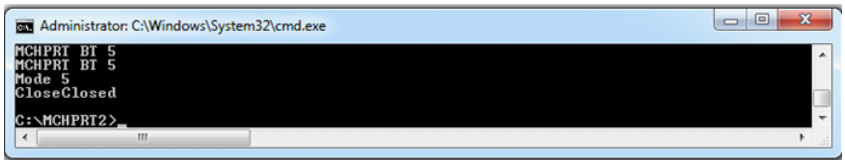
The following table provides the command syntax for BLE deinitialization.

Table 3-25. BLE Deinitialization: After Initialization

Command Syntax	MCHPRT BT 5
Example	**MCHPRT BT 5** BT Deinitialization

The following figure shows the example of BLE deinitialization.

Figure 3-32. Console Log of BLE Deinitialization



3.3 HCI Command

3.3.1 Initialization of COM Port

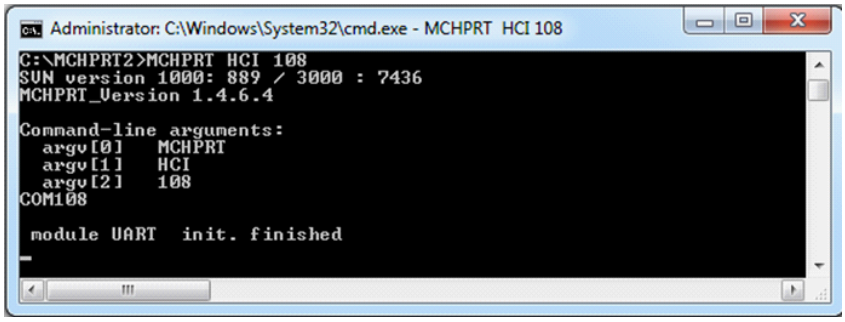
The following table provides the command syntax for initialization of COM port. Refer to 1.3. UART/I2C Pin Details to check if DTR is enabled or not.

Table 3-26. Initialization

Command Syntax	MCHPRT HCI X
HCI	HCI_DTR refers to DTR enable
X	X refers to the port number for Bluetooth UART
Example	**MCHPRT HCI 94**

The following figure shows the example of initialization of COM port.

Figure 3-33. Console Log of Initialization of COM Port



3.3.2 HCI TX

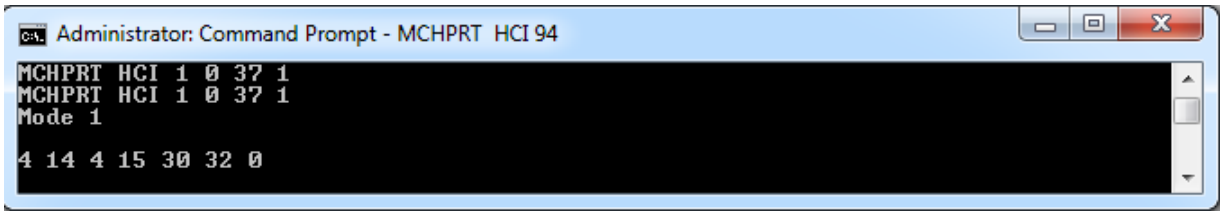
The following table provides the command syntax for the HCI TX test.

Table 3-27. Start HCI TX: HCI command only

Command Syntax	MCHPRT HCI 1 X Y Z
X	X refer to TX channel: 0 to 39 • 0 – Channel 0 (2402 MHz) • 39 – Channel 39 (2480 MHz)
Y	Y refers to Length: 0 – 37 • 1 – 0x1 • 37 – 0x25
Z	Z refers to Payload: 0 – 7 • 0 – PRBS9 • 1 – 11110000 • 2 – 10101010 • 3 – PRBS15 • 4 – 11111111 • 5 – 00000000 • 6 – 00001111 • 7 – 01010101
Example	**MCHPRT HCI 1 0 37 1** Channel 0. 0x25 length, PRBS9

The following figure shows the example of HCI TX test mode.

Figure 3-34. Console Log of HCI TX Test Mode



3.3.3 HCI RX

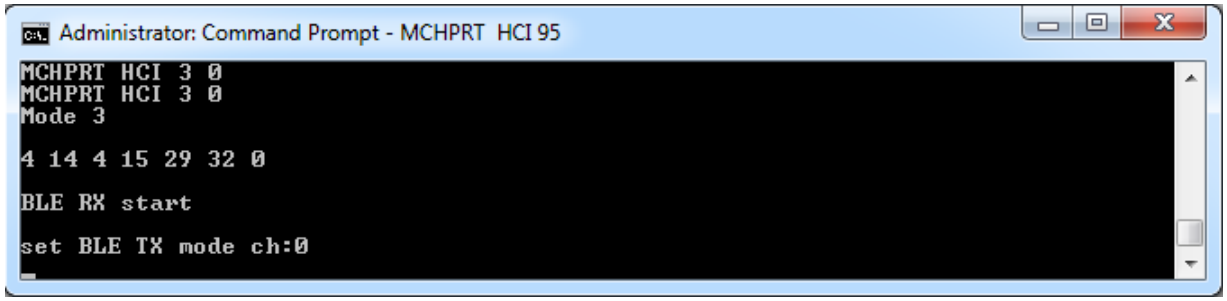
The following table provides the command syntax for HCI RX test.

Table 3-28. Start HCI RX: HCI command only

Command Syntax	MCHPRT HCI 3 X
X	X refers to TX channel: 0 to 39 • 0 – Channel 0 (2402 MHz) • 39 – Channel 39 (2480 MHz)
Example	**MCHPRT HCI 3 0** Channel 0. RX mode start

The following figure shows the example of start HCI RX test.

Figure 3-35. Console Log of HCI RX Mode



3.3.4 HCI RX Package Count

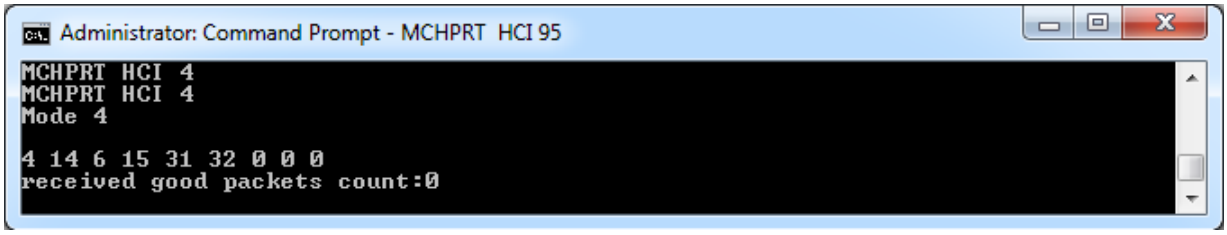
The following table provides the command syntax for HCI RX package count.

Table 3-29. Start HCI RX Package Count: HCI command only

Command Syntax	MCHPRT HCI 4
Example	**MCHPRT HCI 4** Print out good package number

The following figure shows the example of HCI RX package count.

Figure 3-36. Console Log of HCI RX Package Count



3.3.5 HCI UART Initialization Command

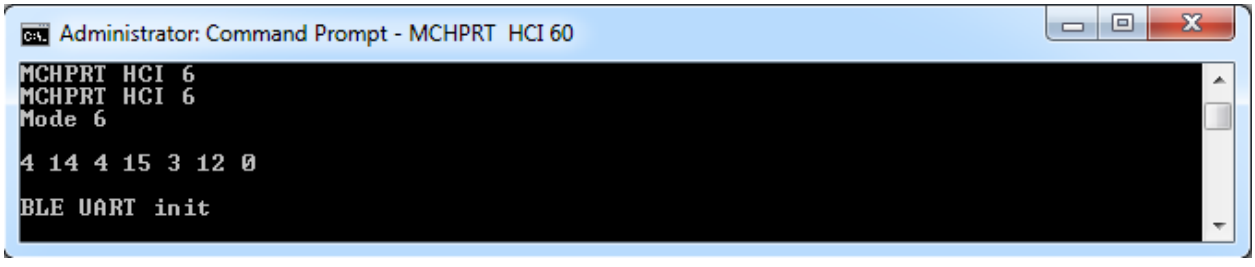
The following table provides the command syntax for HCI UART initialization command.

Table 3-30. Send UART Init Command and Print out Reply

Command Syntax	MCHPRT HCI 6
Example	**MCHPRT HCI 6** Print out the reply

The following figure shows the example of HCI UART initialization command.

Figure 3-37. Console Log of HCI UART Init Command



3.3.6 HCI Deinitialization

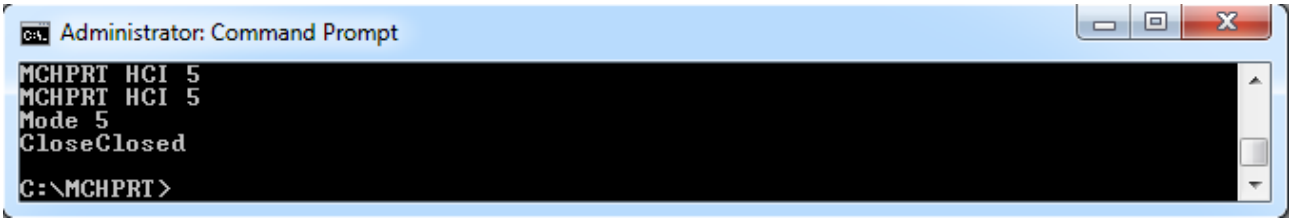
The following table provides the command syntax for HCI deinitialization.

Table 3-31. HCI Deinitialization: HCI command only

Command Syntax	MCHPRT HCI 5
Example	**MCHPRT HCI 5** COM port Deinitialization

The following figure shows the example of HCI deinitialization.

Figure 3-38. Console Log of HCI Deinitialization



3.4 Register

3.4.1 Read

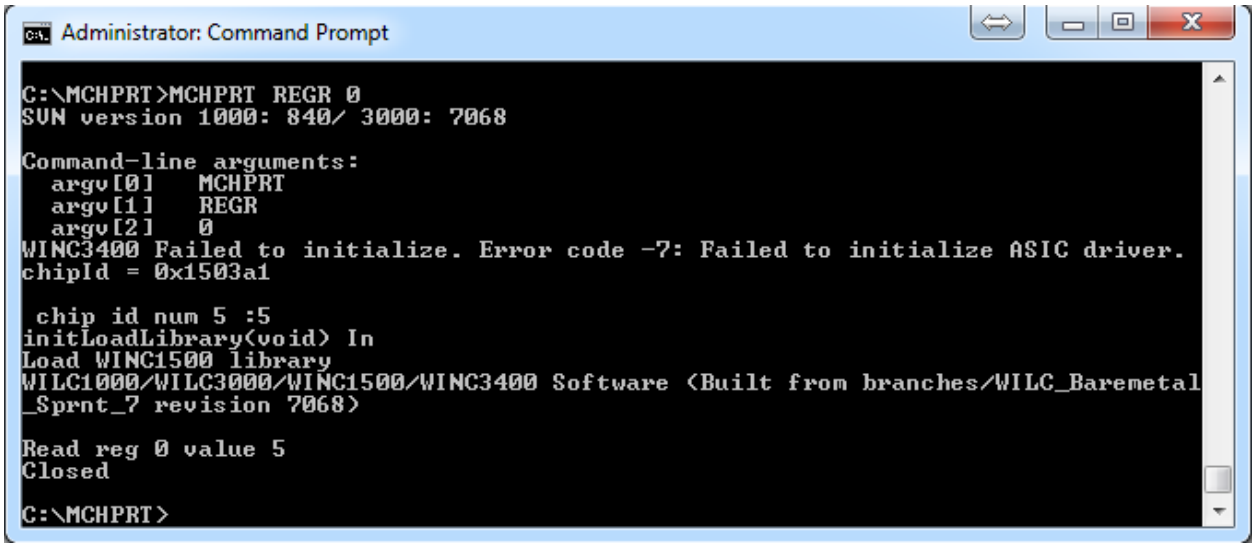
The following table provides the command syntax for Reg value read before initialization.

Table 3-32. Reg Value Read: Before Initialization ATWINC/ATWILC

Command Syntax	MCHPRT REGR X
REGR	• REGR refers to using I2C • REGR_UART refers to using UART
X	X refers to the register number that reads and prints the value
Example	**MCHPRT REGR 0** Reg 0 value will be printed

The following figure shows the example of reg value read before initialization.

Figure 3-39. Console Log of Reg Value Read Before Initialization



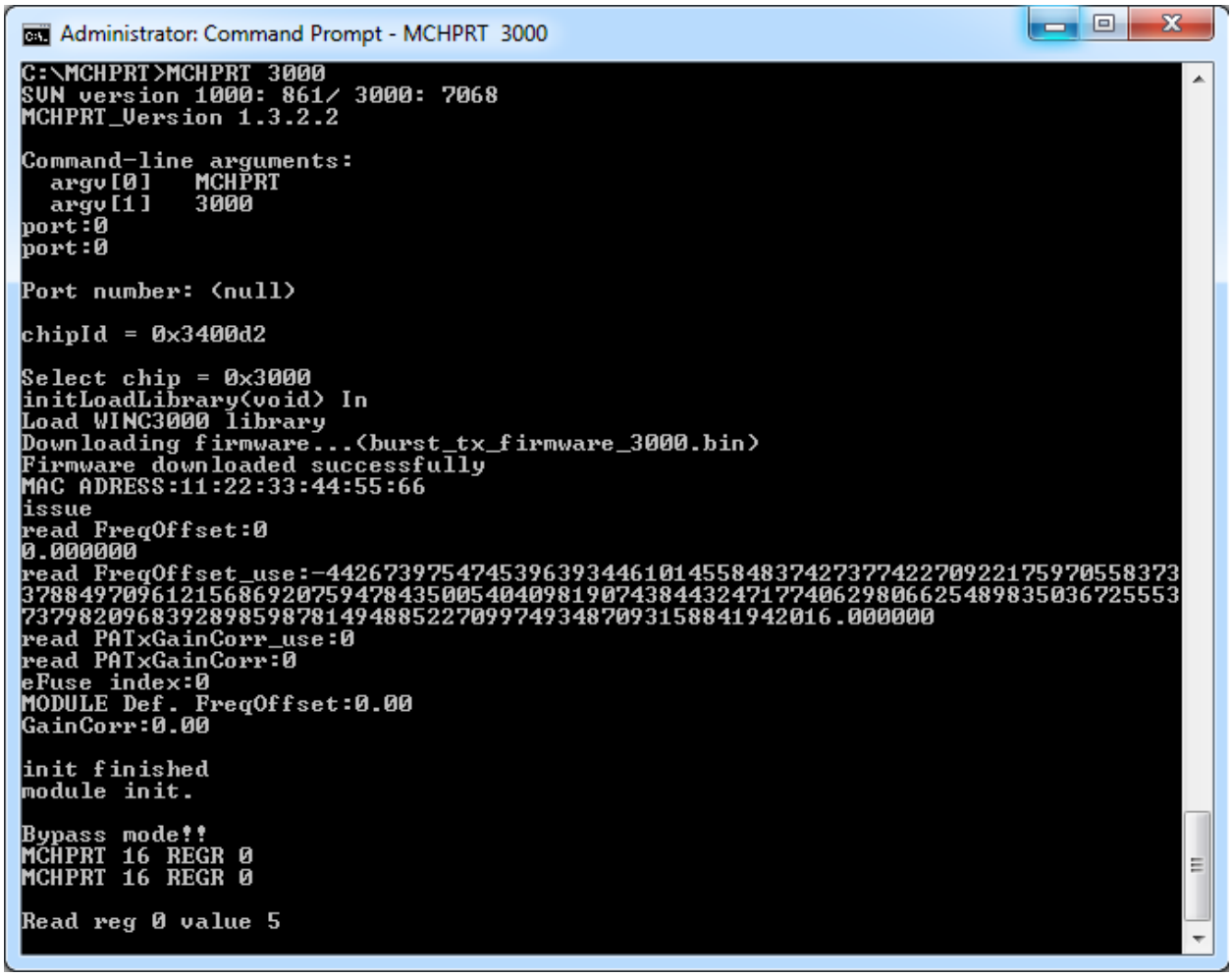
The following table provides the command syntax for Reg value read after initialization.

Table 3-33. Reg Value Read: After Initialization ATWINC/ATWILC

Command Syntax	MCHPRT 16 REGR X
X	X refers to the register number that reads and prints the value
Example	**MCHPRT 16 REGR 0** Reg 0 value will be printed

The following figure shows the example of reg value read after initialization.

Figure 3-40. Console Log of Reg Value Read After Initialization



3.4.2 Write

The following table provides the command syntax for Reg value write before initialization.

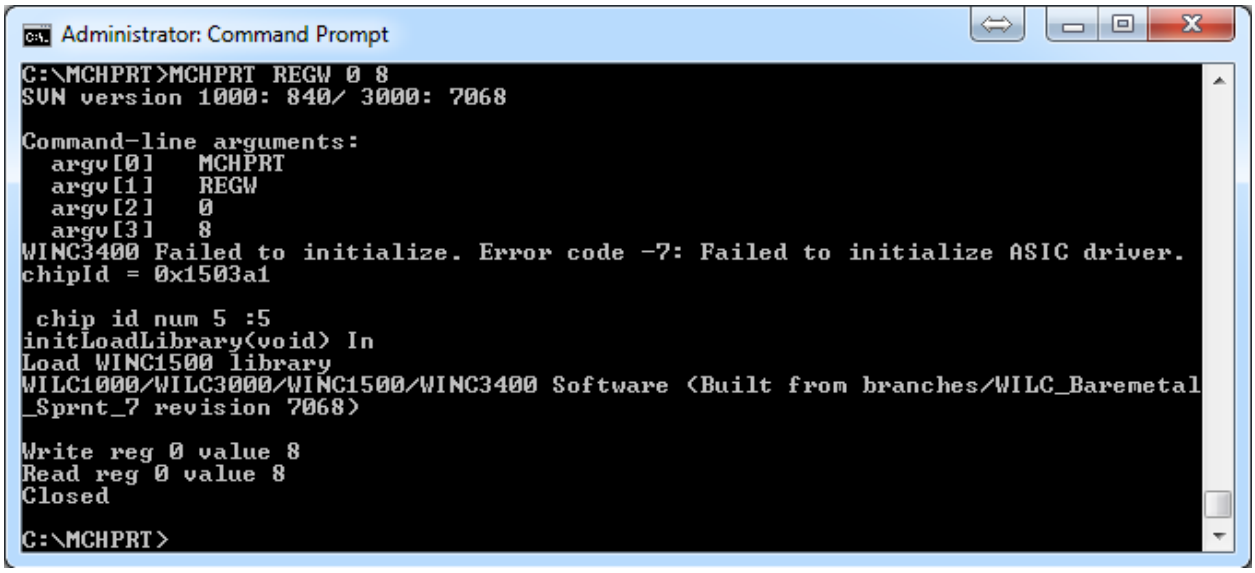
Table 3-34. Reg Value Write: Before Initialization ATWINC/ATWILC

Command Syntax	MCHPRT REGW X Y
REGW	• REGW refers to using I2C • REGW_UART refers to using UART
X	X refers to the register number that writes the register location
Y	Y refers to the write register value that writes the register value

.....continued	
Command Syntax	**MCHPRT REGW X Y**
Example	**MCHPRT REGW 0 8** Reg 0 value will change to 8

The following figure shows the example of Reg value write before initialization.

Figure 3-41. Console Log of Reg Value Write Before Initialization

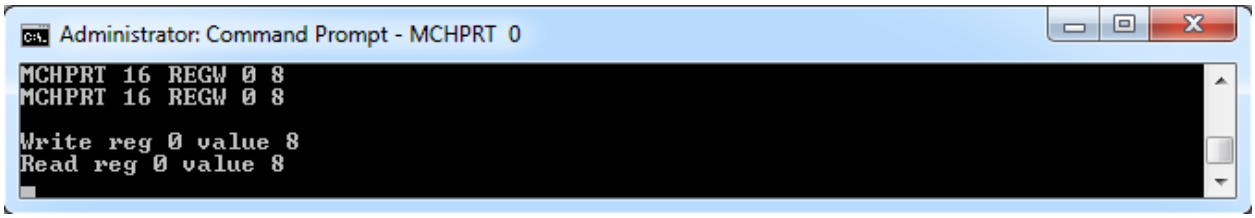


The following table provides the command syntax for Reg value write after initialization.

Table 3-35. Reg Value Write: After Initialization ATWINC/ATWILC

Command Syntax	MCHPRT 16 REGW X Y
X	X refers to the register number that writes the register location
Y	Y refers to the write register value that writes the register value
Example	**MCHPRT 16 REGW 0 8** Reg 0 value will change to 8

Figure 3-42. Console Log of Reg Value Write After Initialization



3.4.3 Dump

The following table provides the command syntax for Reg value dump before initialization.

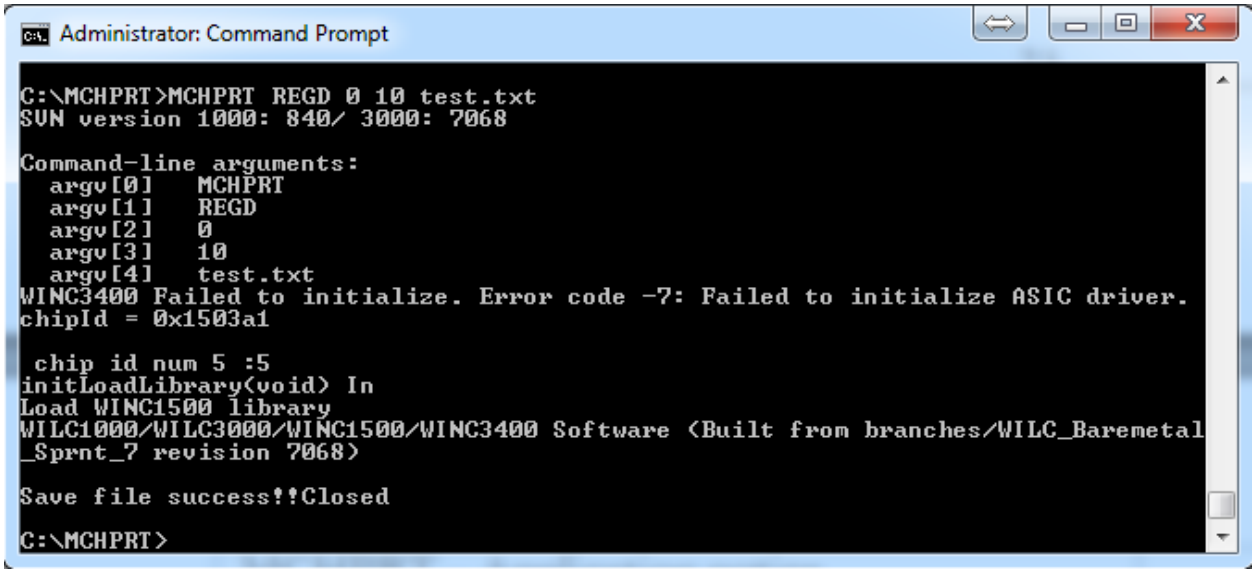
Table 3-36. Reg Value Dump: Before Initialization ATWINC/ATWILC

Command Syntax	MCHPRT REGD X Y F
REGD	• REGD refers to using I2C • REGD_UART refers to using UART

.....continued	
Command Syntax	**MCHPRT REGD X Y F**
X	X refers to the register number that reads the register value
Y	Y refers to the stop register number that reads the register value
F	F refers to the register information file name Example: `test.txt`
Example	**MCHPRT REGD 0 10 test.txt** Report the RX RSSI reading in 10 sec

The following figure shows the example of reg value dump before initialization.

Figure 3-43. Console Log of Reg Value Dump Before Initialization



The following table provides the command syntax for Reg value dump after initialization.

Table 3-37. Reg Value Dump: After Initialization ATWINC/ATWILC

Command Syntax	MCHPRT 16 REGD X Y F
X	X refers to the register number that reads the register value
Y	Y refers to the stop register number that reads the register value
F	F refers to the register information file name Example: `test.txt`
Example	**MCHPRT 16 REGD 0 10 test.txt** Report the RX RSSI reading in 10 sec

The following figure shows the example of reg value dump after initialization.

Figure 3-44. Console Log of Reg Value Dump After Initialization

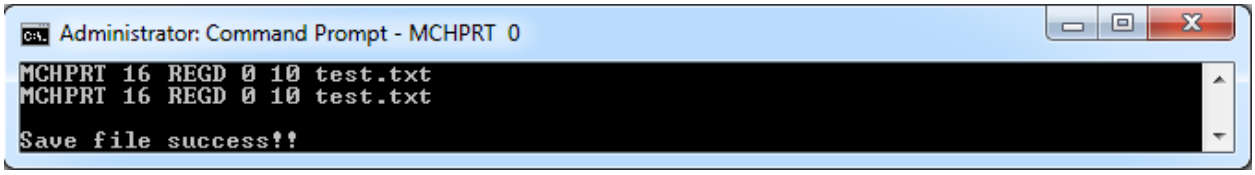
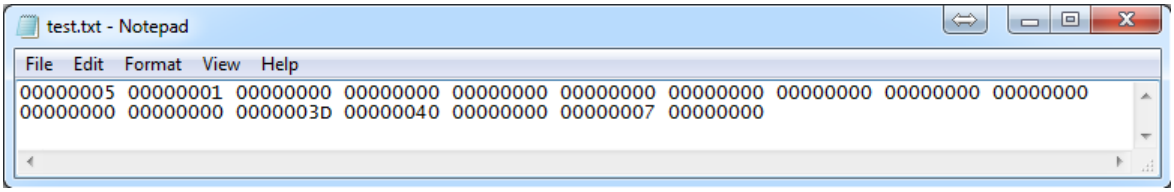


Figure 3-45. Sample test.txt



3.5 eFuse (ATWINC/ATWILC)

3.5.1 Read

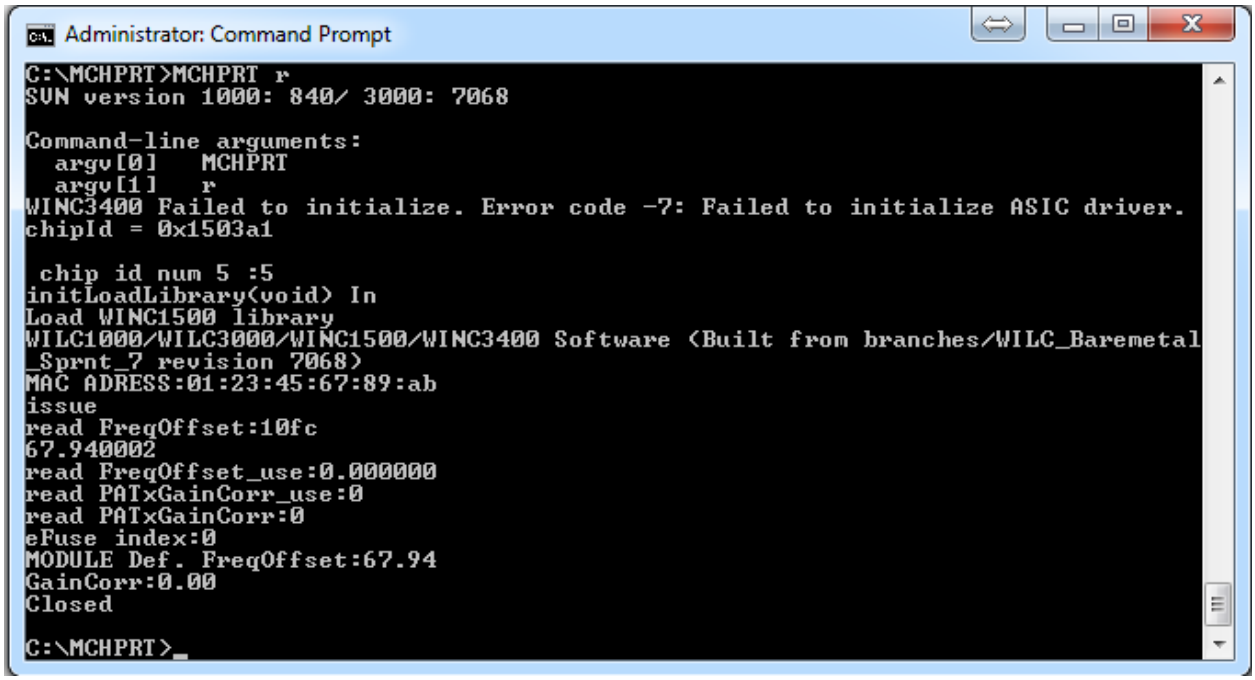
The following table provides the command syntax for read eFuse before initialization.

Table 3-38. Read eFuse: Before Initialization

Command Syntax	MCHPRT r
r	• r refers to I2C • r_UART refers to UART
Example	**MCHPRT r** eFuse information display

The following figure shows the example of read eFuse before initialization.

Figure 3-46. Console Log of Read eFuse Before Initialization



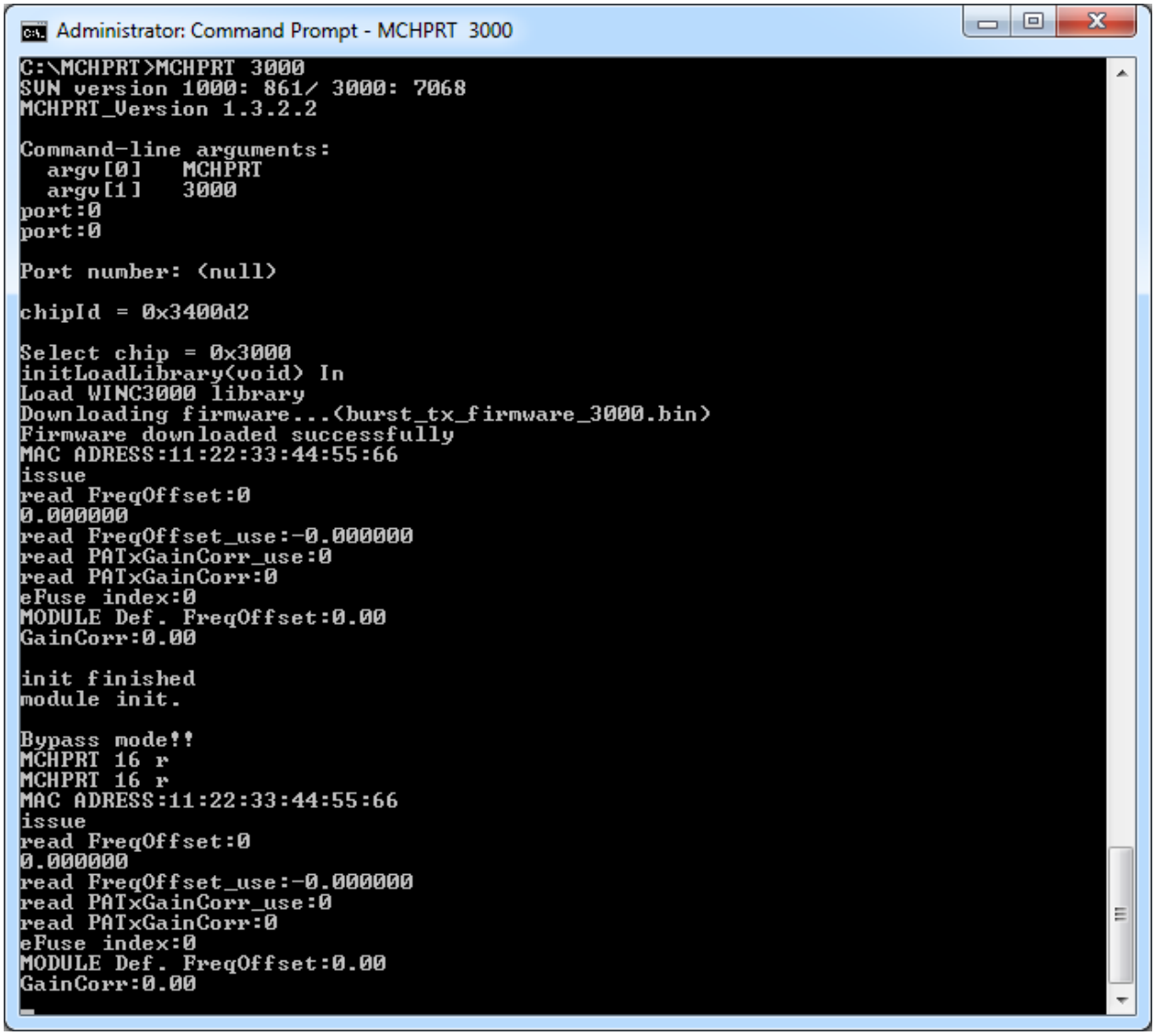
The following table provides the command syntax for read eFuse after initialization.

Table 3-39. Read eFuse: After Initialization

Command Syntax	MCHPRT 16 r
Example	**MCHPRT 16 r** eFuse information display

The following figure shows the example of read eFuse after initialization.

Figure 3-47. Console Log of Read eFuse After Initialization



3.5.2 Write

3.5.2.1 Write MAC ID Information

The following table provides the command syntax for write MAC ID and frequency offset only before initialization.

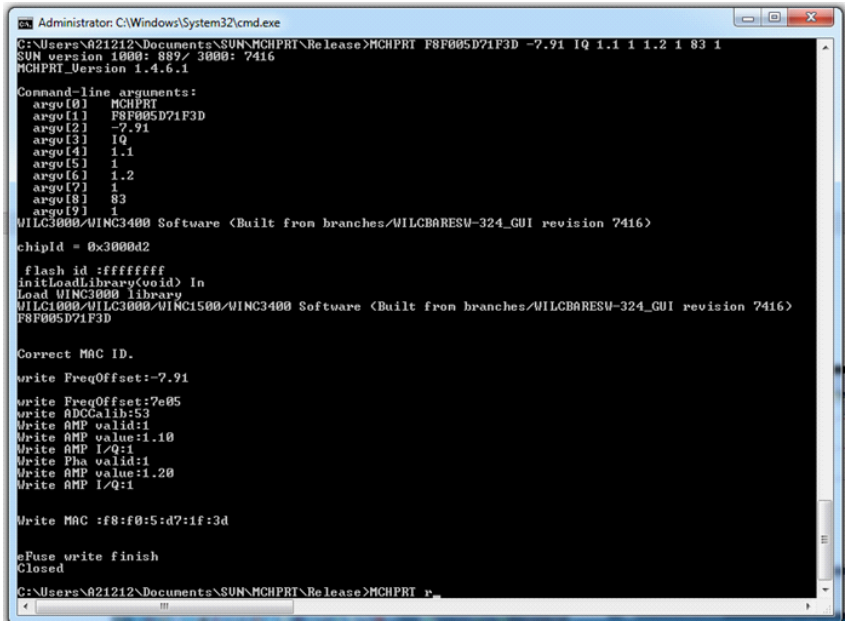
Table 3-40. Write MAC ID in eFuse: Before Initialization

Command Syntax	MCHPRT XXXXXXXXXXXX Y IQ A AE P PE T TEor MCHPRT MAC_UART XXXXXXXXXXXX Y IQ A AE P PE T TE
MAC_UART	• MAC_UART refers to UART • Without MAC_UART refers to I2C XXXXXXXXXXXX refers to MAC ID
XXXXXXXXXXXX	XXXXXXXXXXXX refers to MAC ID

.....continued	
Command Syntax	**MCHPRT XXXXXXXXXXXX Y IQ A AE P PE T TEor MCHPRT MAC_UART XXXXXXXXXXXX Y IQ A AE P PE T TE**
Y	Y refers to frequency offset value If "XO" is given as input then it disables the XO in eFuse.
A	A refers to IQ imbalance amplitude correction value. Give the value as "0". The current WILC/WINC firmware doesn't support this feature, it is for future reservation If "AMP" is given as input then it disable amplitude imbalance in efuse.
AE	AE refers to correction value real or imaginary 0: Real 1: Imaginary If "AMP" is given as input then it disable amplitude imbalance in efuse.
P	P refers to phase correction value in IQ imbalance. Give the value as "0". The current WILC/WINC firmware doesn't support this feature, it is for future reservation If "Phase" is given as input then it disable phase imbalance in efuse.
PE	PE refers to correction value real or imaginary 0: Real 1: Imaginary If "Phase" is given as input then it disable phase imbalance in efuse.
T	Temperature calibration value use temperature calibration calculator to find the temperature calibration value. If "TEMP" is given as input then it disables efuse temperature calibration
TE	Temperature calibration enable 0: disable 1: enable If "TEMP" is given as input then it disables efuse temperature calibration
Example	**MCHPRT 1234567890AB -70 IQ 0 0 0 0 86 1** eFuse update the MAC ID: 1234567890AB Frequency offset: -70Amplitude correction value 0 Amplitude enableReal Phase correction value 0 Amplitude enableReal Temperature calibration value 86 Temperature calibration Enable

The following figure shows the example of write MAC ID in eFuse before initialization.

Figure 3-48. Console Log of Write MAC ID for eFuse Before Initialization



The following table provides the command syntax for write MAC ID and frequency offset only after initialization.

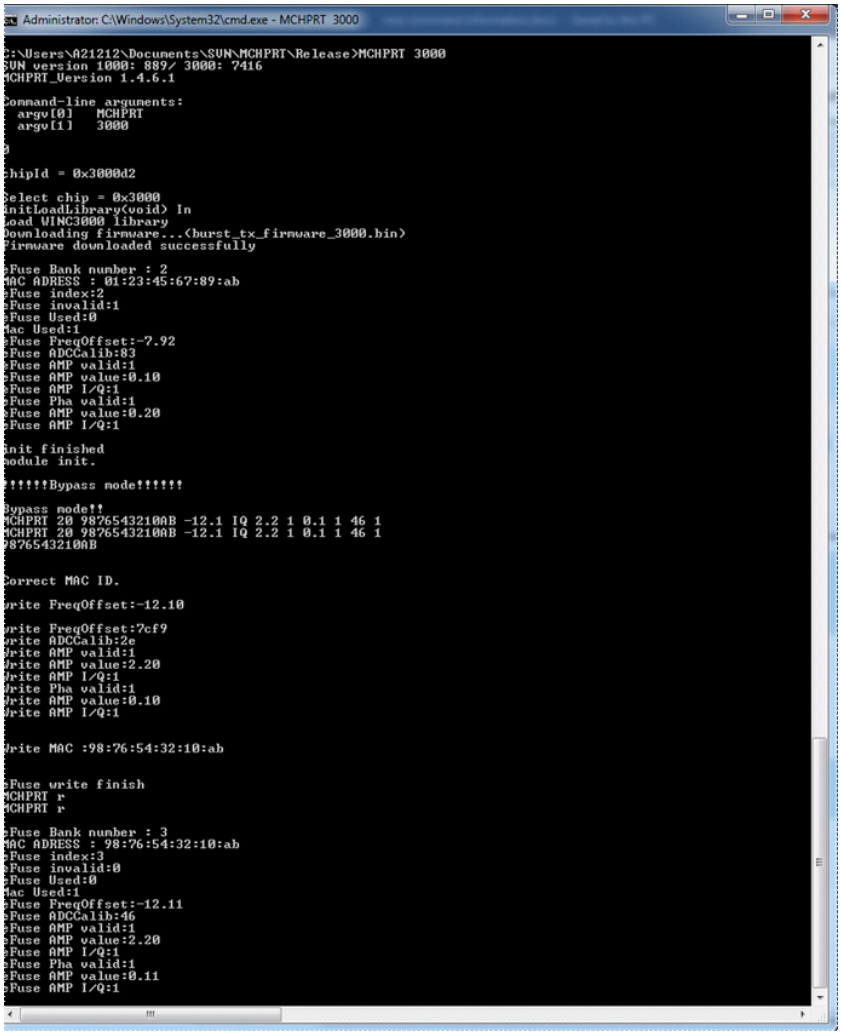
Table 3-41. Write MAC ID and Frequency Offset in eFuse: After Initialization

Command Syntax	MCHPRT 20 XXXXXXXXXXXX Y IQ A AE P PE T TE
XXXXXXXXXXXX	XXXXXXXXXXXX refers to MAC ID
Y	Y refers to frequency offset value
A	A refers to IQ imbalance amplitude correction value. Give the value as "0". The current WILC/WINC firmware doesn't support this feature, it is for future reservation.
AE	AE refers to correction value real or imaginary 0: Real 1: Imaginary
P	P refers to phase correction value in IQ imbalance. Give the value as "0". The current WILC/WINC firmware doesn't support this feature, it is for future reservation.
PE	PE refers to correction value real or imaginary 0: Real 1: Imaginary
T	Temperature calibration value Use temperature calibration calculator to find the temperature calibration value.
TE	Temperature calibration enable 0: disable 1: enable

.....continued	
Command Syntax	**MCHPRT 20 XXXXXXXXXXXX Y IQ A AE P PE T TE**
Example	**MCHPRT 20 1234567890AB -70 IQ 0 0 0 0 86 1** eFuse update the MAC ID: 1234567890AB Frequency offset: -70 Amplitude correction value 0 Amplitude enableReal Phase correction value 0 Amplitude enableReal Temperature calibration value 86 Temperature calibration Enable

The following figure shows the example of write MAC ID and frequency offset in eFuse after initialization.

Figure 3-49. Console Log of Write MAC ID for eFuse After Initialization



3.5.2.2 Invalidate an eFuse Bank

In some cases, the user needs to invalidate a specific eFuse bank. In order to invalidate a specific eFuse bank, use the `MCHPRT efuse_invalid bank_number` command, and the bank number value ranges from 0-5.

The following are some example commands:

- To invalidate eFuse Bank 0, run the command `MCHPRT efuse_invalid 0`.
- To invalidate eFuse Bank 3, run the command `MCHPRT efuse_invalid 3`.

3.6 Firmware Upgrade

Note: For updating the .bat file please refer to the Firmware update section in the appendix.

3.6.1 ATWINC Series Upgrade

3.6.1.1 Full

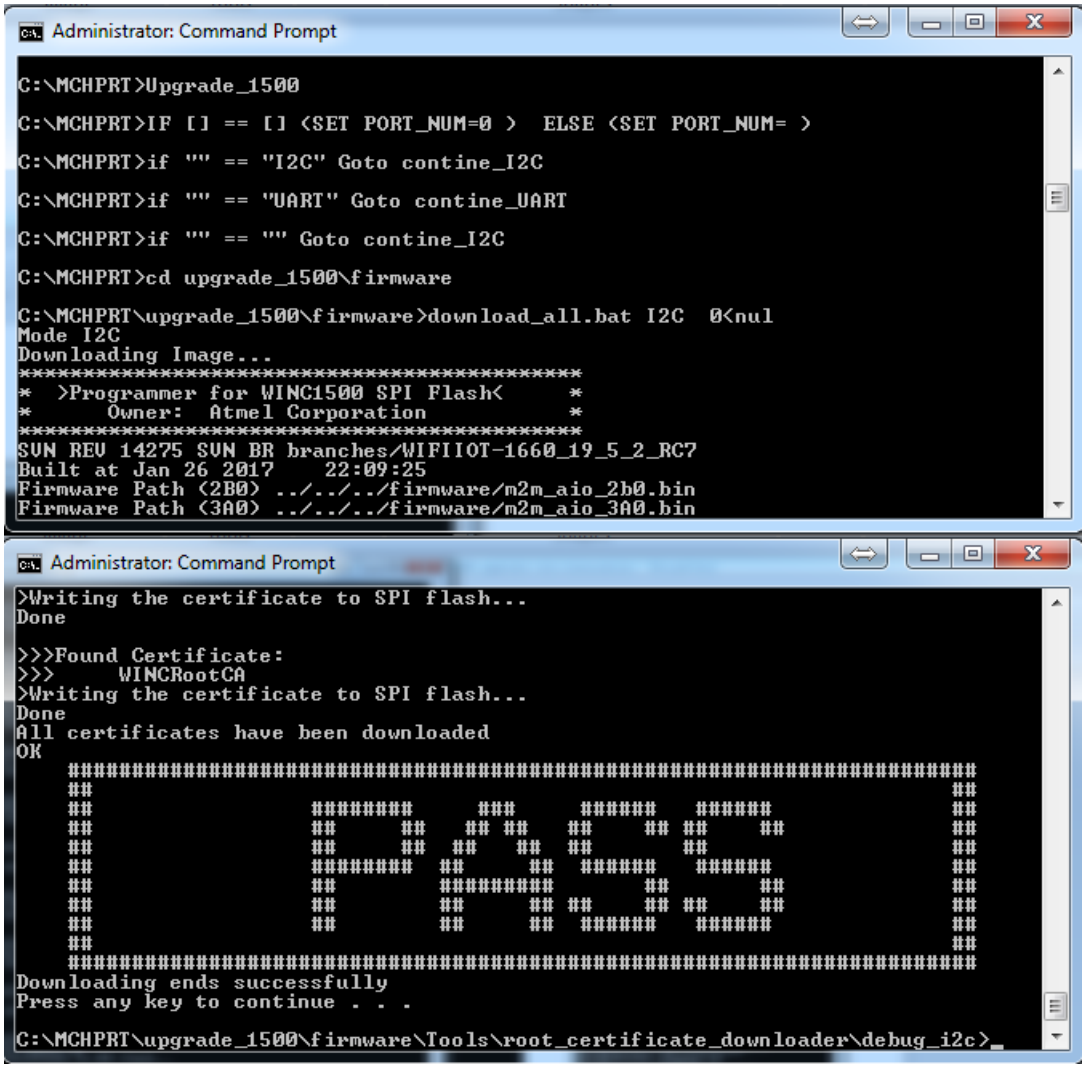
The following table provides the command syntax for firmware upgrade.

Table 3-42. Firmware Upgrade: Before Initialization

Command Syntax	Upgrade_1500/ Upgrade_3400
X	X refers to Antenna • Upgrade_1500 - ATWINC1500 FW upgrade • Upgrade_3400 - ATWINC3400 FW upgrade
Example	**Upgarde_1500** ATWINC1500 FW upgrade starts and when completes it shows “PASS”

The following figure shows the example of firmware upgrade.

Figure 3-50. Console Log of Firmware Upgrade



3.6.1.2 Gain Table

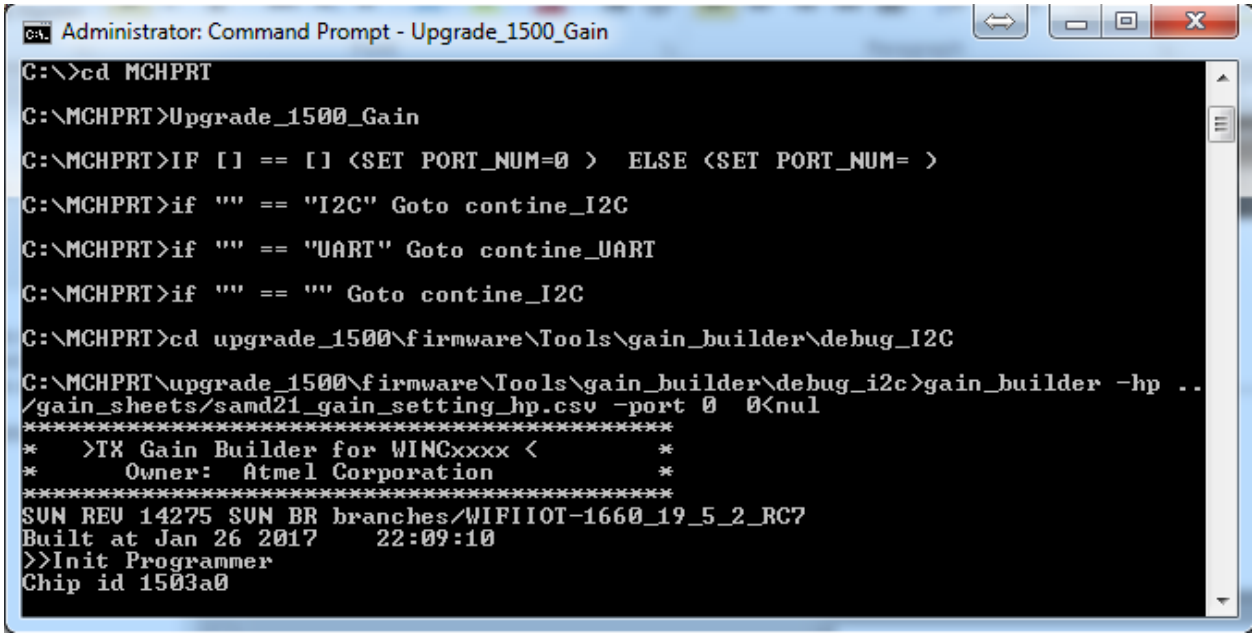
The following table provides the command syntax for firmware upgrade (gain table).

Table 3-43. Firmware Upgrade (gain table): Before Initialization

Command Syntax	Upgrade_1500_Gain/ Upgrade_3400_Gain
X	X refers to Antenna • Upgrade_1500_Gain - ATWINC1500 FW upgrade • Upgrade_3400_Gain - ATWINC3400 FW upgrade
Example	**Upgarde_1500_Gain** ATWINC1500 FW upgrade starts and when completes it closes the command line

The following figure shows the example of firmware upgrade (gain table).

Figure 3-51. Console Log of Firmware Upgrade (Gain table)



3.6.1.3 Provisioning Webpage

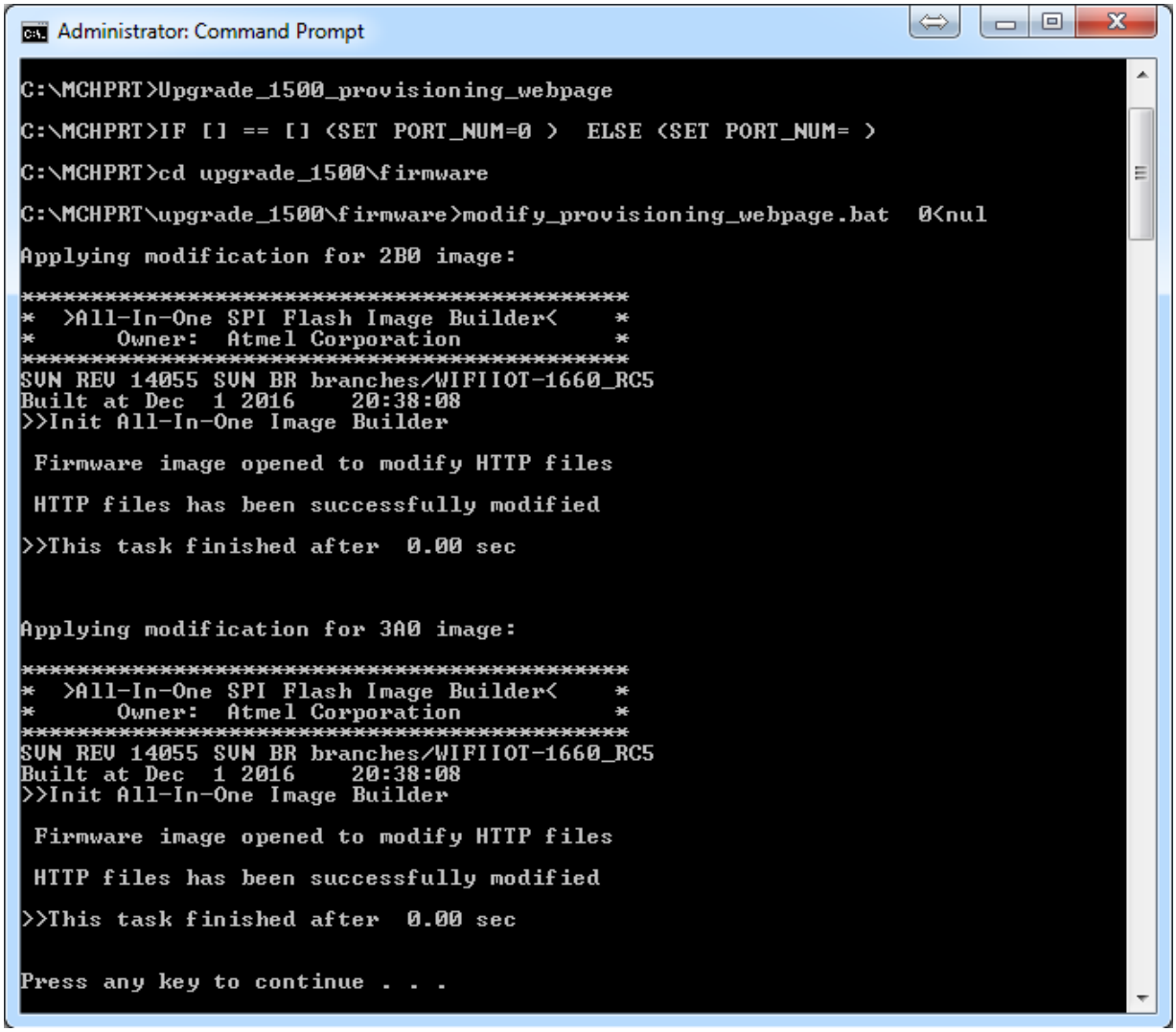
The following table provides the command syntax for firmware upgrade (provisioning webpage).

Table 3-44. Firmware Upgrade (Provisioning Webpage): Before Initialization

Command Syntax	Upgrade_1500_provisioning webpage/ Upgrade_3400_provisioning_webpage
X	X refers to Antenna • Upgrade_1500_provisioning_webpage - ATWINC1500 • Upgrade_3400_provisioning_webpage - ATWINC3400
Example	**Upgarde_1500_provisioning_webpage** ATWINC1500 webpage update

The following figure shows the example of firmware upgrade (provisioning webpage).

Figure 3-52. Console Log of Firmware Upgrade (Provisioning Webpage)



Note: ASF has the latest firmware. See Firmware upgrade folder in MCHPRT2 package, for information on how to add the upgrade file into MCHPRT2 tool folder.

Important: Before the Firmware upgrade, update the Firmware file in the following folder:

- ..\MCHPRT\upgrade_1500\firmware\firmware (for ATWINC1500)
- ..\MCHPRT\upgrade_3400\firmware\firmware (for ATWINC3400)

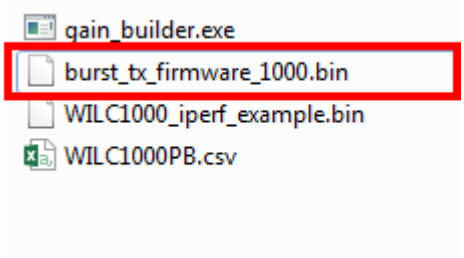
3.6.2 ATWILC Series Upgrade

3.6.2.1 Updating Target Firmware

Before the Firmware upgrade, update the target firmware file in the ATWILC1000 or ATWILC3000 folder:

\..\MCHPRT\upgrade_1000

Figure 3-53. Target Firmware File

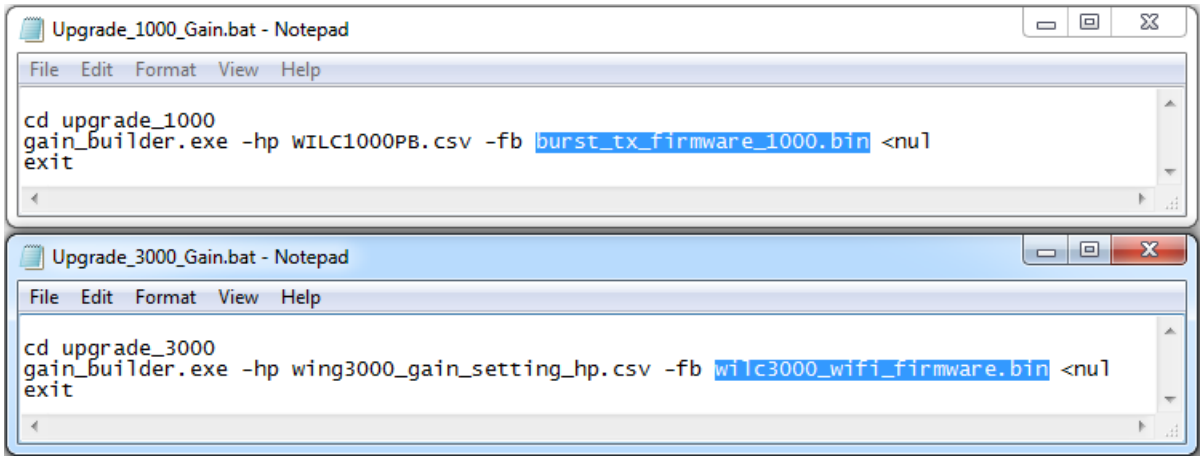


Note: If required, edit the `.csv` file for gain table update. For additional details on the gain table update procedure, refer to the application notes.

3.6.2.2 Gain Table Update

Edit the `Upgrade_1000_Gain.bat` or `Upgrade_3000_Gain.bat`. Update the highlighted text (as shown in the following figure) to update target `bin` or `hex` file and then save the edited `bat` file.

Figure 3-54. Editing Firmware Files



3.6.2.3 Gain Table Update on Target Firmware

The following table provides the command syntax for gain table update on target firmware.

Table 3-45. Upgrade Gain Table on Target Firmware File

Command Syntax	Upgrade_1000_gain/ Upgrade_3000_gain
Setting model	• Upgrade_1000_gain - ATWILC1000 FW upgrade • Upgrade_3000_gain - ATWILC3000 FW upgrade
Example	**Upgarde_1000_gain** Target file will upgrade with new gain table

The following figures illustrate the example of firmware upgrade.

Figure 3-55. Console Log of Firmware Upgrade using ATWILC1000

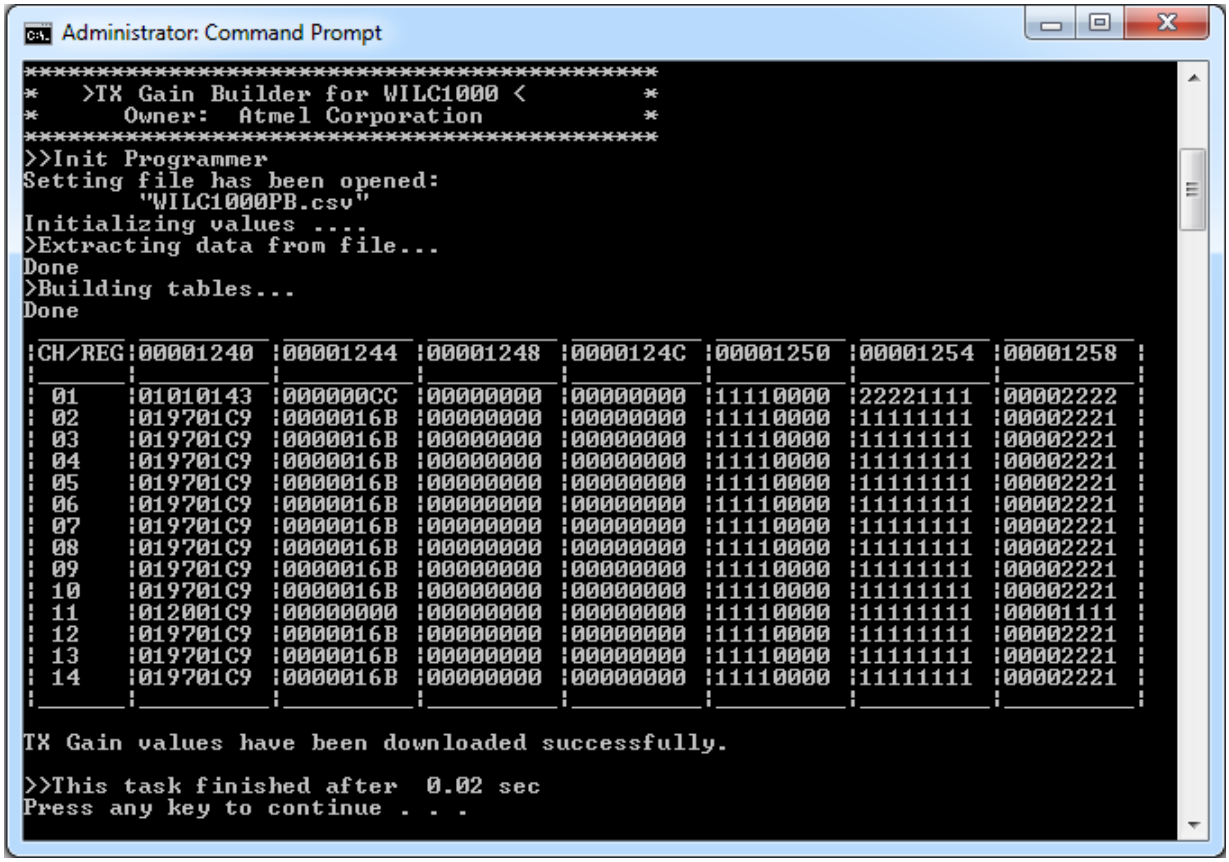
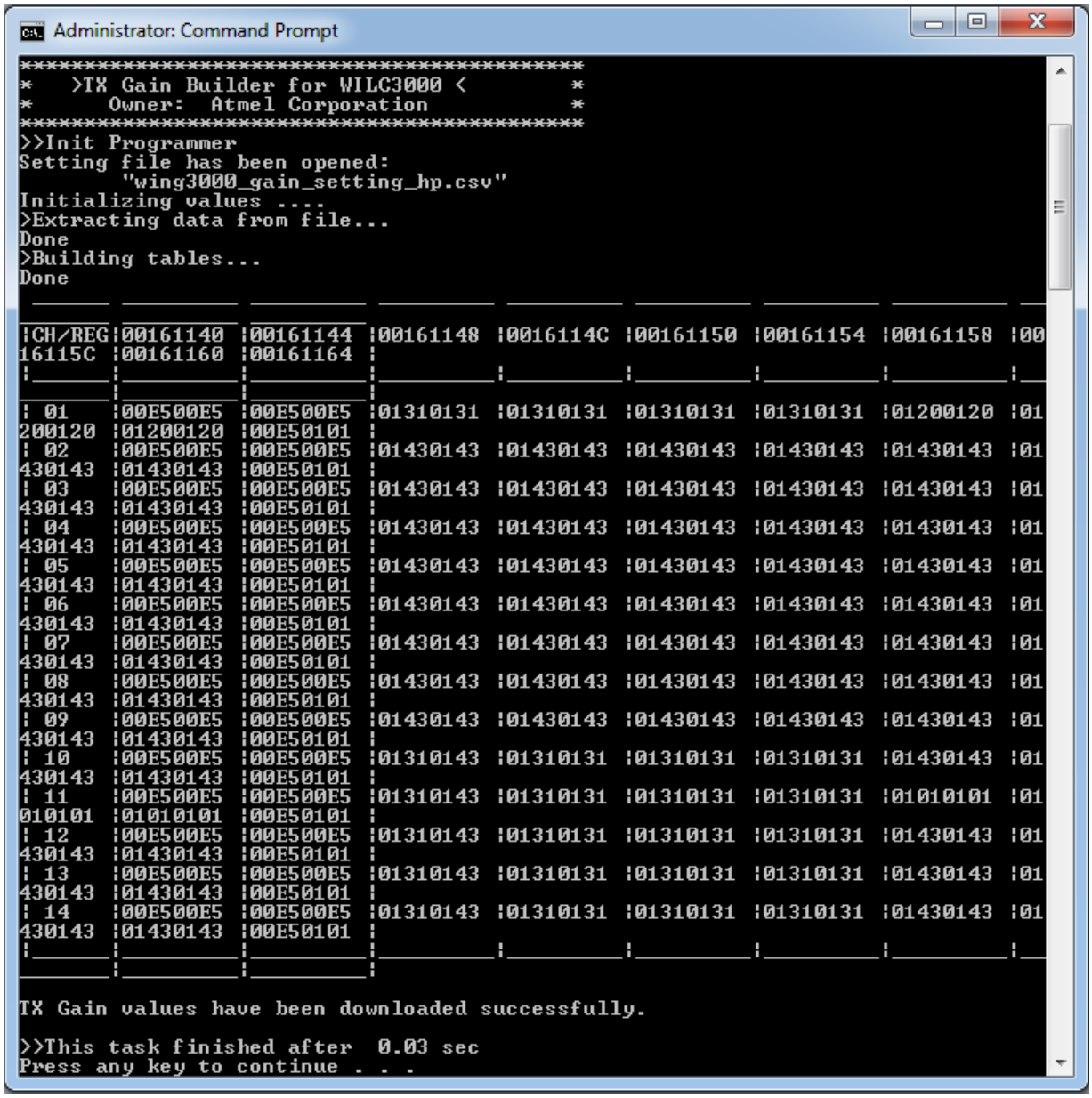


Figure 3-56. Console Log of Firmware Upgrade using ATWILC3000



4. Appendix A – Python® Example

Overview

Python is an interpreted, high-level, general-purpose programming language. Refer to www.python.org/ for downloading Python software and documentation.

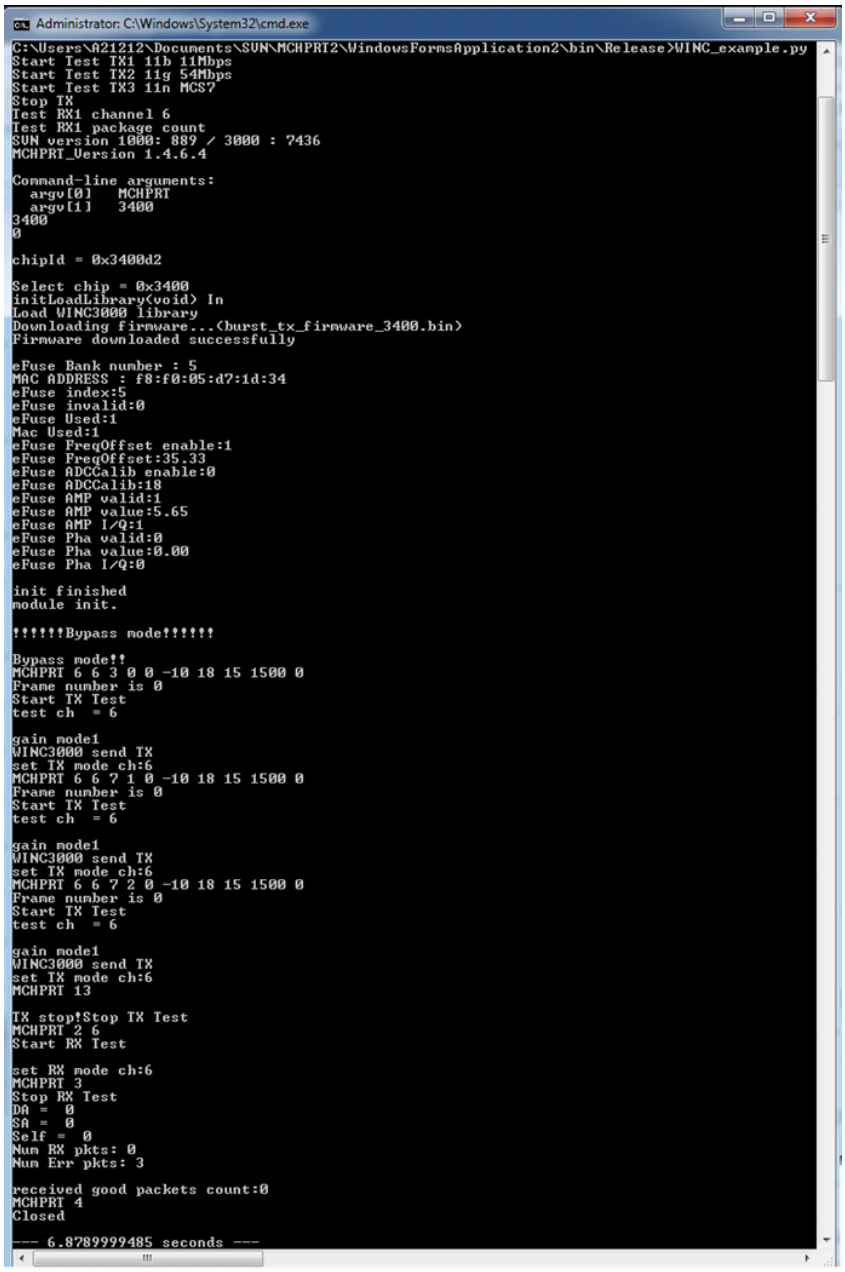
4.1 Example

3 TX with 1 RX test case:

```
import sys
# import Python standard function for sys
import subprocess
# import Python standard function for call CMD function
import time
# import Python standard function for time
start_time = time.time()
#Python standard function for time check the start time
child = subprocess.Popen(["MCHPRT", "3400"], stdout=subprocess.PIPE,stdin=subprocess.PIPE )
# Start Init in CMD type "MCHPRT 3400" using subprocess
time.sleep(1)
# Delay 1 sec for upload test FW to module


print "Start Test TX1 11b 11Mbps"
# Print the command state to screen
child.stdin.write("MCHPRT 6 6 3 0 0 -10 18 15 1500 0\n")
# Send command to start TX, command informaiton please help to check application note
# add the TX measurement in here


print "Start Test TX2 11g 54Mbps"
# Print the command state to screen
child.stdin.write("MCHPRT 6 6 7 1 0 -10 18 15 1500 0\n")
# Send command to start TX, command informaiton please help to check application note
# add the TX measurement in here


print "Start Test TX3 11n MCS7"
# Print the command state to screen
child.stdin.write("MCHPRT 6 6 7 2 0 -10 18 15 1500 0\n")
# Send command to start TX, command informaiton please help to check application note
# add the TX measurement in here


print "Stop TX"
# Print the command state to screen
child.stdin.write("MCHPRT 13\n")
# Send command to stop TX, command informaiton please help to check application note


print "Test RX1 channel 6"
# Print the command state to screen
child.stdin.write("MCHPRT 2 6\n")
# Send command to start channel 6, command informaiton please help to check application note


print "Test RX1 package count "
# Print the command state to screen
child.stdin.write("MCHPRT 3\n")
# Send command to stop RX and printing recevied package information, command informaiton
please help to check application note


child.stdin.write("MCHPRT 4\n")
# Send command to close MCHPRT, command informaiton please help to check application note

print child.stdout.read()
child.stdin.close()
child.kill()
```

```
print("--- %s seconds ---" % (time.time() - start_time))
#--- 7.08999991417 seconds ---
```

Figure 4-1. Log when the script is run:

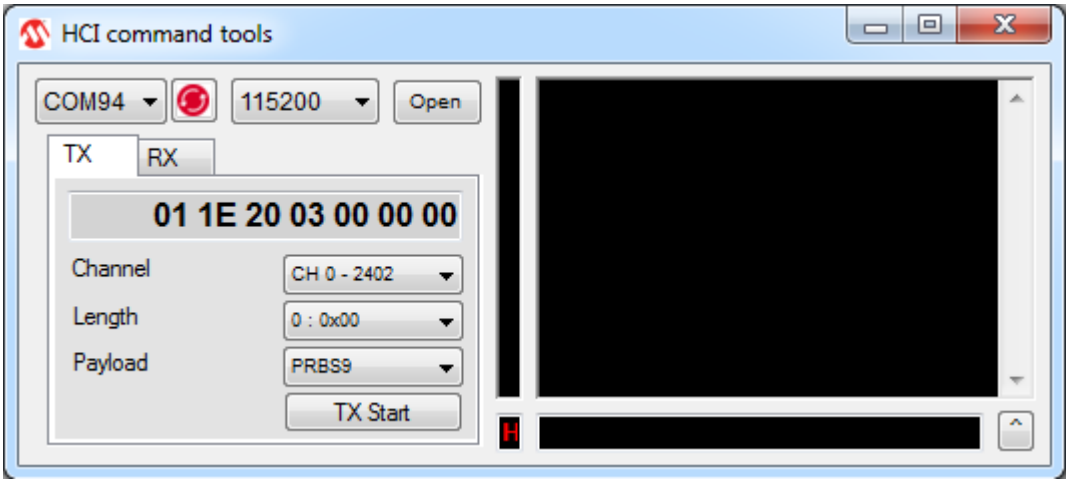


5. Appendix B – HCI Command Tools

This appendix explains the HCI command tools included in the following function for serial port communication:

- HCI TX command
- HCI RX command
- Serial port communication
  - Hexadecimal communication
  - Decimal communication
  - String communication

Figure 5-1. HCI Command Tool

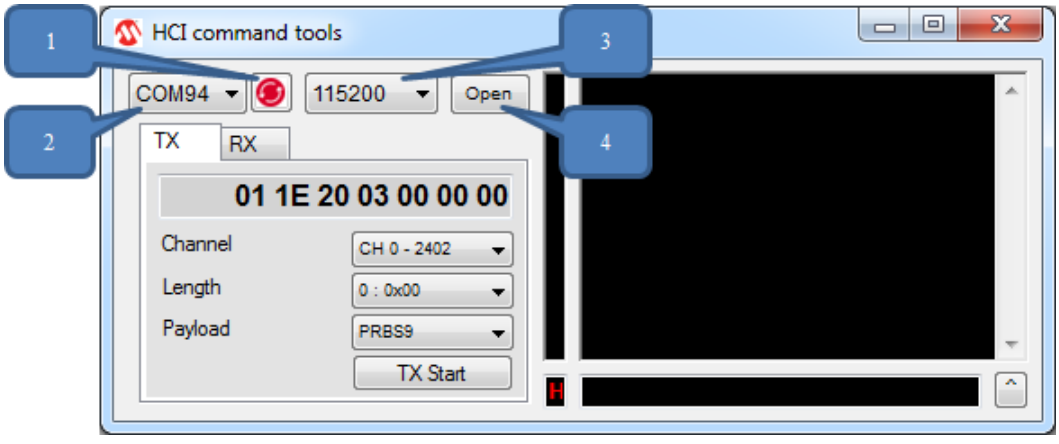


5.1 HCI Initialization

Perform the following steps for HCI initialization.

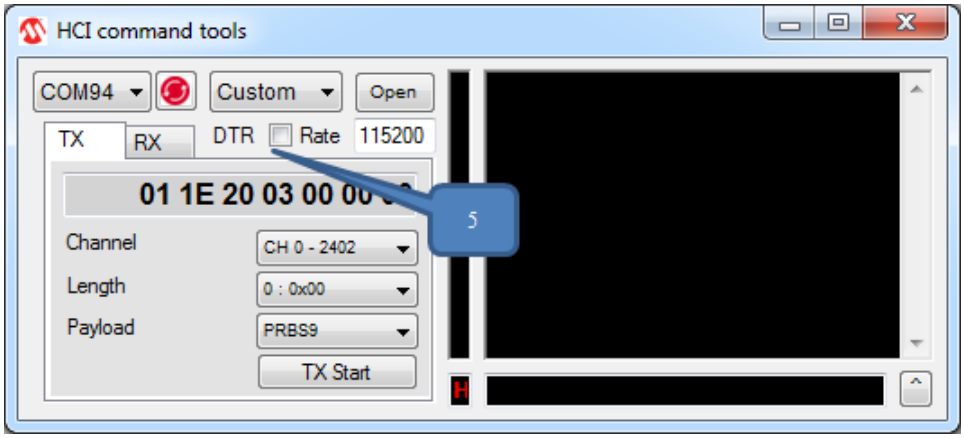
1. Click **rescan** button to scan the serial port in PC.
2. Select the COM Port.
3. Select the Baud Rate.
4. Click **Open** to open the Serial port for communication.

Figure 5-2. HCI Command Initialization



5. Select the baud rate as Custom and then DTR is enabled. Select DTR check box.

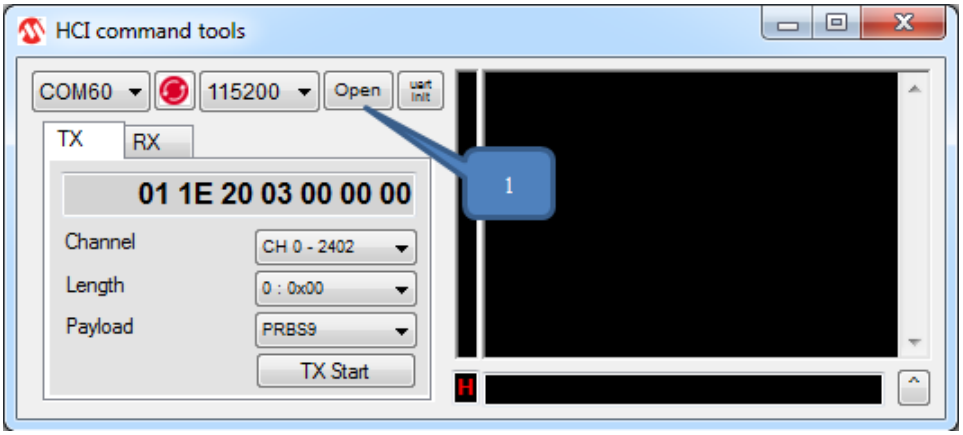
Figure 5-3. Enable DTR



5.2 HCI Command

After the initialization of the Serial port connection, the button will change to “Close”.

Figure 5-4. Serial Port Initialization

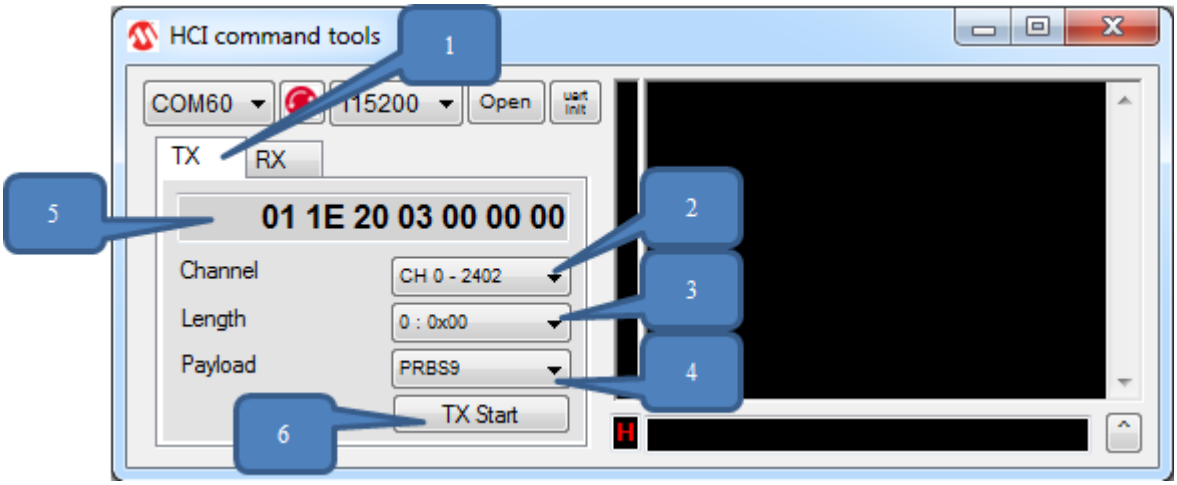


5.2.1 HCI TX

Perform the following steps for TX.

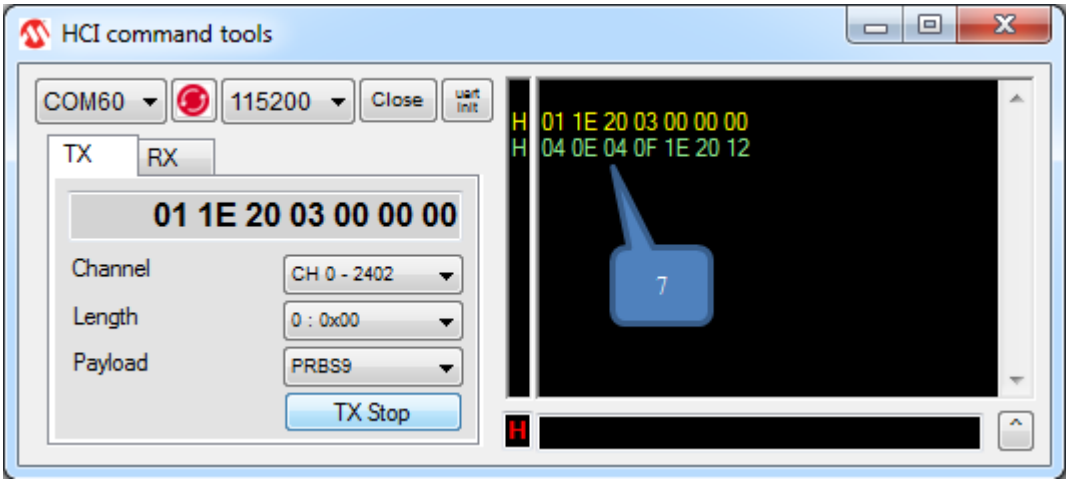
1. After successful initialization, select the **TX** tab to change to TX HCI command.
2. Select the Channel.
3. Select the Length.
4. Select the Payload.
5. Then the HCI command is shown in the TX command box.
6. Click **TX Start** to send the TX HCI command.

Figure 5-5. Start TX



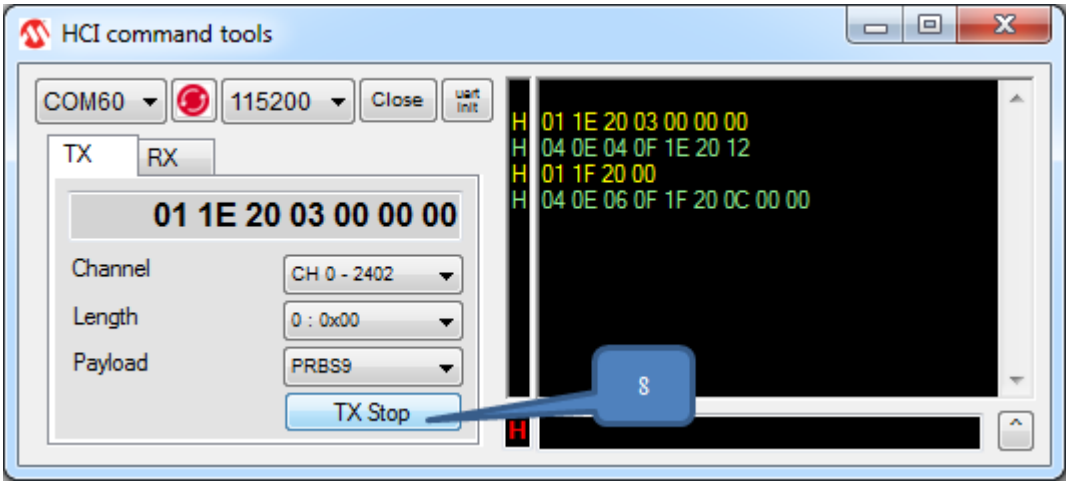
7. The sent and received HCI command is shown in the log. Yellow represents the sent command [Hex] and Green represents the received command [Hex].

Figure 5-6. Sent/Received HCI Command



8. Click **TX Stop** to send TX stop command.

Figure 5-7. Stop TX

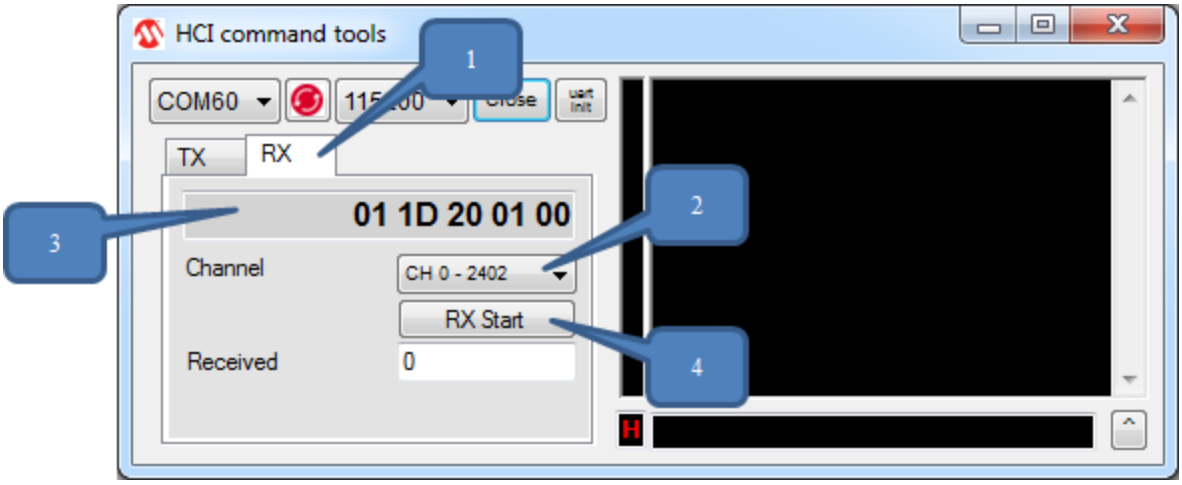


5.2.2 HCI RX

Perform the following steps for HCI RX.

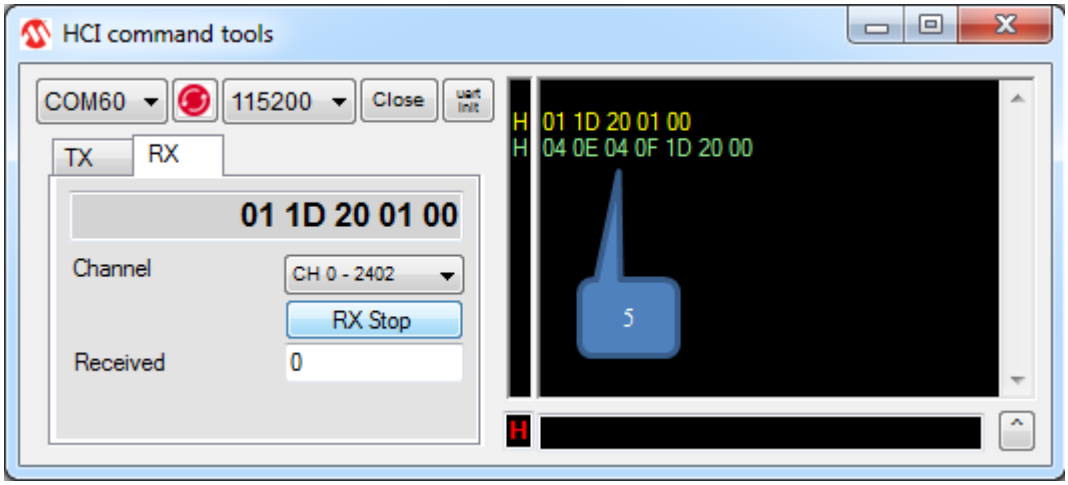
1. After successful initialization, select the **RX** tab to change to RX HCI command.
2. Select the Channel.
3. The HCI command is shown in the RX command box.
4. Click **RX Start** to send the RX HCI command.

Figure 5-8. Start RX



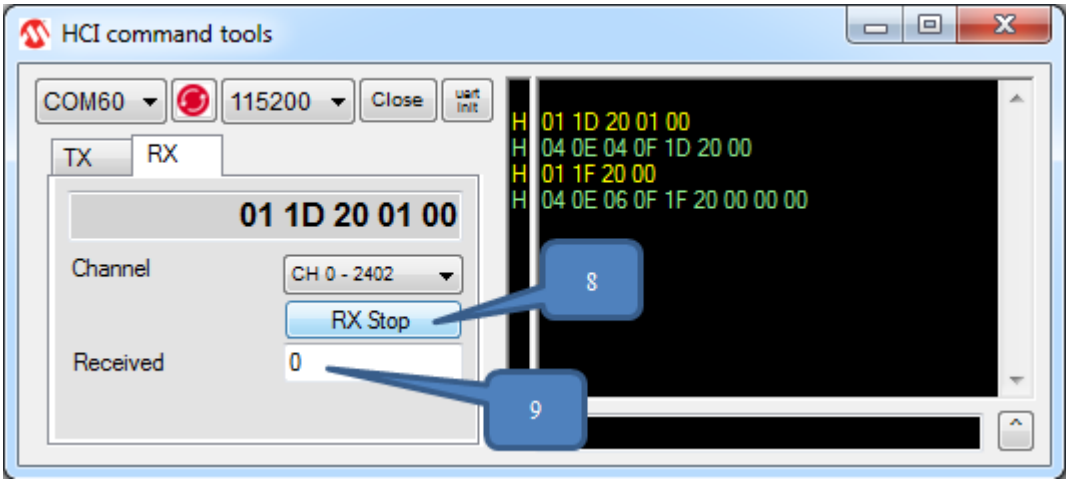
5. The sent and received HCI command is shown in the log. Yellow represents the sent command [Hex] and Green represents the received command [Hex].

Figure 5-9. Sent/Received HCI Command



6. Click **RX Stop** to send RX stop command and the received package number is shown in Received text box.

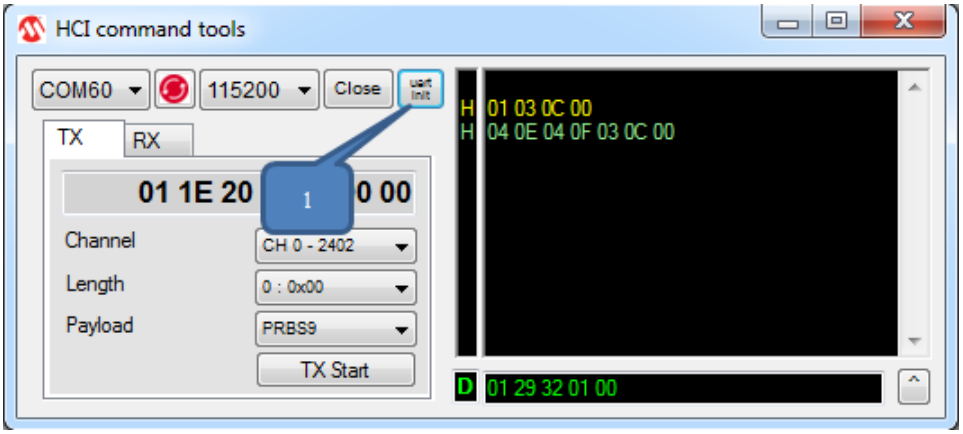
Figure 5-10. Stop RX



5.3 UART Initialization

To enable the UART command, click **UART init**. Then send the UART command (0x01, 0x03, 0x0c, 0x00).

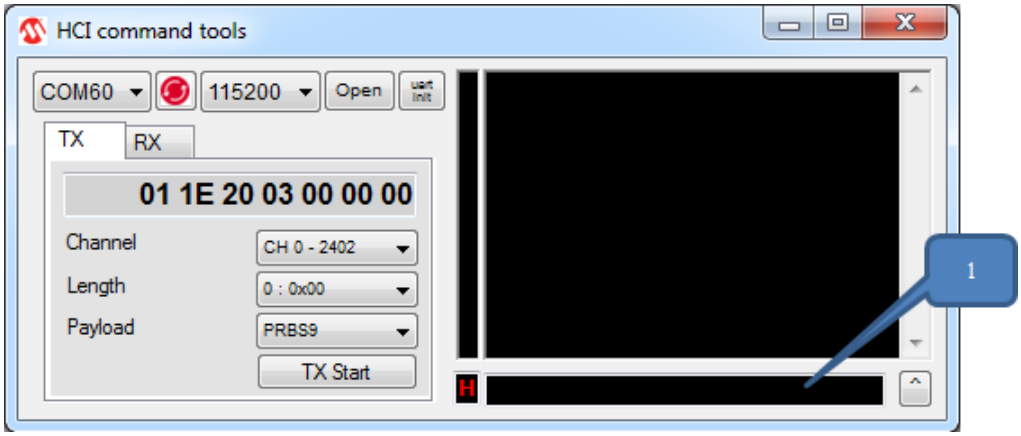
Figure 5-11. UART Init



5.4 Serial Port

After successful initialization, the Serial port communication starts and enter the commands to be sent using the text box, as shown in the following figure. The commands can be Hexadecimal or Decimal value for Hexadecimal command or String.

Figure 5-12. Serial Port Communication

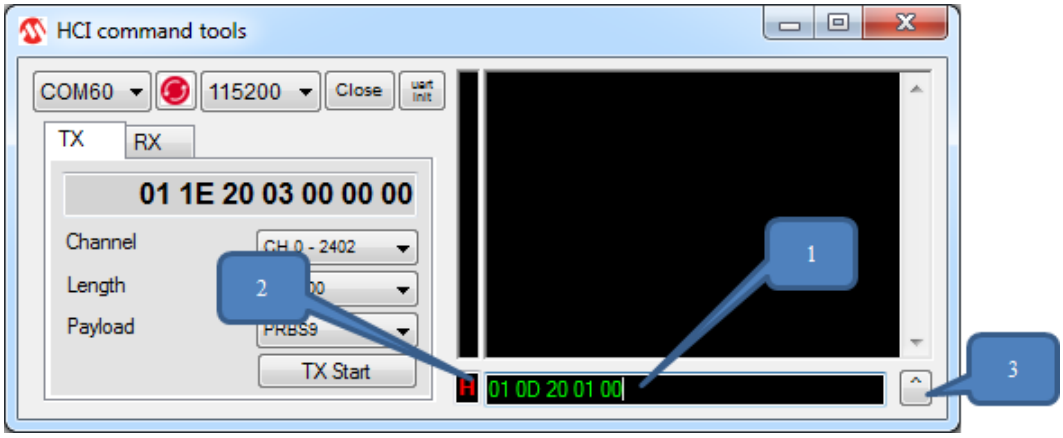


5.4.1 Hexadecimal Communication

Perform the following steps for Hexadecimal communication.

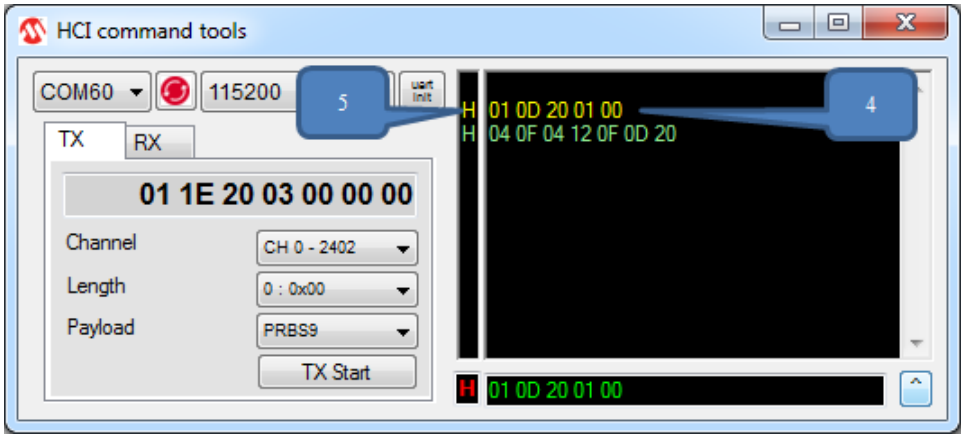
1. Enter the Hex command in the text box.
2. Then double-click the input type display until “H” is shown.
3. Click **^** to send the Hex command input manually.

Figure 5-13. Start Hexadecimal Communication



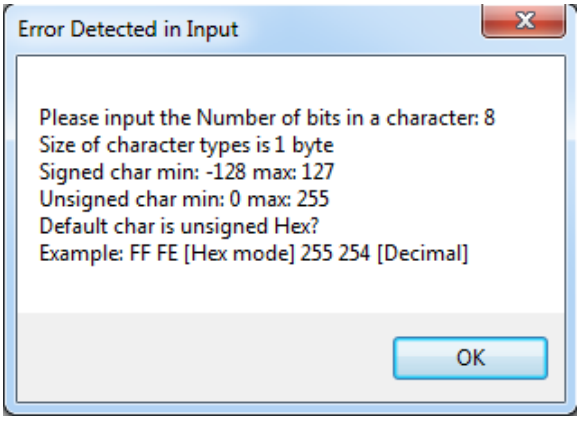
4. The sent manual input command is shown in the log.
5. The log displays the format as “H” (Hexadecimal) or “S” (String). Yellow represents the sent command [Hex] and Green represents the received command [Hex].

Figure 5-14. Sent/Received Command



Provide the Hexadecimal input with 1 byte (Min: 00, Max: FF). For example: 01 1E 20 03 00 00 00

Figure 5-15. Error Detected in Input

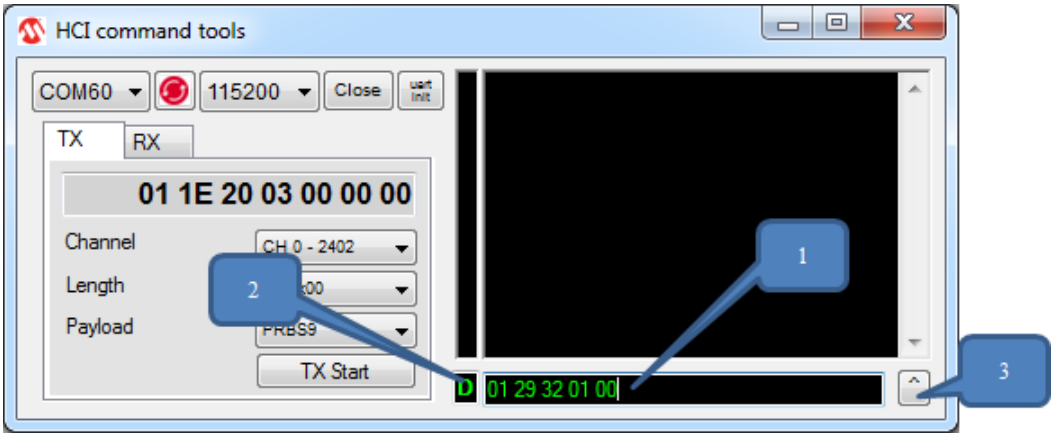


5.4.2 Decimal Input Hexadecimal Communication

Perform the following steps for Decimal input Hexadecimal communication.

1. Enter the Decimal command in the text box.
2. Then double-click the input type display until “D” is shown.
3. Click ^ to send the Decimal command input manually and to auto-convert to Hex command.

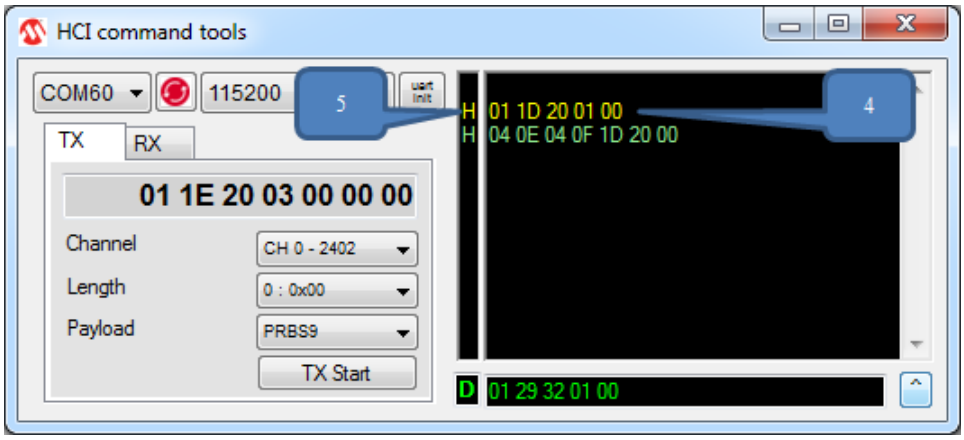
Figure 5-16. Start Hexadecimal Communication with Decimal Input



4. The sent manual input command is shown in the log.

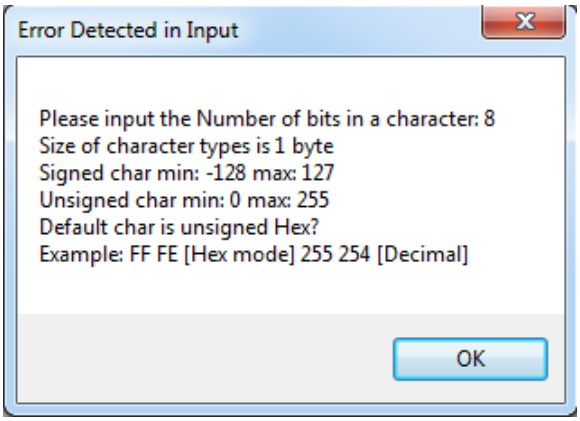
5. The log displays the format as “H” (Hexadecimal) or “S” (String). Yellow represents the sent command [Hex] and Green represents the received command [Hex].

Figure 5-17. Sent/Received Command



Provide the Hexadecimal input with 1 byte (Min: 00, Max: FF). For example: 01 1E 20 03 00 00 00

Figure 5-18. Error Detected in Input

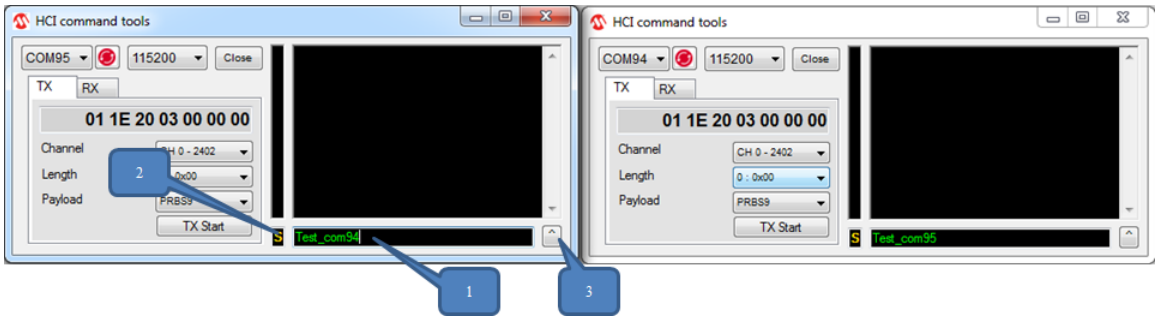


5.4.3 String Communication

Perform the following steps for String communication.

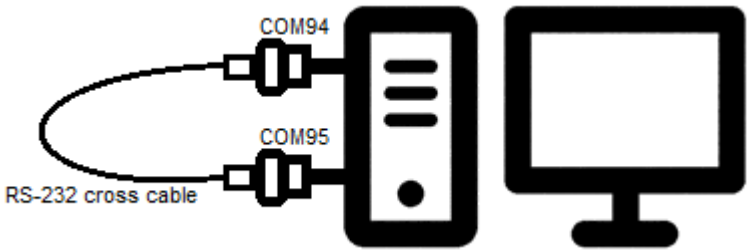
1. Enter the String command in the text box.
2. Then double-click the input type display until “S” is shown.
3. Click ^ to send the String command input manually.

Figure 5-19. Start String Communication



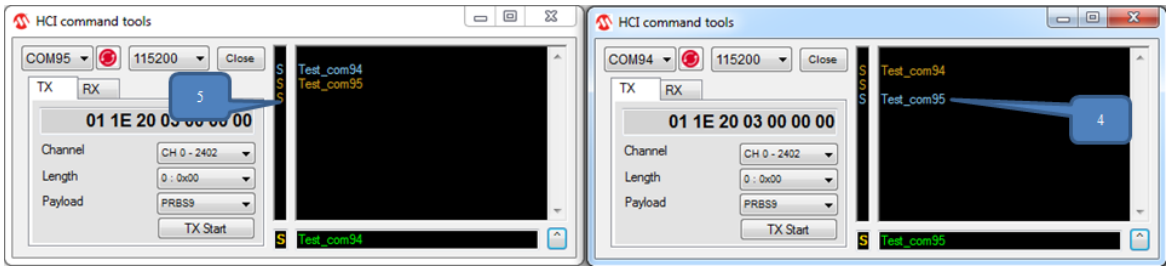
The following display is setup as the loopback for COM Port 94 and COM Port 95.

Figure 5-20. Example of Test Setup



4. The sent manual input command is shown in the log.
5. The log displays the format as “H” (Hexadecimal) or “S” (String). Blue represents the sent command [String] and Gold represents the received command [String].

Figure 5-21. Sent/Received String Command

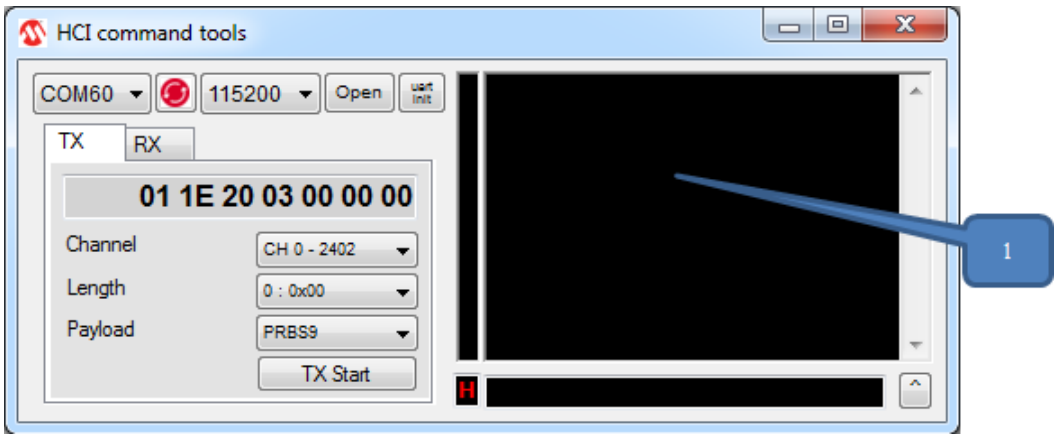


5.4.4 Log

Perform the following steps for String communication.

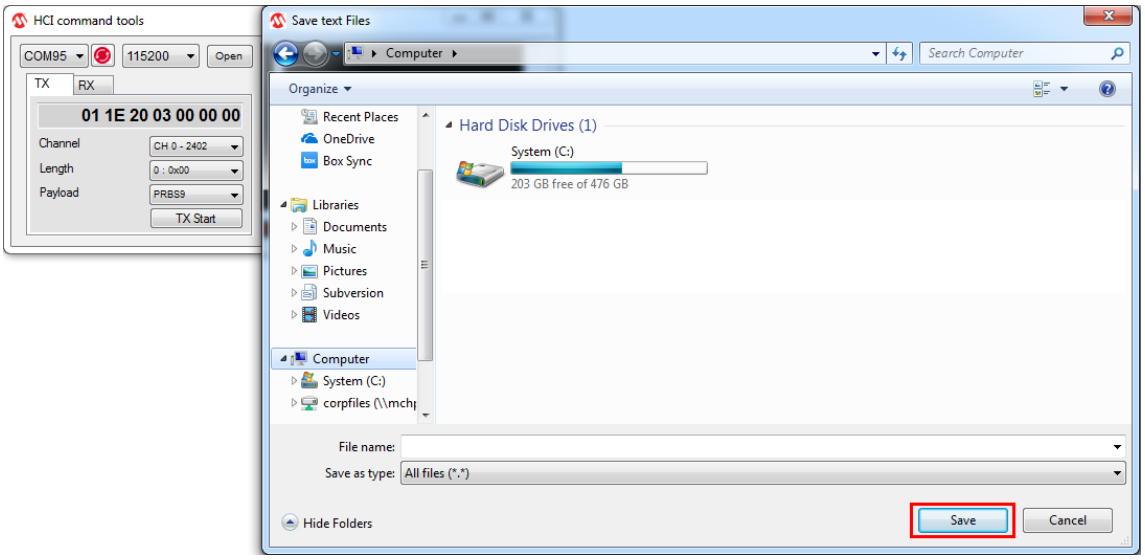
1. Double-click the log display, to select the location to save the file.

Figure 5-22. Saving the Log File



2. Select the log location and file name and then click **Save**.

Figure 5-23. Save Text Files

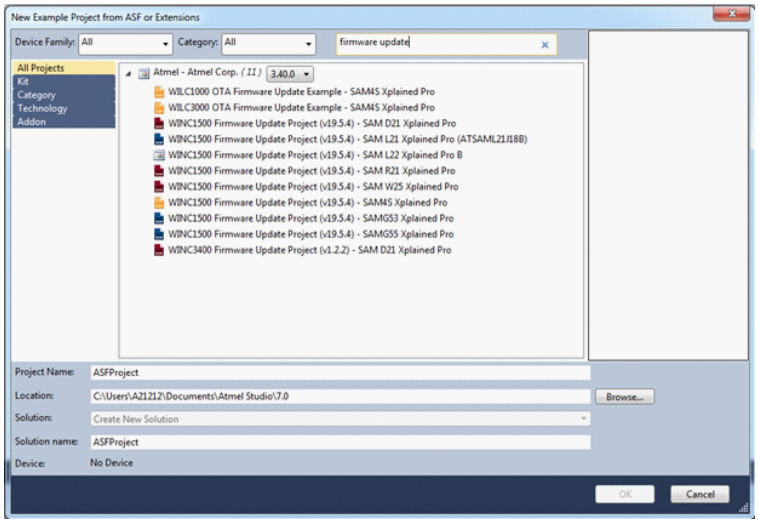


6. Appendix C – Firmware Update

6.1 Firmware Update

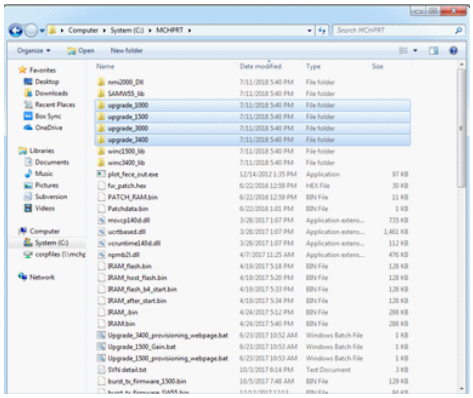
The Firmware update folder included in MCHPRT2 package is from Microchip Studio, Advanced Software Framework (ASF). The following figure shows firmware update example application in Microchip Studio ASF.

Figure 6-1. Firmware Update Folder in ASF



The following figure shows the firmware update folder in MCHPRT2 tool

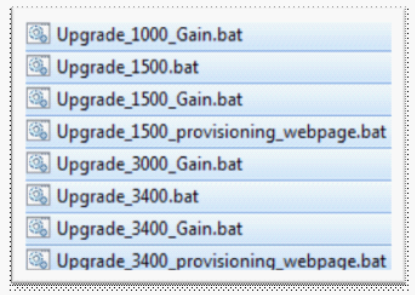
Figure 6-2. Firmware Update Folder in MCHPRT Tool



6.1.1 Firmware/Gain Table Example in MCHPRT2 Package

MCHPRT2 GUI Tool uses the batch file to use the ASF Firmware example project in MCHPRT2 Package.

Figure 6-3. Example for bat File



The following figure shows the details information of what is present in the bat file.

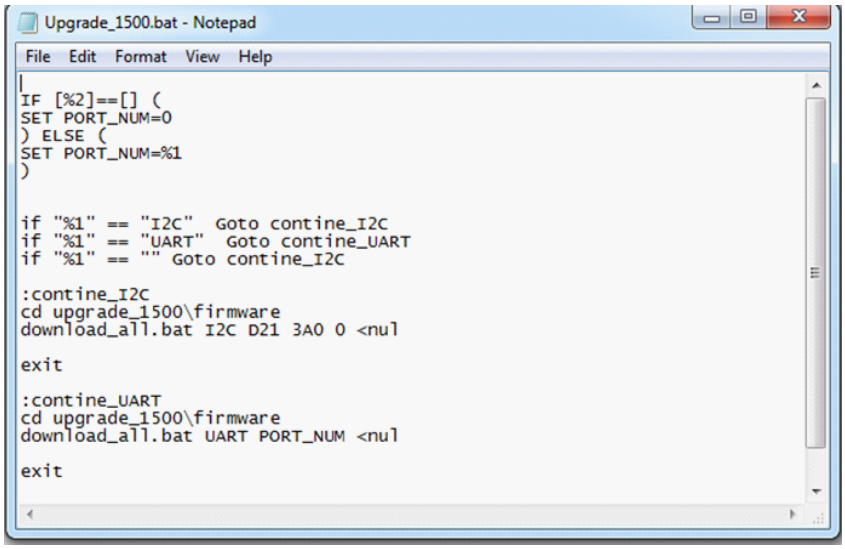
WILC1000 bin file gain table upgrade bat file (upgrade_1000_gain_bat):

cd upgrade_1000 //change the path to upgrade_1000 Folder in the Package.

gain_builder.exe -hp WILCPB.csv -fb burst_tx_firmware_1000.bin // run gain_builder.exe update the gain table in burst_tx_firmware_1000.bin with WILC1000PB.csv gain table value

exit // exit the command prompt

WINC1500 firmware upgrade and gain table example batch file (Upgrade_1500.bat) :



If [%2] == [ ] (SET PORT_NUM = 0) //setting UART Port Number

ELSE (SET PORT_NUM =% 1)

if "%1" == "I2C" Goto continue_I2C // Jump to I2C part based on the command entered in the command prompt

if "%1" == "UART" Goto continue_UART // Jump to UART part based on the command entered in the command prompt

if "%1" == I2C Goto continue_I2C

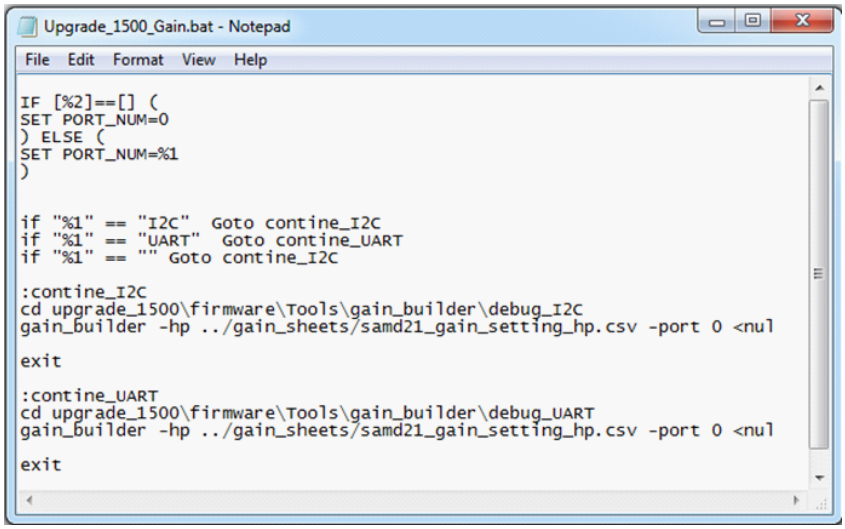
:continue_I2C // I2C Part

cd upgrade_1500\firmware // change the path to upgrade_1500\firmware

donwload_all.bat I2C D21 3A0 0 <nul // giving inputs to donwload_all.bat file if the firmware upgrade is via UART or I2C, D21 part number, chip 3A0, Aardvark serial number, com port of edbg USB device.

exit

upgrade_1500_gain_bat



IF [%2]==[] (// check the input value to

SET PORT_NUM=0

) ELSE (SET PORT_NUM=%1) //setting UART port number to upgrade

if "%1" == "I2C" Goto contine_I2C // jump to I2C part

if "%1" == "UART" Goto contine_UART // jump to UART part

if "%1" == "" Goto contine_I2C

:contine_I2C // update module gain table to samd21_gain_setting_hp.csv value by I2C

cd upgrade_1500\firmware\Tools\gain_builder\debug_I2C

gain_builder -hp ../gain_sheets/samd21_gain_setting_hp.csv -port 0 <nul

exit

:contine_UART // update module gain table to samd21_gain_setting_hp.csv value by UART

cd upgrade_1500\firmware\Tools\gain_builder\debug_UART

gain_builder -hp ../gain_sheets/samd21_gain_setting_hp.csv -port 0 <nul

exit

6.1.2 Firmware Upgrade Folder in MCHPRT2 Package

The folder that is present in MCHPRT2 package can be updated from the firmware update project that is available in Microchip Studio ASF.

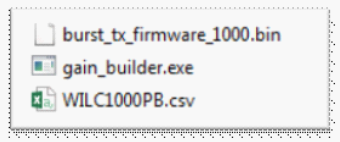
Folder information:

- upgrade_1000 WILC1000 – Gain table upgrade file example
- upgrade_1500 WINC1500 – Firmware example project for ASF

- upgrade_3000 WILC3000 – Gain table upgrade file example
- upgrade_3400 WINC3400 – Firmware example project for ASF

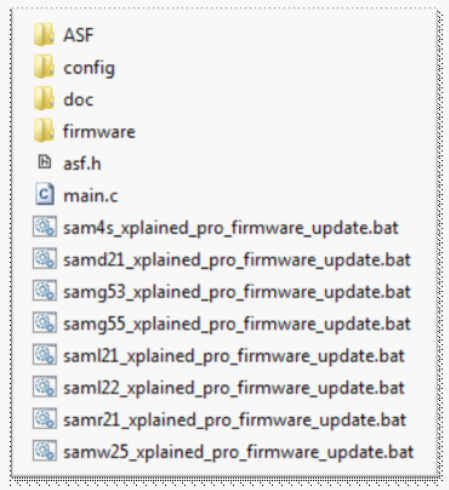
upgrade_1000 includes: upgrade_1000 folder includes burst_tx_firmware_1000.bin, gain_builder.exe and WILC1000PB.csv files as shown in the following figure.

Figure 6-4. Files in upgrade_1000 Folder



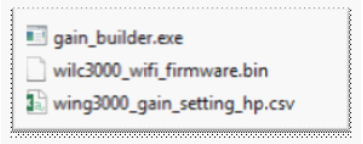
upgrade_1500 includes(same as ASF version 3.40.0): The following figure shows the files that are present in the upgrade_1500. The files are same as the firmware update example project that is available in the ASF.

Figure 6-5. Files in upgrade_1500 Folder



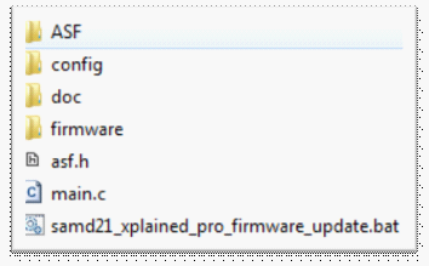
upgrade_3000 includes: upgrade_3000 folder includes wilc3000_wifi_firmware.bin, gain_builder.exe and wilc3000_gain_setting_hp.csv files as shown in the following figure.

Figure 6-6. Files in upgrade_3000 Folder



upgrade_3400 included (same as in ASF version 3.40.0): The following figure shows the files that are present in the upgrade_3400. The files are same as the firmware update example project that is available in the ASF.

Figure 6-7. Files in upgrade_3400 Folder



7. Appendix D – MCHPRT2 Tool Inbuilt Configuration

The MCHPRT2 tool comes with some of the following configuration parameters available in the `list.ini` file of the MCHPRT2 tool package, see the following figure:

- Retry function
- Module enable/disable

Figure 7-1. list.ini

```
DELAY 0
INIT_COUNTER 1
FW_COUNTER 1
MESSAGE_DISABLE 1
TX_duty_cycle 5
==Input the setting to enable the module==
WILC1000 ENABLE
WINC15x0 ENABLE
WILC3000 ENABLE
WINC3400 ENABLE
SAMB11/BTLC1000 DISABLE
```

- DELAY – Delay between retries in milliseconds (ms). The delay range is from 0 ms to 1s.
- INIT_COUNTER – Number of retries in the initial connection loop
- FW_COUNTER – Number of retries of firmware download
- MESSAGE_DISABLE:
  - MESSAGE DISABLE – 1
  - MESSAGE ENABLE – 0

  Note: MESSAGE ENABLE – For some decision making, the MCHPRT2 tool requests the user to manually enter a few parameters, such as, Yes or No, while executing the MCHPRT2 tool commands. For the production environment, disable the message, which is the default configuration.
- Module Enable/Disable – By default, the WILC1000/WINC15x0 and the WILC3000/WINC3400 modules are enabled and SAMB11/BTLC1000 modules are disabled.

8. Document Revision History

Revision	Date	Section	Description
C	02/2023	1.2.1. Serial Bridge Connection (ATWILC/ ATWINC)	• Added hyperlink • Replaced Atmel by Microchip
		2.6. Firmware Upgrade	Replaced Atmel by Microchip
		3.1.1. Initialization	Removed Auto Chip Selection commands • 0 – Autodetect Chip with I2C • 0_UART – Autodetect Chip with UART
		3.1.2. IQ Amplitude and Phase Imbalance Calibration	Added Note
		3.5.2. Write	Removed eFuse "Write MAC ID Only" command section
		6.1. Firmware Update	Replaced Atmel by Microchip
		6.1.2. Firmware Upgrade Folder in MCHPRT2 Package	Replaced Atmel by Microchip
B	03/2022	Document	Minor edits and updates
		1.2.2. MCHPRT2 GUI Tool	• Updated section • Updated Figure 1-3
		2.1.2.1. Start TX – Gain, Channel, Data Rate	Updated section
		3. Command Line	Updated section
		3.1.2. IQ Amplitude and Phase Imbalance Calibration	Added section
		3.5.2.2. Invalidate an eFuse Bank	Added section
		7. Appendix D – MCHPRT2 Tool Inbuilt Configuration	Added section
A	07/2019	All	Initial Revision

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