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# **MT-52 WiFi+BT Module User Manual**

Applicable Model No.: MT-52



## Module Features

- Use software development kit (SDK) to design and develop Wearables and IoT applications with RTOS. □

### Wireless

- Single band 2.4GHz IEEE 802.11b/g/n + BT4.2 □
- Supports wireless data rates up to 65Mbit/s □
- CMOS and low-swing sine wave input clock □
- Low power operation supporting deep sleep and □standby modes □

### WiFi

Features	Description
WLAN Standards	IEEE 802.11 b/g/n
Antenna Port	Single Antenna
Frequency Band	2.412 GHz – 2.462 GHz
Number of Sub Channels	1 ~ 11 Channels
Modulation	DSSS, CCK, OFDM, BPSK, QPSK, 16QAM, 64QAM
Supported data rates	1, 2, 5.5, 11 (Mbps) 6, 9, 12, 18, 24, 36, 48, 54 (Mbps) HT20_MCS0(6.5Mbps) ~ HT20_MCS7(65Mbps) HT40_MCS0(13.5Mbps) ~ HT40_MCS7(135Mbps)



## Bluetooth

Features	Description
Frequency Band	2402 MHz ~ 2480 MHz
Number of Sub Channels	40 channels
Modulation	GFSK
Antenna Port	Single Antenna for Wi-Fi- and BT

## Microprocessor

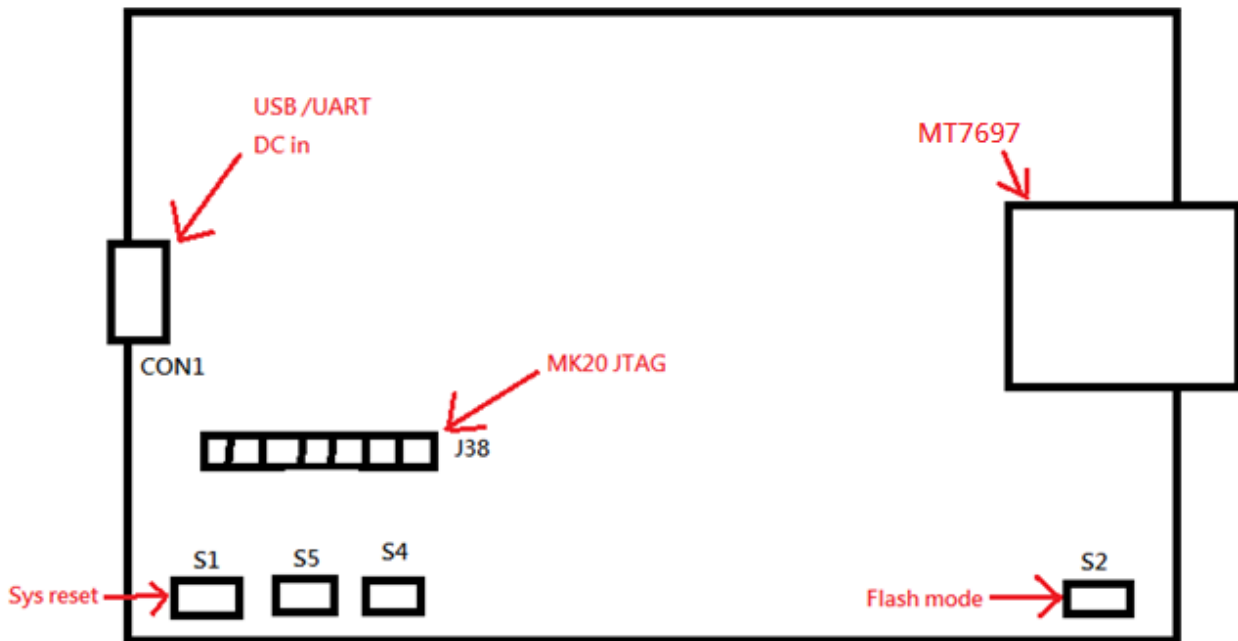
- ARM32-bitCortex-M4CPU □
- CPUfrequencyupto192MHz □
- 28 General Purpose IOs multiplexed with other □interfaces □
- The MCU executes the Thump-2 instruction set for □optimal performance and code size □
- Hardware division and fast multiplier □

## Voltage

Symbol	Parameter	Min.	Typ.	Max.	Unit
VDD_3V3	Power Supply for MCU	3.1	3.3	3.5	V

# User Guide

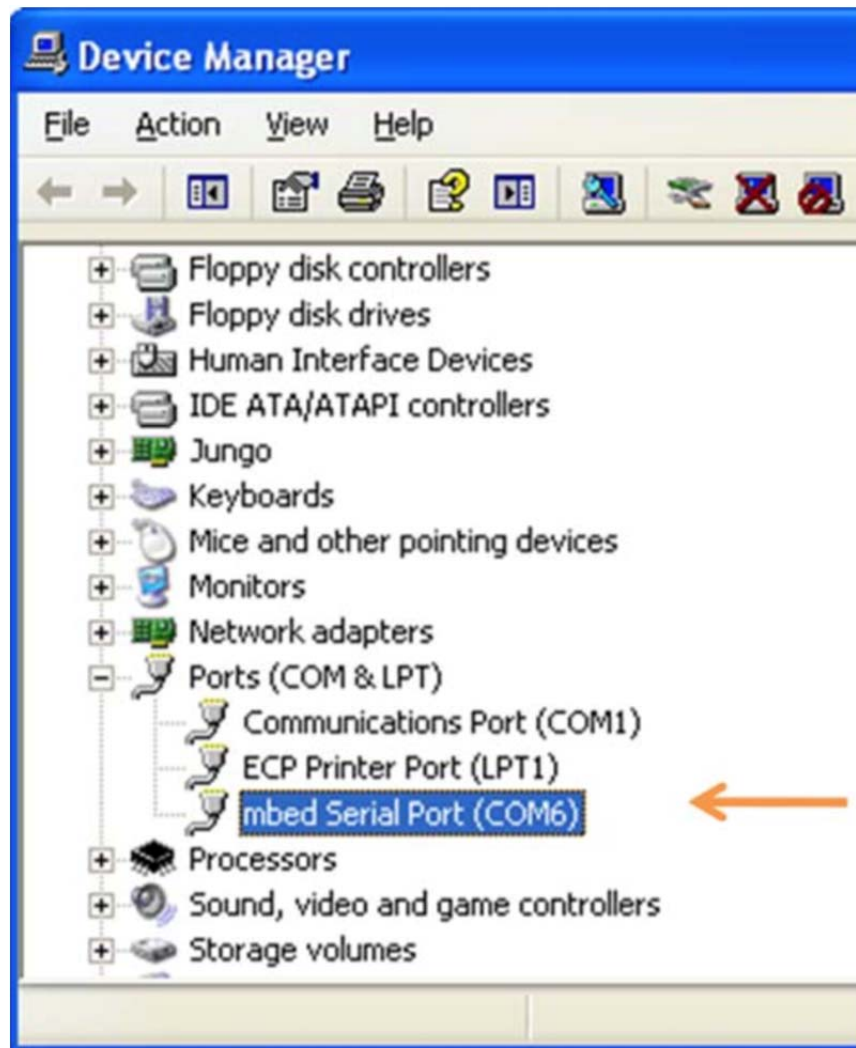
## MT7697Hx EVB



## Installing the EVB drivers on Microsoft Windows

Apply the following configuration settings in your terminal application:

- 1) Connect the EVB to the computer using a micro-USB cable.
- 2) Install mbed Windows serial port driver. In Device Manager, navigate to Ports (COM & LPT). A new COM device should appear under Ports (COM & LPT) in Device Manager.



## Serial port settings

Apply the following configuration settings in your terminal application:

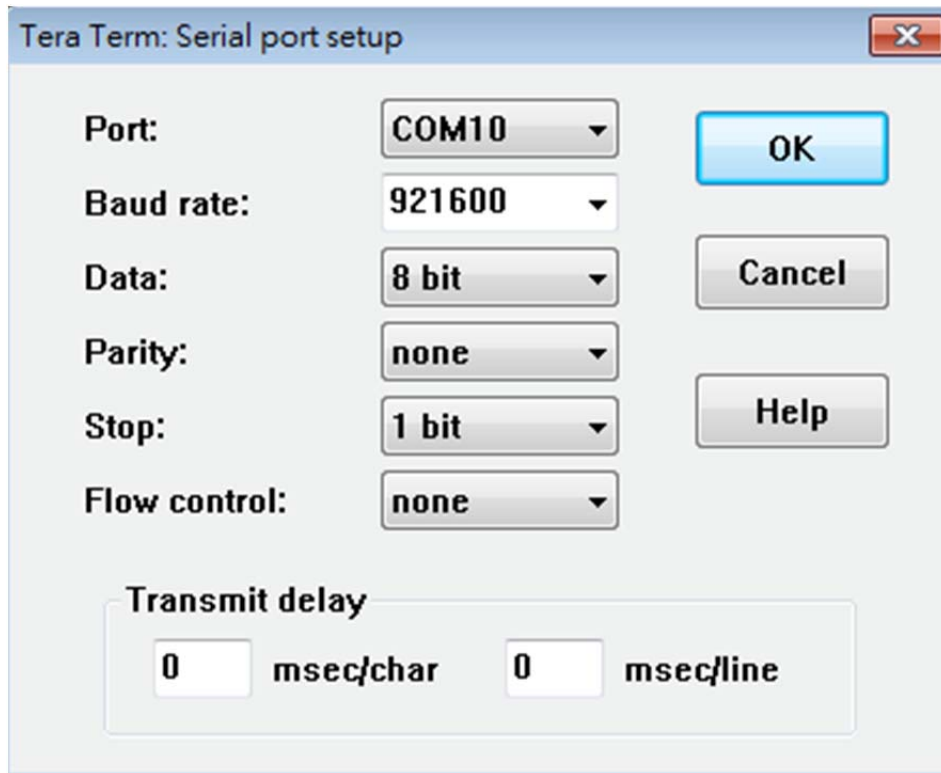
If you are using TeraTerm:

- 1) Launch TeraTerm and then click Setup on the top menu of the command window.
- 2) Click the Serial Port setup.
- 3) Select the COM port number that maps to the mbed serial port.



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4) Set the Baud rate, Data, Parity, Stop and Flow control parameters. Leave the Transmit delay fields with default values (0), and click OK.



## Run the User Mode Application

- 1) Connect the micro-USB cable to power on the board.
- 2) Open the terminal application and connect to the mbed serial port.
- 3) Press the reset button S1 (RST) on the board.
- 4) Observe the output log from UART port. A reference log example is shown below.



```

COM10:921600baud - Tera Term VT
File Edit Setup Control Window Help

[T: 76 M: common C: info F: system_init L: 318]: FreeRTOS Running
$ wifi_task
$ [T: 4031 M: common C: info F: wifi_connect L: 98]: wifi config init success
[T: 4195 M: common C: info F: wifi_init L: 792]: wifi_init_register_callback.
[T: 4196 M: common C: info F: wifi_init L: 807]: NetTaskInit
[T: 4196 M: common C: info F: wifi_init L: 817]: wpa_supplicant_task_init
[T: 4203 M: wifi C: error F: wifi_wlan_evt_handler L: 1320]: Supplicant is not ready to receive event from interface(=0) yet.
[T: 4217 M: common C: info F: wifi_init_done_handler L: 1618]: WiFi Init Done: port = 0
[T: 4217 M: minisupp C: error F: wpa_supplicant_entry L: 418]: ===== Supplicant Ready =====
[T: 4299 M: minisupp C: error F: wpa_supplicant_entry_op_mode_set L: 648]: wpa_supplicant_entry_op_mode_set: same op_mode(=1), r
ecoverly event register & get_sta_qos_bit hook.

wifi_connect;200

$ bt_task
$ [T: 7907 M: common C: info F: bt_demo_generate_local_address L: 130]: [BT]Empty bt address after bt_gap_le_get_local_address()
[T: 7907 M: common C: info F: bt_demo_generate_local_address L: 131]: [BT]Try to read from NVDM.
[T: 7907 M: common C: info F: bt_demo_generate_local_address L: 134]: [BT]Read from NVDM:085C8E38FBC6
[T: 7907 M: common C: info F: bt_demo_generate_local_address L: 141]: [BT]Read address from NVDM [08:5C:8E:38:FB:C6]
[T: 7907 M: BT C: info F: bt_debug_log L: 113]: [1][BT_CMGR] bt_callback_manager_register_callback, type 1, module_mask 0, callb
ack 100b2131
[T: 7908 M: BT C: info F: bt_debug_log L: 113]: [1][BT_CMGR] bt_callback_manager_register_callback, type 3, module_mask 0, callb
ack 100b7151
[T: 7908 M: BT C: info F: bt_debug_log L: 113]: [1][BT_CMGR] bt_callback_manager_register_callback, type 6, module_mask 0, callb
ack 10086161
[T: 7908 M: BT C: info F: bt_debug_log L: 113]: [1][BT_CMGR] bt_callback_manager_register_callback, type 7, module_mask 0, callb
ack 1009b32d
[T: 7908 M: BT C: info F: bt_debug_log L: 113]: [1][BT_CMGR] bt_callback_manager_register_callback, type 8, module_mask 0, callb
ack 100860e1
[T: 7908 M: BT C: info F: bt_debug_log L: 113]: [1][BT_CMGR] bt_callback_manager_register_callback, type 11, module_mask 0, call
back 100b9525
[T: 7909 M: BT C: info F: bt_debug_log L: 113]: [1][BT_CMGR] bt_callback_manager_register_callback, type 12, module_mask 0, call
back 100b2e85
[T: 7910 M: BT C: info F: bt debug log L: 113]: [1][BT_CMGR] bt callback manager register callback, type 0, module_mask 2d210, c

```

## WiFi Commands

This section introduces the Wi-Fi CLI APIs including terms and acronyms, supported features, details on how to use the Wi-CLI, function groups, enumerations, structures and functions.

Command Syntax	Parameter	Example	Description
wifi_task			Start WiFi Application Task
wifi config set opmode <mode>	<mode> 1:STA mode 2:AP mode 3:Repeater mode	wifi config set opmode 1	Set the current operation mode as STA
wifi config get	Output:	wifi config get	Get the current



opmode	1:STA mode 2:AP mode 3:Repeater mode	opmode	operation mode
wifi config set ssid <port> <ssid>	<port> 0:STA 1:AP <ssid> The ssid of target AP	wifi config set ssid 0 APRouter	Set the ssid named "APRouter" in STA mode
wifi config get ssid <port>	Output: ssid setting	wifi config get ssid 0	Get the current ssid setting
wifi config set sec <port> <auth_mode> <encrypt_type>	<port> 0:STA 1:AP <auth_mode> 7:WPA2PSK(AES) 7:WPA2PSK(TKIP) 7:WPA2PSK(AES+TKIP) 4:WPAPSK(AES) 4:WPAPSK(TKIP) 9:WPAPSK+WPA2PSK(AES+TKIP) 0:WEP(OPEN) <encrypt_type> 6:WPA2PSK(AES) 4:WPA2PSK(TKIP) 8:WPA2PSK(AES+TKIP) 6:WPAPSK(AES) 4:WPAPSK(TKIP) 8:WPAPSK+WPA2PSK(AES+TKIP) 0:WEP(OPEN)	wifi config set sec 0 0 1	Set the authentication mode and encryption mode for the specified AP
wifi config get sec <port>	Output: authentication mode and encryption mode	wifi config get sec 0	Get the authentication mode and encryption mode
wifi config set psk	<port>	wifi config set psk	Set the password of





<port> <password>	0: STA 1: AP <password> 8 ~ 63 bytes ASCII or 64 bytes Hex	0 12345678	the specified AP
wifi config get psk <port>	Output: password setting	wifi config get psk 0	Get the password of connected AP
wifi config set wep <port> <key_id> <key_string_id>	<port> 0: STA 1: AP <key_id> 0~3 <key_string_id> The key string of specified id	wifi config set wep 0 0 1234567890	Set the key string of first key as "1234567890" The wep key string length should be 5 or 10 or 13 or 26
wifi config get wep <port> <key_id>	Output: Get the key string of specified key id	wifi config set wep 0 0	Get the key string of specified key id
wifi config set ch <port> <ch>	<port> 0: STA 1: AP <ch> 1~14 are supported for 2.4GHz only	wifi config set ch 0 1	Set the current channel as 1
wifi config get ch <port>	Output: Get the current channel	wifi config get ch 0	Get the current channel
wifi config set bw <port> <bw>	<port> 0: STA 1: AP <bw> 0: 20MHz 1: 40MHz	wifi config set bw 0 0	Set the current bandwidth
wifi config get bw <port>	Output: Get the current bandwidth	wifi config get bw 0	Get the current bandwidth
wifi config set	<port>	wifi config set	Set the current



wirelessmode <port> <mode>	0: STA 1: AP <mode> 0: 11BG mixed 1: 11B only 4: 11G only 6: 11N only in 2.4G 7: 11GN mixed 9: 11BGN mixed	wirelessmode 0 0	wireless mode
wifi config get wirelessmode <port>	Output: Get the current wireless mode	wifi config get wirelessmode 0	Get the current wireless mode
wifi config set country <band> <region>	<band>: 0: 2.4G 1: 5G <region> (2.4G): 0: CH1~11 1: CH1~13 2: CH10~11 3: CH10~13 4: CH14 5: CH1~14 6: CH3~9 7: CH5~13	wifi config set country 0 0	Set the region of 2.4GHz band
wifi config get country <band>	Output: Get the current region info	wifi config get country 0	Get the region of 2.4GHz band
wifi config get mac <port>	<port> 0: STA 1: AP	wifi config get mac 0	Get the Mac address
wifi config set radio <on_off>	<on_off> 0: OFF 1: ON	wifi config set radio 1	Wi-Fi interface radio will turn on
wifi config get radio	Output:	wifi config get	Get the current



	0: OFF 1: ON	radio	status of Wi-Fi interface radio
wifi config set rxraw <enable>	<enable> 0: unregister 1: register		Set RX RAW packet
wifi config set txraw			Send TX RAW packet
wifi connect get linkstatus	<output> Return the link status only for station mode 0: disconnected 1: connected	wifi connect get linkstatus	
wifi connect get stalist	<output> Return the number of associated stations only for AP mode Default max number of station is 16	wifi connect get stalist	
wifi connect get max_num_sta	<output> Get the maximum number of supported stations in AP mode or Repeater mode	wifi connect get max_num_sta	
wifi connect get rssi	<output> Get rssi of the connected AP Note: Only used for STA mode and the station has connected to the AP	wifi connect get rssi	
wifi connect set deauth <MAC>		wifi connect set deauth <MAC>	Disconnect the specified station of the MacAddress
wifi connect set eventcb <enable> <enable_ID>	<enable>: 0:register 1:unregister		



	<p>&lt;enable_ID&gt;:</p> <p>0:link up event</p> <p>1:scan complete event</p> <p>2:disconnect event</p> <p>3:port secure event</p> <p>4:report beacon/probe response frames</p>		
<p>config read</p> <p>&lt;group_name&gt;</p> <p>&lt;data_item_name&gt;</p>	<p>Read the data from NVDM with specified group name and data item name.</p> <p>&lt;group_name&gt;: the group name of the data item, such as: common; STA; AP</p> <p>&lt;data_item_name&gt;: the name of the data item, such as: IpMode, MacAddr, IpAddr, OpMode, Ssid, SsidLen, BW, AuthMode, EncrypType, WpaPsk, WpaPskLen, DefaultKeyId</p>	<p>config read STA</p> <p>AuthMode</p>	<p>Read authmode of STA from NVDM</p>
<p>config write</p> <p>&lt;group_name&gt;</p> <p>&lt;data_item_name&gt;</p> <p>&lt;item_value&gt;</p>	<p>Write value of specified group name and data item name to NVDM.</p> <p>&lt;group_name&gt;: the group name of the data item, such as: common; STA; AP</p> <p>&lt;data_item_name&gt;: The same with config read cli.</p> <p>&lt;item_value&gt;: The value depends on the specified group name and data item name</p>	<p>config write STA</p> <p>MacAddr</p> <p>00:00:4c:76:87:01</p>	<p>Write the MAC address of STA to NVDM</p>
<p>config reset</p> <p>&lt;group_name&gt;</p>	<p>&lt;group_name&gt;: the group name of the data item, such as: common; STA; AP</p>	<p>Example1: config reset STA</p> <p>Recovers the</p>	<p>Recover the default value of the group not specified</p>



		default value of the group STA Example2: config reset	
config show <group_name>	<group_name>: the group name of the data item, such as: common; STA; AP	Example1: config show STA Show content of the group STA. Example2: config show	Show content of the group not specified
wifi config set reload			Reload the configuration

## Wi-Fi CLI Usage Examples

### 1. STA Mode

Mode	Command	Description
AP Router :OPEN	wifi config set opmode 1 wifi config set ssid 0 TEST_AP wifi config set reload	connect AP with OPEN mode
AP Router :WPA2- PSK(TKIP)	wifi config set opmode 1 wifi config set ssid 0 TEST_AP wifi config set psk 0 12345678 wifi config set reload	connect AP with WPA2-PSK(TKIP) mode
AP Router :WEP(OPEN)(64bit)	wifi config set opmode 1 wifi config set ssid 0 TEST_AP wifi config set wep 0 0 12345 (use the first key index, the key index start from 0) wifi config set reload	connect AP with WEP OPEN(64bit) mode,WEP key is 12345

### 2. SoftAP Mode



Mode	Command	Description
Soft AP :OPEN	wifi config set opmode 2 wifi config set ssid 1 TEST_AP wifi config set sec 1 0 1 wifi config set bw 1 1 (set the bandwidth of softAP as 40MHZ) wifi config set reload	connect SoftAP with OPEN mode
Soft AP :WPA2-PSK(TKIP)	wifi config set opmode 2 wifi config set ssid 1 TEST_AP wifi config set sec 1 7 4 wifi config set psk 1 12345678 wifi config set bw 1 1 wifi config set reload	config SoftAP as WPA2-PSK(TKIP) mode,Password is 12345678
Soft AP :WEP(OPEN)(64bit)	wifi config set opmode 2 wifi config set ssid 1 TEST_AP wifi config set sec 1 0 0 wifi config set wep 1 0 12345 (use the first key index,the key index start from 0) wifi config set bw 1 1 wifi config set reload	config SoftAP as WEP(OPEN)(64bit)mode,Password is 12345

## Bluetooth Commands

This application bring up the Bluetooth BR/EDR (A2DP, AVRCP, HFP) communication and include Bluetooth CLI APIs

Command Syntax	Parameter	Description
bt_task		Start BT Application Task
btaddr		Show BT local public address
ble show status		Dump device status



ble po		Power on
ble pf		Power off
ble scan on		Start scan
ble scan off		Stop scan
ble advanced scan [scan type] [Own Address Type] [Scanning Filter Policy]	[scan type] 0x00: Passive scan 0x01: Active scan [Own Address Type] 0x00: Public address type 0x01: Random address 0x02: Public identity address type 0x03: Random identity address type [Scanning Filter Policy] 0x00: No scanning filter 0x01: Scan using the white list filter	Advanced Scan
ble adv on		Enable advertising
ble adv off		Disable advertising
ble advanced adv [own addr type] [adv type] [advertising_filter_policy] [peer addr type] [peer BT addr]	[own addr type] 0: public 1: random 2: Gen RPA from resolving list or public address host provide 3: Gen RPA from resolving list or static random address host provide [adv type] 0: ADV_IND 1: ADV_DIRECT_IND high duty cycle 2: ADV_SCAN_IND 3: ADV_NONCONN_IND 4: ADV_DIRECT_IND low duty cycle [peer addr type] 0: public 1: random [advertising_filter_policy]	Advanced advertising



	define in spec, 0~4 [peer addr type] BT_GAP_LE_AD_xxxx 0~4 [peer BT Addr] peer BT address for BT_GAP_LE_AD_CONNECTABLE_DIRECTED_HIGH or BT_GAP_LE_AD_CONNECTABLE_DIRECTED_LOW	
ble connect [addr_type] [bt address]	[addr_type] 0: public 1: random [bt address]	Connect
ble advanced connect [Initiator_Filter_Policy] [Own_Address_Type] [Peer_Address_Type] [Peer_Address]	[Initiator_Filter_Policy] 0: white list is not used 1: white list is used [Own_Address_Type] 0~4: Public/Random/RPA or Public/RPA or Random [Peer_Address_Type] 0~4: Public/Random/Public Identity/Random Identity [Peer_Address] Test case command for Privacy 1.2: [ar on] advanced connect 0 2 2 [Peer Identity Address] advanced connect 1 2 0 0x000000000000	Advanced connect
ble disconnect		Disconnect
ble read rssi		Read rssi
ble list connection		List connection





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### **Federal Communication Commission Interference Statement**

This device complies with Part 15 of the FCC Rules. Operation is subject to the following two conditions: (1) This device may not cause harmful interference, and (2) this device must accept any interference received, including interference that may cause undesired operation.

This equipment has been tested and found to comply with the limits for a Class B digital device, pursuant to Part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference in a residential installation. This equipment generates, uses and can radiate radio frequency energy and, if not installed and used in accordance with the instructions, may cause harmful interference to radio communications. However, there is no guarantee that interference will not occur in a particular installation. If this equipment does cause harmful interference to radio or television reception, which can be determined by turning the equipment off and on, the user is encouraged to try to correct the interference by one of the following measures:

- Reorient or relocate the receiving antenna.
- Increase the separation between the equipment and receiver.
- Connect the equipment into an outlet on a circuit different from that to which the receiver is connected.
- Consult the dealer or an experienced radio/TV technician for help.

FCC Caution: Any changes or modifications not expressly approved by the party responsible for compliance could void the user's authority to operate this equipment.

This transmitter must not be co-located or operating in conjunction with any other antenna or transmitter.

#### **Radiation Exposure Statement:**

This equipment complies with FCC radiation exposure limits set forth for an uncontrolled environment. This equipment should be installed and operated with minimum distance 20cm between the radiator & your body.



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**This device is intended only for OEM integrators under the following conditions:**

- 1) The antenna must be installed such that 20 cm is maintained between the antenna and users, and
- 2) The transmitter module may not be co-located with any other transmitter or antenna.

As long as 2 conditions above are met, further transmitter test will not be required. However, the OEM integrator is still responsible for testing their end-product for any additional compliance requirements required with this module installed

**IMPORTANT NOTE:** In the event that these conditions can not be met (for example certain laptop configurations or co-location with another transmitter), then the FCC authorization is no longer considered valid and the FCC ID can not be used on the final product. In these circumstances, the OEM integrator will be responsible for re-evaluating the end product (including the transmitter) and obtaining a separate FCC authorization.

#### **End Product Labeling**

This transmitter module is authorized only for use in device where the antenna may be installed such that 20 cm may be maintained between the antenna and users. The final end product must be labeled in a visible area with the following: "Contains FCC ID: COFMT-52". The grantee's FCC ID can be used only when all FCC compliance requirements are met.

#### **Manual Information To the End User**

The OEM integrator has to be aware not to provide information to the end user regarding how to install or remove this RF module in the user's manual of the end product which integrates this module.

The end user manual shall include all required regulatory information/warning as show in this manual.



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**This device is intended only for OEM integrators under the following conditions:**

- 1) The antenna must be installed with 20 cm is maintained between the antenna and users **in mobile or fixed applications.**
- 2) **The Antenna for Module (COFMT-52) is detachable and the maximum antenna gain allowed for use with this device is 2.5 dBi.**
- 3) The transmitter module may not be co-located with any other transmitter or antenna.
- 4) **OEM integrators Must** demonstrate SAR test and meet compliance before end-product with module ( **COFMT-52**) marketed **in portable application.**

As long as 2 conditions above are met, further transmitter test will not be required. However, the OEM integrator is still responsible for testing their end-product for any additional compliance requirements required with this module installed.

**OEM integrators Must** demonstrate Part 15B test and meet compliance before end-product with module ( **COFMT-52**) marketed.



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**Industry Canada statement:**

This device complies with ISED's licence-exempt RSSs. Operation is subject to the following two conditions: (1) This device may not cause harmful interference, and (2) this device must accept any interference received, including interference that may cause undesired operation.

Le présent appareil est conforme aux CNR d'ISED applicables aux appareils radio exempts de licence. L'exploitation est autorisée aux deux conditions suivantes : (1) le dispositif ne doit pas produire de brouillage préjudiciable, et (2) ce dispositif doit accepter tout brouillage reçu, y compris un brouillage susceptible de provoquer un fonctionnement indésirable.

**Radiation Exposure Statement:**

This equipment complies with ISED radiation exposure limits set forth for an uncontrolled environment. This equipment should be installed and operated with minimum distance 20cm between the radiator & your body.

**Déclaration d'exposition aux radiations:**

Cet équipement est conforme aux limites d'exposition aux rayonnements ISED établies pour un environnement non contrôlé. Cet équipement doit être installé et utilisé avec un minimum de 20 cm de distance entre la source de rayonnement et votre corps.



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**This device is intended only for OEM integrators under the following conditions: (For module device use)**

- 1) The antenna must be installed such that 20 cm is maintained between the antenna and users, and
- 2) The transmitter module may not be co-located with any other transmitter or antenna.

As long as 2 conditions above are met, further transmitter test will not be required. However, the OEM integrator is still responsible for testing their end-product for any additional compliance requirements required with this module installed.

**Cet appareil est conçu uniquement pour les intégrateurs OEM dans les conditions suivantes: (Pour utilisation de dispositif module)**

- 1) L'antenne doit être installée de telle sorte qu'une distance de 20 cm est respectée entre l'antenne et les utilisateurs, et
- 2) Le module émetteur peut ne pas être coimplanté avec un autre émetteur ou antenne.

Tant que les 2 conditions ci-dessus sont remplies, des essais supplémentaires sur l'émetteur ne seront pas nécessaires. Toutefois, l'intégrateur OEM est toujours responsable des essais sur son produit final pour toutes exigences de conformité supplémentaires requis pour ce module installé.



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**IMPORTANT NOTE:**

In the event that these conditions can not be met (for example certain laptop configurations or co-location with another transmitter), then the Canada authorization is no longer considered valid and the IC ID can not be used on the final product. In these circumstances, the OEM integrator will be responsible for re-evaluating the end product (including the transmitter) and obtaining a separate Canada authorization.

**NOTE IMPORTANTE:**

Dans le cas où ces conditions ne peuvent être satisfaites (par exemple pour certaines configurations d'ordinateur portable ou de certaines co-localisation avec un autre émetteur), l'autorisation du Canada n'est plus considéré comme valide et l'ID IC ne peut pas être utilisé sur le produit final. Dans ces circonstances, l'intégrateur OEM sera chargé de réévaluer le produit final (y compris l'émetteur) et l'obtention d'une autorisation distincte au Canada.

**End Product Labeling**

This transmitter module is authorized only for use in device where the antenna may be installed such that 20 cm may be maintained between the antenna and users. The final end product must be labeled in a visible area with the following: "Contains IC:10293A-MT52".

**Plaque signalétique du produit final**

Ce module émetteur est autorisé uniquement pour une utilisation dans un dispositif où l'antenne peut être installée de telle sorte qu'une distance de 20cm peut être maintenue entre l'antenne et les utilisateurs. Le produit final doit être étiqueté dans un endroit visible avec l'inscription suivante: "Contient des IC: 10293A-MT52".

**Manual Information To the End User**

The OEM integrator has to be aware not to provide information to the end user regarding how to install or remove this RF module in the user's manual of the end product which integrates this module.

The end user manual shall include all required regulatory information/warning as show in this manual.

**Manuel d'information à l'utilisateur final**

L'intégrateur OEM doit être conscient de ne pas fournir des informations à l'utilisateur final quant à la façon d'installer ou de supprimer ce module RF dans le manuel de l'utilisateur du produit final qui



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intègre ce module.

Le manuel de l'utilisateur final doit inclure toutes les informations réglementaires requises et avertissements comme indiqué dans ce manuel.

**Brazil (ANATEL)**



**Mexico (IFFETEL)**



**Hong Kong (OFCA)**



**Taiwan (NCC)**

