

# **AW-CB375NF**

## **IEEE 802.11a/b/g/n/ac Wireless LAN 2T2R and Bluetooth 5.0 Combo Module (M.2 2230)**

### **RF Tool Guide (Linux)**

**Rev. A**

(For Standard)

## Revision History

Version	Revision Date	Description	Initials	Approved
A	2020/9/21	● Initial Version	Shihhua Huang	N.C. Chen

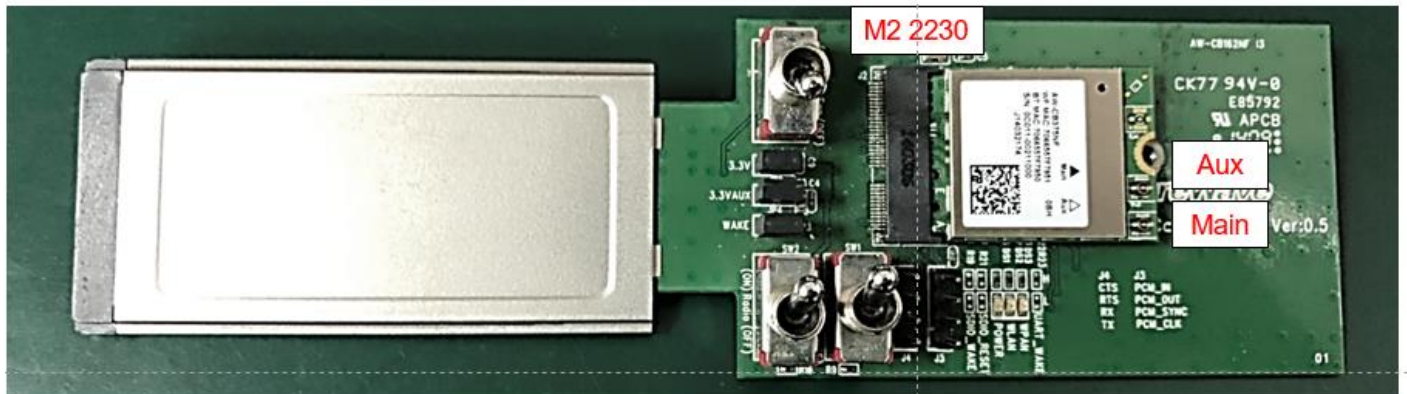
# 1. System Setup

## (1) Hardware Requirements

- AW-CB375NF Module test board(M2 2230)
- Host system need running the Linux operating system (Ubuntu14.04 or later)

**Note: below is using OS Ubuntu 16.04.1 (x64) kernel 4.10 for example**

- Vector Signal Analyzer/WLAN analyzer for transmit measurements.
- WLAN signal generator for receiver measurements.
- RF isolation chamber for receive measurements.
- RF attenuators
- RF cable



## (2) Software Requirements (WiFi)

Note: Use `sudo su` for root authentication with following command.

Note: You may need unlock permissions if you need. (Ex: `chmod 777`)

➤ Unzip Driver source folder -

```
# unzip RTL8822CE_WiFi_linux_v5.7.3_35403_COEX20190531-0e0e.20191028.7z (Wi-Fi normal driver files)
```

➤ Change to the driver source code directory-

```
# cd -xvzf RTL8822CE_WiFi_linux_v5.7.3_35403_COEX20190531-0e0e.20191028.tar.gz
```

```
# cd RTL8822CE_WiFi_linux_v5.7.3_35403_COEX20190531-0e0e.20191028
```

```
# make
```

-----  
If nothing goes wrong, the driver "8xxx.ko" will be generated.  
-----

```
# insmod 88x2cs.ko           // Setup WiFi driver
```

Note: If you need below command can reference that.

```
# rmmmod 88x2cs.ko         // Remove WiFi driver
```

```
# make clean               // Clean 88x2cs.ko and related files
```

### (3) Software Requirements (BT)

Note: Use `sudo su` for root authentication with following command.

Note: You may need unlock permissions if you need. (Ex: `chmod 777`)

➤ Untar Driver source folder -

```
# tar -xvzf Linux_BT_USB_v3.10_20191119_8822CU_BTCEX_20190927-1313.tgz (BT normal driver files)
```

➤ Change to the driver source code directory-

```
# cd Linux_BT_USB_v3.10_20191119_8822CU_BTCEX_20190927
```

```
# cd Bluetooth_usb_driver
```

```
# make
```

-----  
If nothing goes wrong, the driver "rtk\_btusb.ko" will be generated.  
-----

```
# insmod rtk_btusb.ko           // Setup BT driver
```

Note: If you need below command can reference that.

```
# rmmmod rtk_btusb.ko          // Remove BT driver
```

```
# make clean                   // Clean rtk_btusb.ko and related files
```

## (4) Software Requirements (related tool)

Note: Use `sudo su` for root authentication with following command.

Copy the `rtwpriv` (choose one the `rtwpriv_arm`, `rtwpriv_arm64`, `rtwpriv_x86` depending on your system)

➤ Untar Driver source folder -

```
# tar -xvzf rtwpriv_binary_release_v5.6.3.31997.20191031.tar.gz (rtwpriv tool)
```

```
# cd rtwpriv_binary_release_v5.6.3.31997.20191031
```

```
# cd build_platform
```

```
# cp rtwpriv_x86_64 /usr/sbin/ //copy file to the target location
```

```
# chmod 777 /usr/sbin/rtwpriv_x86_64 //Unlock file
```

```
# mv /usr/sbin/rtwpriv_x86_64 /usr/sbin/rtwpriv //rename to "rtwpriv"
```

➤ Unzip Driver source folder –

```
# unzip MP_Tool_for_Linux_20190701_RTL8822CU_x64.zip (BT MP tool)
```

```
# cd MP_Tool_for_Linux_20190701_RTL8822CU_x64
```

```
# cd Linux_tool
```

```
# cp rtlbtmp /usr/sbin // Need copy 1 file to the target location
```

```
# cd .. // Back to the previous step
```

```
# cd BT_Firmware
```

```
# cp mp_rtl8822c_fw /lib/firmware/ // Need copy 2 files to the target location
```

```
# cp mp_rtl8822c_config /lib/firmware/
```

➤ Close Bluetooth audio and change related setting.

```
killall rtk_hciattach
```

```
killall bluetoothd
```

```
echo 0 > /sys/class/rfkill/rfkill0/state
```

```
echo 1 > /sys/class/rfkill/rfkill0/state
```

```
cat /sys/class/rfkill/rfkill0/state
```

## 2. RF Basic Test (WiFi)

### (1) TX Test Mode Command

- Setup the WLAN Driver

```
#insmod 88x2ce.ko
```

- Enable wlan interface

```
#ifconfig wlan0 up
```

- Enter wlan MP mode

```
#rtwpriv wlan0 mp_start
```

- Execute the rtwpriv tool to launch RF Tx.

-----  
Command format (Channel until TxMode is mandatory parameter):

```
rtwpriv wlan0 [Channel] [Bandwidth] [ANT_PAH] [RateID] [TxMode] [Packet Interval] [PacketLength] [Packet Count]  
[Packet Pattern]
```

-----  
#rtwpriv wlan0 36 0 a HTMCS0 1 //Start Tx

```
#rtwpriv wlan0 stop //Stop Tx
```

- To adjust the Tx power index

If you want to adjust [CONTINUOUS Tx] power, please first to stop Tx, then do adjust power index.

```
#rtwpriv wlan0 mp_txpower patha=30,pathb=30,pathc=30,pathd=30 //Set path A and path B TX power level, and the  
Range is 0~63, new chipset (8822C, 8821D, 8814B) is 0~ 127.
```

-----  
If you want to get eFuse TX power index, please input advance the command "rtwpriv wlan0 mp\_get\_txpower 0/1",  
then use the return a value and fill in following orange field (mp\_txpower patha=44, pathb=44).

-----  
#rtwpriv wlan0 mp\_get\_txpower (RF\_Path) // (RF\_Path) of input parameter: 0 or 1 or 2 or 3.

#### i. Instruction Command format

- Please following command below:

```
rtwpriv wlan0 [Channel] [Bandwidth] [ANT_PAH] [RateID] [TxMode] [Packet Interval]  
[PacketLength] [Packet Count] [Packet Pattern]
```

- [Channel]: 1~177

- [BW]: 0 = 20M, 1 = 40M, 2 = 80M

- [ANT\_PAH]: a: PATH A, b: PATH B, c: PATH C, d: PATH D, ab: PATH AB 2x2....
  - [RateID]: 1M 2M 5.5M 11M 6M 9M 12M 18M 24M 36M 48M 54M
- HTMCS0 HTMCS1 HTMCS2 HTMCS3 HTMCS4 HTMCS5 HTMCS6 HTMCS7 HTMCS8 HTMCS9 HTMCS10  
HTMCS11 HTMCS12 HTMCS13 HTMCS14 HTMCS15 HTMCS16 HTMCS17 HTMCS18 HTMCS19 HTMCS20  
HTMCS21 HTMCS22 HTMCS23 HTMCS24 HTMCS25 HTMCS26 HTMCS27 HTMCS28 HTMCS29 HTMCS30  
HTMCS31 VHT1MCS0 VHT1MCS1 VHT1MCS2 VHT1MCS3 VHT1MCS4 VHT1MCS5 VHT1MCS6 VHT1MCS7  
VHT1MCS8 VHT1MCS9 VHT2MCS0 VHT2MCS1 VHT2MCS2 VHT2MCS3 VHT2MCS4 VHT2MCS5 VHT2MCS6  
VHT2MCS7 VHT2MCS8 VHT2MCS9 VHT3MCS0 VHT3MCS1 VHT3MCS2 VHT3MCS3 VHT3MCS4 VHT3MCS5  
VHT3MCS6 VHT3MCS7 VHT3MCS8 VHT3MCS9 VHT4MCS0 VHT4MCS1 VHT4MCS2 VHT4MCS3 VHT4MCS4  
VHT4MCS5 VHT4MCS6 VHT4MCS7 VHT4MCS8 VHT4MCS9
- [TxMode]: 1: PACKET Tx, 2: CONTINUOUS TX, 3: OFDM Single Tone TX
  - [Packet Interval] (Option): 1~65535 us,default 100
  - [PacketLength] (Option): Packet of payload data length, default 1500.
  - [Packet Count] (Option): count the number of packet to Tx, set 0 for CONTINUOUS Packet TX , default is 0.
  - [Packet Pattern] (Option): 00~ff(hex), default random hex.

## ii. MP Test Note

- If you want to continue the MP test, don't do this command "**mp\_stop**", it means you want to finish MP test and switch to Normal mode (Scan and Connect AP).
- Change the config parameter (Rate, Channel, Power index, Bandwidth) or to continue the other MP test, please must first to stop Tx, command "**rtwpriv wlan0 mp\_ctx stop**".
- We must make sure that the instructions have been completed and command in order.

Your MP Test Programs should wait for a return string after executing the command.

Example:

```
#rtwpriv wlan0 mp_start
```

The return-string is: "**wlan0 mp\_start:mp\_start ok**"

Please check return-string to confirm the command is set completely.



## (2) RX Test Mode Command

```
#ifconfig wlan0 up // Enable Device for MP operation
#rtwpriv wlan0 mp_start // Enter MP mode
#rtwpriv wlan0 mp_bandwidth 40M=0,shortGI=0 //40M=0 is set 20M bandwidth mode and long GI, Example:
To set 40M is 40M=1 \ 20M is 40M=0 \ 80M is 40M=2.
#rtwpriv wlan0 mp_channel 1 // Set channel to 1, 2, 3, 4~13 etc.
#rtwpriv wlan0 mp_ant_rx a // Select antenna A for the operation, if device has 2x2 antenna select antenna
"a" or "b" and "ab" for operation.
#rtwpriv wlan0 mp_arx start // start air Rx testing.
#rtwpriv wlan0 mp_arx phy // get the Driver of Rx statistics.
#rtwpriv wlan0 mp_arx stop or #rtwpriv wlan0 mp_reset_stats // Stop air Rx test and show the Statistics /
Reset TX and Rx Counter.
#rtwpriv wlan0 mp_stop // exit MP mode.
If you want to continue the MP test, don't do this command.
#ifconfig wlan0 down // close WLAN interface
```

## (3) Enable/Disable TX Power Tracking

```
#rtwpriv wlan0 mp_pwrctldm start //Enable the power tracking for TX.
#rtwpriv wlan0 mp_pwrctldm stop //Disable the power tracking for TX.
```

### 3. RF Basic Test (BT(BR, EDR))

- Setup the BT Driver

```
#insmod rtk_btusb.ko
```

```
(1) Run rtlbtmp and enable BT //Enable BT MP tool
# rtlbtmp
```

```
root@tristan-PORTEGE-R700:~# rtlbtmp
::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::
:::::::::::: Bluetooth MP Test Tool Starting ::::::::::::::
>
```

```
# enable uart:/dev/ttyUSB0 //UART interface <=2431SM
# enable usb:/dev/rtk_btusb //USB interface
# enable uart:/dev/sdio //SDIO interface
```

```
root@tristan-PORTEGE-R700:~# rtlbtmp
::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::
:::::::::::: Bluetooth MP Test Tool Starting ::::::::::::::
> enable uart:/dev/ttyUSB0
> > > enable[Success:0]
```

```
(2) BT RF test command : //BT Test mode
# bt_mp_Exec 3
# bt_mp_Exec 4
# bt_mp_Exec 1 //Start test mode
# bt_mp_Exec 0 //Stop test mode
```

```
(3) BT Packet Tx test command
# bt_mp_Exec 3
# bt_mp_Exec 4
# bt_mp_SetParam 1,0;2,8;3,7;5,0x3F
//1,0 "0" represent Channel0 · Channel range is 0~78 ;
//2,8 "8" represent Packet Type is 3DH5
"2" represent Packet Type is DH5,
"5" represent Packet Type is 2DH5.
//3,7 "7" represent BT Payload is PRBS9,
"0" represent BT Payload is All0,
"1" represent BT Payload is All1,
"2" represent BT Payload is 0101
# bt_mp_Exec 12 //Start Packet Tx
# bt_mp_Exec 14 //Stop Packet Tx
```

```
(4) BT Continue Tx test command
# bt_mp_Exec 3
```

```
# bt_mp_Exec 4
# bt_mp_SetParam 1,0;2,8;3,7;5,0x3F
//1,0 "0" represent Channel0 · Channel range is 0~78 ;
//2,8 "8" represent Packet Type is 3DH5,
    "2" represent Packet Type is DH5,
    "5" represent Packet Type is 2DH5 ;
//3,7 "7" represent BT Payload is PRBS9,
    "0" represent BT Payload is All0,
    "1" represent BT Payload is All1,
    "2" represent BT Payload is 0101 ;
# bt_mp_Exec 15 //Start Continue Tx
# bt_mp_Exec 17 //Stop Continue Tx
```

(5) BT Single Tone test command

```
# bt_mp_SetParam 1,0x00;2,0x08;3,0x00;4,0x00;5,0x3F;6,0xFF;7,0xFF;11,0x000000c6967e;
//1,0x00 "0x00" represent Channel0 · Channel range is 0~78 ( this value shows Hexadecimal,0x4e represent
Channel78) ;
//2,0x08 "0x08" represent Packet Type is 3DH5,
    "0x02" represent Packet Type is DH5,
    "0x05" represent Packet Type is 2DH5 ;
//3,0x00 "0x00" represent BT Payload is All0,
    "0x01" represent BT Payload is All1,
    "0x02" represent BT Payload is 0101,
    "0x07" represent BT Payload is PRBS9 ;
# bt_mp_Exec 34 //Start BT Single Tone
# bt_mp_Exec 35 //Stop BT Single Tone
```

## 4. RF Basic Test (BT(BLE))

Untar "Linux\_BT\_USB\_v3.10\_20190809\_8822CU\_BTCEX\_20190509-0d0d.tgz" normal driver, and edit `bluetooth_usb_driver/rtk_misc.c` file

```
{0xc123, 0x8822, "mp_rtl8822cu_fw", "rtl8822cu_fw", "rtl8822cu_config", NULL, 0 }, /* RTL8822CE */ to
{0x3548, 0x8822, "mp_rtl8822cu_fw", "rtl8822cu_fw", "rtl8822cu_config", NULL, 0 }, /* RTL8822CE */ this value
0x3548 depending your e-fuse in the device.
```

(1) Key in the "make install -s" //Setup BT device for the normal driver

You can see that "install rtk\_btusb success"

```
azwave@azwave-vm-ubuntu:~/Downloads/Linux_BT_USB_v3.10_20190809_8822CU_BTCEX_20190509-0d0d$ sudo make install -s
[sudo] password for azwave:
Copy 8822CU firmware to /lib/firmware/rtl8822cu_fw
Copy 8822CU config to /lib/firmware/rtl8822cu_config
rmmod: ERROR: Module btusb is not currently loaded
mv: cannot stat '/lib/modules/4.8.0-59-generic/kernel/drivers/bluetooth/btusb.ko': No such file or directory
install rtk_btusb success!
azwave@azwave-vm-ubuntu:~/Downloads/Linux_BT_USB_v3.10_20190809_8822CU_BTCEX_20190509-0d0d$
```

(2) The next step device power off/on to reboot BT device.

(3) And then you can key in `hcitool` command to check device performance.

```
fae@fae-IdeaPad-Y430:~$ sudo hcitool cmd 03 03
< HCI Command: ogf 0x03, ocf 0x0003, plen 0
> HCI Event: 0x0e plen 4
 03 03 0C 00
fae@fae-IdeaPad-Y430:~$ sudo hcitool cmd 08 1e 00 25 00
< HCI Command: ogf 0x08, ocf 0x001e, plen 3
 00 25 00
> HCI Event: 0x0e plen 4
 02 1E 20 00
fae@fae-IdeaPad-Y430:~$
```

(4) Reset command

```
# hcitool cmd 03 03 //Reset device
```

(5) BLE TX command

```
# hcitool cmd 08 1e 00 25 00 //Start BLE TX test
```

Command format

```
hcitool cmd [Channel] [Packet payload]
```

`0x00` PRBS9 Pattern

`0x01` 0xF0 8-bit Pattern

`0x02` 0xAA 8-bit Pattern

```
(6) Reset command
#hctool cmd 03 03 //Reset device
(7) BLE Receiver Test
# hctool cmd 08 1d 00 //Start BLE RX test
```

---

Command format  
hctool cmd [Channel]

---

```
(8) BLE Test end
#hctool cmd 08 1F //Device test end
```