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User Guide

(簡易使用手冊)

產品名稱 (Product):   Demo Board for MDBT42Q-ATM / PATM

產品型號 (Model No.):   **MDBT42Q – AT – UART – M**

韌體版本 (FW Revision):   1.2

Index

1. Introduction

This document shows how to use the demo board (MDBT42Q-AT-UART-M) to test function of MDBT42Q-ATM & MDBT42Q-PATM.

MDBT42Q-AT-UART-M is designed for testing and debugging without building your own board. The board is only available with MDBT42Q-ATM (chip antenna) module. MDBT42Q-ATM will be pre-programmed with Raytac's AT command firmware. If you don't need such pre-programming and is looking for nRF52832 module, please check MDBT42Q-512KV2 and MDBT42Q-P512KV2.
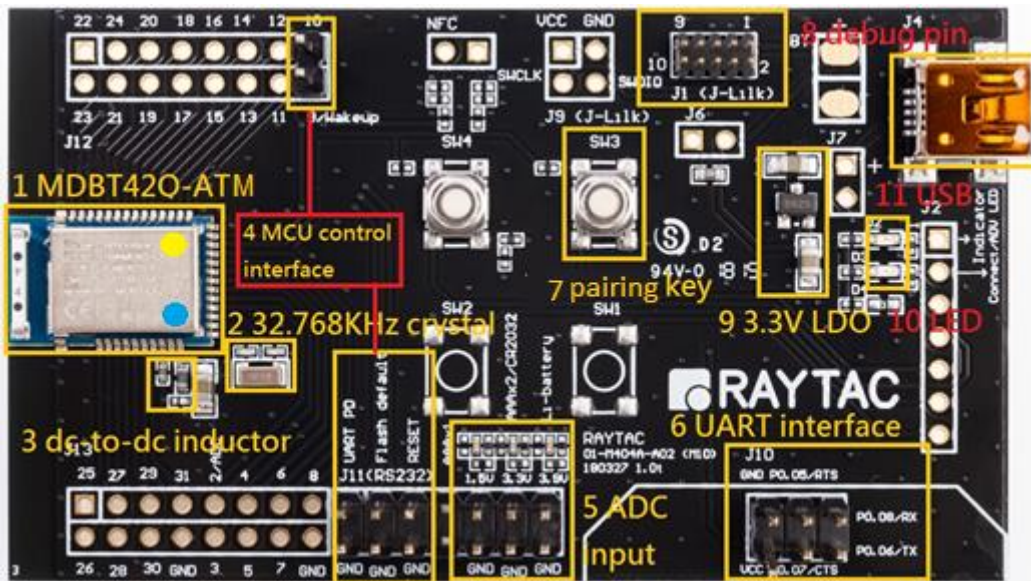
Please visit our website for spec sheet of every module mentioned above.

1.1. Contents of the Set

Each set includes MDBT42Q-AT-UART-M x 1 and mini-USB cable x 1. Please contact us if the set you receive is not complete.
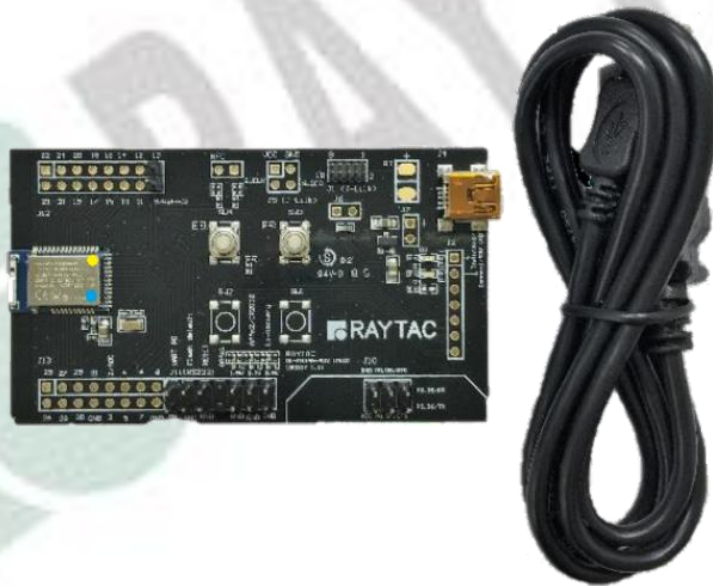
2. Hardware Description

(1)   MDBT42Q-ATM BLE module based on nRF52832.

(2)   32.768KHz crystal for external LF.

(3)   10uH & 15nH inductor for DC-to-DC mode.

(4)   Interface to connect to external MCU.

(5)   ADC input for battery detection only. Reference voltage is 0.6V.
Example:
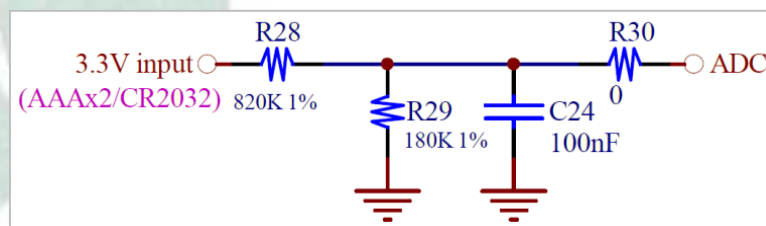
$$formula\text{: Input Voltage } \times \frac{R1}{R1 + R2} = \text{Reference Voltage}$$

$$\rightarrow 3.3V \times \frac{180}{820 + 180} = 0.594 \approx 0.6V$$

(6)   UART interface for data bridge or AT commands.

(7)   Pairing key.

(8)　　Debug interface, connecting to Nordic's nRF5X DK.
　　　　*__Important:__ **Please be careful not to "erase" the module during testing. Raytac's AT command firmware will not be shared. You may need to send the unit to us for re-programming when module's FW is erased.***

(9)　　3.3V LDO to power up MDBT42Q-ATM.

(10)　　LED for status indicator

(11)　　USB Power only
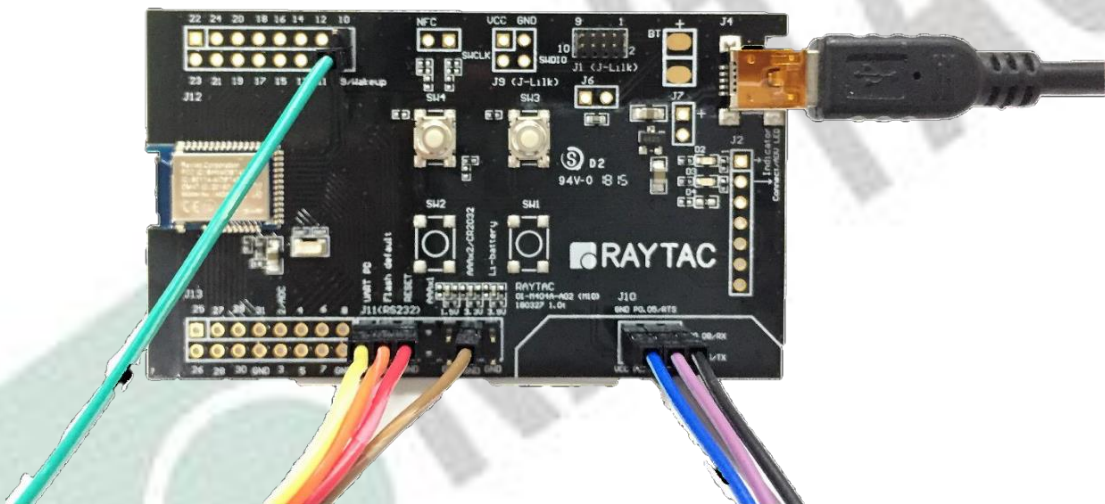
3. Reference Circuit
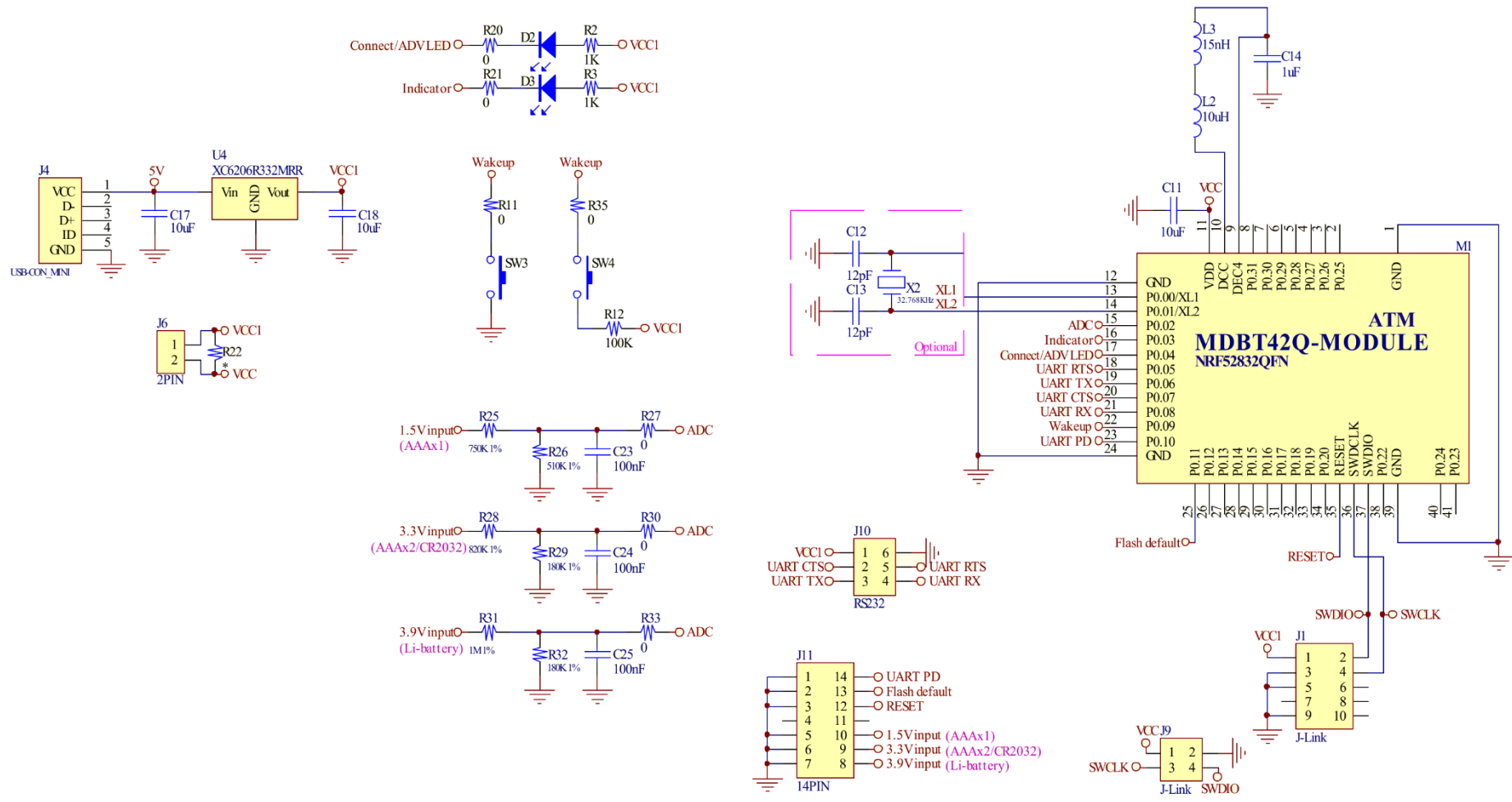
4. Connecting for the First Time

Please follow instruction below to connect MDBT42Q-AT-UART-S to MDBT42Q-AT-UART-M.

1. Make sure the distance between 2 boards is less than 30 cm.

2. Press the "**pairing key**" on MDBT42Q-AT-UART-M for over 2 seconds.

3. When seeing LED blinks like below, the connection is successful.

Connected	0.2秒 1.8秒 (continue) 0.2 sec ON / 1.8 secs OFF
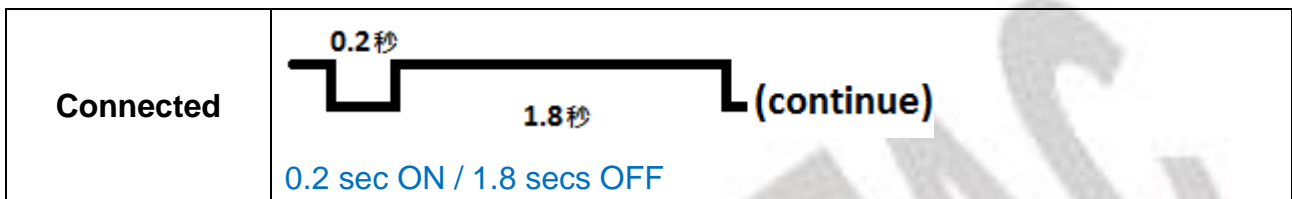
Note that a few criteria must be met in order to pair successfully, see *6.3 How to Start Scanning*. Try default setting if pairing was not successful.

5. AT Command

5.1.　List of supported commands

- Setting of scanned device name
- Setting of scanned base UUID/service UUID/TX character/RX character
- Setting of scanned RSSI threshold
- Choose data rate of 1M bps or 2M bps on-air
- Set TX output power in 5 levels.
- Set scanning time
- Enable/disable scanning
- Set LED pattern indicating scanning or connecting status
- 7 sets of UART baud rates
- Enable/disable UART flow control
- Power-down mode for power saving and GPIO wake-up
- Support DC-to-DC and LDO power mode
- Use internal or external 32.768KHz oscillator
- Recover-to-default setting with hardware and software method
- System reset of hardware and software
- Set serial number and retrieve
- Retrieve MAC Address
- Retrieve ADC value for battery detection
- Support maximum MTU 247bytes / data payload up to maximum 244 bytes
- Enable/Disable Beacon information printed out through UART interface
  (31 bytes beacon)
- Support scan Beacon company ID/UUID (31 bytes beacon)

5.2. AT Command Sets

5.2.1. "Write" Commands

No.	Command	Description
(1)	**AT+NAME**	Set scanned device name. Max. length of 20 characters e.g. AT+NAME123 (device name 123, 3 characters)
(2)	**AT+RESET**	Set to reset system
(3)	**AT+SCANOLDSTART**	Set to start scanning paired device
(4)	**AT+SCANNEWSTART**	Set to start scanning **ALL** devices
(5)	**AT+SCANSTOP**	Set to stop scanning
(6)	**AT+SLEEP**	Set to get into deep sleep mode
(7)	**AT+BAUDRATE9600**	Set UART baud rate at 9600 bps,n,8,1
(8)	**AT+BAUDRATE19200**	Set UART baud rate at 19200 bps,n,8,1
(9)	**AT+BAUDRATE38400**	Set UART baud rate at 38400 bps,n,8,1
(10)	**AT+BAUDRATE57600**	Set UART baud rate at 57600 bps,n,8,1
(11)	**AT+BAUDRATE115200**	Set UART baud rate at 115200 bps,n,8,1
(12)	**AT+BAUDRATE230400**	Set UART baud rate at 230400 bps,n,8,1 **(recommended enabling flow control)**
(13)	**AT+BAUDRATE460800**	Set UART baud rate at 460800 bps,n,8,1 **(recommended enabling flow control)**
(14)	**AT+FLOWCONTROLDIS**	Disable UART flow control
(15)	**AT+FLOWCONTROLEN**	Enable UART flow control
(16)	**AT+TXPOWER4DBM**	Set RF TX power at + 4dBm
(17)	**AT+TXPOWER0DBM**	Set RF TX power at 0dBm
(18)	**AT+TXPOWER-4DBM**	Set RF TX power at - 4dBm
(19)	**AT+TXPOWER-8DBM**	Set RF TX power at - 8dBm
(20)	**AT+TXPOWER-20DBM**	Set RF TX power to - 20dBm
(21)	**AT+XTALINTERNAL**	Use internal RC 32.768KHZ low frequency oscillator
(22)	**AT+XTALEXTERNAL**	Use external crystal 32.768KHZ low frequency oscillator
(23)	**AT+CONNECTINDICATORLOW**	Set logic low output when connecting BT
(24)	**AT+CONNECTINDICATORHIGH**	Set logic high output when connecting BT

No.	Command	Description
(25)	**AT+PHYMODE1MBPS**	Set PHY mode at 1Mbps
(26)	**AT+PHYMODE2MBPS**	Set PHY mode at 2Mbps
(27)	**AT+WAKEUPLOW**	Set logic low at wake-up when in deep sleep
(28)	**AT+WAKEUPHIGH**	Set logic high at wake-up when in deep sleep
(29)	**AT+IDLETIMEtttt**	Set idle time **(Hex)** e.g. 0x001E (min. 30secs), 0x0258 (Max. 600secs) 0x0000 (forever)
(30)	**AT+SCANOLDTIMEtttt**	Set time of scanning of paired device **(Hex)** e.g. 0x001E (min. 30secs), 0x0258 (Max. 600secs) 0x0000 (forever)
(31)	**AT+SCANNEWTIMEtttt**	Set time of scanning all devices **(Hex)** e.g. 0x001E (min. 30secs), 0x0258 (Max. 600secs) 0x0000 (forever)
(32)	**AT+DCDCDIS**	Disable DC to DC converter
(33)	**AT+DCDCEN**	Enable DC to DC converter
(34)	**AT+CONNECTINTERVALMODE0**	Set connection interval mode for Peripheral 20ms/40ms usage (min. 20ms / Max. 75ms),
(35)	**AT+CONNECTINTERVALMODE1**	Set connection interval mode for Peripheral 8ms/8ms usage (min. 8ms / Max. 8ms)
(36)	**AT+IDLEPATTERNnnnnffff**	Set LED idle pattern **(Hex)**, where n = time when LED on, f = time when LED off e.g. 0x0064 (min. 100ms) 0x1388 (Max. 5,000ms) 0x00000000 (off) 0xFFFFFFFF (on)

No.	Command	Description
(37)	AT+CONNECTPATTERNnnnnffff	Set LED connecting pattern **(Hex)**, where n = time when LED on, f = time when LED off e.g. 0x0064 (min. 100ms) 0x1388 (Max. 5,000ms) 0x00000000 (off) 0xFFFFFFFF (on)
(38)	AT+SCANOLDPATTERNnnnnffff	Set LED pattern for scanning paired device **(Hex)**, where n = time when LED on, f = time when LED off e.g. 0x0064 (min. 100ms) 0x1388 (Max. 5000ms) 0x00000000 (off) 0xFFFFFFFF (on)
(39)	AT+SCANNEWPATTERNnnnnffff	Set LED pattern for scanning all devise **(Hex)**, where n = time when LED on, f = time when LED off e.g. 0x0064 (min. 100ms) 0x1388 (Max. 5000ms) 0x00000000 (off) 0xFFFFFFFF (on)
(40)	AT+SERIALNOnnnnnnnn	Set serial number e.g. AB000001, fixed 8-character length
(41)	AT+RESPONSEDIS	Disable response when sending "write" command
(42)	AT+RESPONSEEN	Enable response when sending "write" command
(43)	AT+DISCONNECT	Terminate the connection
(44)	AT+RSSITHRESHOLDnnn	Set RSSI threshold for scanning all devices (Ascii), e.g. -69 (min.); -29 (Max.)
(45)	AT+BEACONINFODIS	Disable scanning beacon (31 bytes)
(46)	AT+BEACONINFOEN	Enable scanning beacon (31 bytes) **When AT+BEACONINFOEN is set, *the device become a BEACON SCANNER only*. If you want to exchange data, please set "AT+BEACONINFODIS".**
(47)	AT+COMPANYIDdddd	Set company ID for beacon **(Hex)**, e.g. 0x004C (for Apple ID)

No.	Command	Description
(48)	**AT+BEACONUUID** **uuuuuuuuuuuuuuuu** **uuuuuuuuuuuuuuuu**	Set UUID for beacon **(Hex)**, e.g. 0112233445566778899AABBCCDDEEFF0
(49)	**AT+TXCHARACTERUUIDuuuu**	Set TX character UUID for NUS **(Hex)**, e.g. 0x0003
(50)	**AT+RXCHARACTERUUIDuuuu**	Set RX character UUID for NUS **(Hex)**, e.g. 0x0002
(51)	**AT+SERVICEUUIDuuuu**	Set service UUID for NUS **(Hex)**, e.g. 0x0001
(52)	**AT+BASEUUID** **uuuuuuuuuuuuuuuu** **uuuuuuuuuuuuuuuu**	Set base UUID for NUS **(Hex)**, e.g. 9ECADC240EE5A9E093F3A3B5**0000**406E 13th & 14th byte is reserved for service / TX character RX character UUID, always be 0000.
(53)	**AT+DEFAULT**	Back to default

5.2.2. "Read" Commands

No.	Command	Description
(1)	AT?NAME	To retrieve scanned device name
(2)	AT?VERSION	To retrieve firmware version
(3)	AT?MACADDR	To retrieve IC MAC address
(4)	AT?BAUDRATE	To retrieve current UART baud rate
(5)	AT?FLOWCONTROL	To retrieve UART status of flow control
(6)	AT?TXPOWER	To retrieve RF TX power
(7)	AT?XTAL	To retrieve status of 32.768KHz oscillator
(8)	AT?CONNECTINDICATOR	To retrieve logic of pin for BT-connecting indicator
(9)	AT?PHYMODE	To retrieve status of PHY mode
(10)	AT?WAKEUP	To retrieve logic of wake-up pin
(11)	AT?IDLETIME	To retrieve idle time **(Hex)**
(12)	AT?SCANOLDTIME	To retrieve time of scanning paired device **(Hex)**
(13)	AT?SCANNEWTIME	To retrieve time of scanning all devices **(Hex)**
(14)	AT?DCDC	To retrieve DC to DC converter status
(15)	AT?CONNECTINTERVALMODE	To retrieve status of connection interval mode
(16)	AT?IDLEPATTERN	To retrieve LED idle pattern **(Hex)**
(17)	AT?CONNECTPATTERN	To retrieve LED connecting pattern **(Hex)**
(18)	AT?SCANOLDPATTERN	To retrieve LED pattern when scanning paired device **(Hex)**
(19)	AT?SCANNEWPATTERN	To retrieve LED pattern when scanning all devices **(Hex)**
(20)	AT?SERIALNO	To retrieve serial number
(21)	AT?ADCVALUE	To retrieve 10bit ADC value
(22)	AT?RESPONSE	To retrieve status of response
(23)	AT?RSSITHRESHOLD	To retrieve scanning new RSSI threshold value **(Ascii)**
(24)	AT?CONNECTRSSI	To retrieve RSSI value when in BLE connection **(Ascii)**
(25)	AT?BEACONINFO	To retrieve beacon information
(26)	AT?COMPANYID	To retrieve company ID value **(Hex)**
(27)	AT?BEACONUUID	To retrieve beacon UUID value **(Hex)**

No.	Command	Description
(28)	**AT?TXCHARACTERUUID**	To retrieve TX character UUID value **(Hex)**
(29)	**AT?RXCHARACTERUUID**	To retrieve RX character UUID value **(Hex)**
(30)	**AT?SERVICEUUID**	To retrieve service UUID value **(Hex)**
(31)	**AT?BASEUUID**	To retrieve base UUID value **(Hex)**
(32)	**AT?ALLPARAMETERS**	To retrieve value of all parameters

5.2.3. Response (Default)

No.	Command	Response
(1)	AT?NAME	Raytac AT-UART (default)
(2)	AT?VERSION	e.g. version: 1.0
(3)	AT?MACADDR	e.g. D352BDE1E414
(4)	AT?BAUDRATE	0 baudrate9600 (default) (0 = 9600; 1 = 19200; 2 = 38400; 3 = 57600; 4 = 115200; 5 = 230400; 6 = 460800)
(5)	AT?FLOWCONTROL	0 flowcontrol dis (default) (0 = disabled; 1 = enabled)
(6)	AT?TXPOWER	0 txpower 4dbm (default) (0 = 4dBm; 1 = 0dBm; 2 = -4dBm; 3 = -8dBm, 4 = -20dBm)
(7)	AT?XTAL	0 xtal internal (default) (0 = internal; 1 = external, and XTAL = 32.768KHz oscillator)
(8)	AT?CONNECTINDICATOR	0 connect indicator low (default) (0 = output low; 1 = output high)
(9)	AT?PHYMODE	0 PHY mode 1Mbps (default) (0 = 1Mbps; 1 = 2Mbps)
(10)	AT?WAKEUP	0 wakeup low (default) (0 = low active; 1 = high active)
(11)	AT?IDLETIME	0000 (default: **Hex**, forever idle with no timeout, tttt: 0x0000)
(12)	AT?SCANOLDTIME	0000 (default: **Hex**, forever scanning paired device with no timeout, tttt: 0x0000)
(13)	AT?SCANNEWTIME	0000 default: **Hex**, forever scanning ALL devices with no timeout, tttt: 0x0000)
(14)	AT?DCDC	0 dcdc dis (default) (0 = disabled; 1 = enabled)

No.	Command	Response
(15)	AT?CONNECTINTERVALMODE	0 connect interval mode 0 (default) (0 = connection interval for Peripheral 20ms/40ms usage 1 = connection interval for Peripheral 8ms/8ms usage)
(16)	AT?IDLEPATTERN	00640f3c (default: Hex, 0.1sec on / 3.9sec off, nnnn: 0x0064, ffff: 0x0f3c)
(17)	AT?CONNECTPATTERN	00c80708 (default: Hex, 0.2sec on / 1.8sec off, nnnn: 0x00c8, ffff: 0x0708)
(18)	AT?SCANOLDPATTERN	03e803e8 (default: Hex, 1sec on / 1sec off, nnnn: 0x03e8, ffff: 0x03e8)
(19)	AT?SCANNEWPATTERN	00640064 (default: Hex, 0.1sec on / 0.1sec off, nnnn: 0x0064, ffff: 0x0064)
(20)	AT?SERIALNO	Display " no data! " string (default)
(21)	AT?ADCVALUE	Value varies from input voltage
(22)	AT?RESPONSE	1 response en (default) (0 = disable response; 1 = enable response)
(23)	AT?RSSITHRESHOLD	-51 (default: Ascii, nnn: -51)
(24)	AT?BEACONINFO	0 beaconinfo dis (default) (0 = disable print beacon info.; 1 = enable print beacon info.)
(25)	AT?COMPANYID	004C (default: **Hex**, dddd: 0x004C)
(26)	AT?BEACONUUID	0112233445566778899AABBCCDDEEFF0 (default: **Hex**, uuuuuuuuuuuuuuuuuuuuuuuuuuuuuuu: 0x0112233445566778899AABBCCDDEEFF0)
(27)	AT?TXCHARACTERUUID	0003 (default: **Hex**, uuuu: 0x0003)
(28)	AT?RXCHARACTERUUID	0002 (default: **Hex**, uuuu: 0x0002)
(29)	AT?SERVICEUUID	0001 (default: **Hex**, uuuu: 0x0001)
(30)	AT?BASEUUID	9ECADC240EE5A9E093F3A3B50000406E (default: **Hex**, uuuuuuuuuuuuuuuuuuuuuuuuuuuuuuu: 0x9ECADC240EE5A9E093F3A3B50000406E)
(31)	AT?ALLPARAMETERS	Display value of all parameters, separated by "0x0d0x0a"

5.3. Default Info

No.	Description	Default
(1)	Scanned device name	Raytac AT-UART
(2)	Base UUID	0x9E, 0xCA, 0xDC, 0x24, 0x0E, 0xE5, 0xA9, 0xE0, 0x93, 0xF3, 0xA3, 0xB5, 0x00, 0x00, 0x40, 0x6E
(3)	Service UUID	0x0001 TX characteristic: 0x0003; RX characteristic: 0x0002
(4)	Baud rate	9600bps,n,8,1
(5)	Status of flow control	Disabled
(6)	RF TX power	+4dBm
(7)	32.768Khz oscillator	Using internal RC with 1,000ms calibration time
(8)	Logic of BT connecting indicator	Output set as logic low when BT is connecting
(9)	PHY mode	1Mbps
(10)	Logic of wake-up pin	Set logic low to wake up in deep sleep
(11)	Idle time	Forever idle with no timeout
(12)	Time of scanning paired device	Forever scanning for paired device with no timeout
(13)	Time of scanning all devices	Forever scanning for all devices with no timeout
(14)	Status of DC-to-DC converter	Disabled
(15)	Connection interval mode	Set at min. 20ms and Max. 75ms for Peripheral 20ms/40ms usage
(16)	Idle LED pattern	0.1sec on / 3.9sec off
(17)	Connecting LED pattern	0.2sec on / 1.8secs off
(18)	LED pattern for scanning paired device	1sec on / 1sec off
(19)	LED pattern for scanning all devices	0.1sec on / 0.1sec off
(20)	Serial number	Display " no data! " string
(21)	ADC value	Value varies from input voltage between 0x0000 ~ 0x03FF **(Hex)**.
(22)	State of response	Enabled

No.	Description	Default
(23)	**Scanning new RSSI threshold**	-51 **(Ascii)**.
(24)	**Beacon UUID**	0x01, 0x12, 0x23, 0x34, 0x45, 0x56, 0x67, 0x78, 0x89, 0x9A, 0xAB, 0xBC, 0xCD, 0xDE, 0xEF, 0xF0
(25)	**Company ID**	0x004C

6. How to Control External MCU

6.1.　How to Send AT Commands

● **When BT is NOT connected (for all commands)**

1.　Output low to P0.10 (UART PD pin) to enable UART interface. Please keep it enabling during the whole time when sending AT commands.

2.　Send any AT commands you want.

3.　**Send command " AT+RESET " to save all your settings.**

4.　Output high or NC to P0.10 (UART PD pin) to turn off UART interface.

● **When BT is connected (for AT?ADCVALUE, AT+DISCONNECT, AT?CONNECTRSSI, AT+SCANNEWSTART and AT+SLEEP only)**

1.　Output low to P0.11 (flash default pin) to enable receiving AT commands when BT is connected. Please keep it low during the whole time when sending AT commands.

2.　Send "AT?ADCVALUE" or "AT+DISCONNECT" or "AT?CONNECTRSSI" or "AT+SCANNEWSTART" or "AT+SLEEP".

3.　Output high or NC to P0.11 (flash default pin) to disable receiving AT commands when BT is connected.
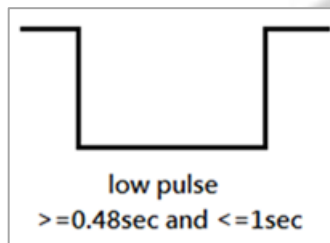
6.2. How to Return to Flashed Default Setting

* Only when BT is NOT connected *

* Note that default baud rate is "9600bps,n,8,1". For other default, please check " 5.3 Default Info"
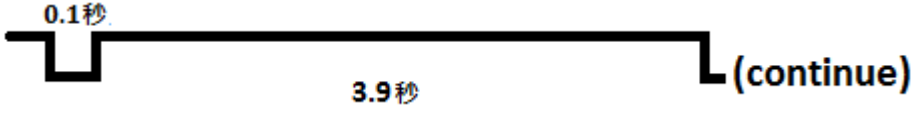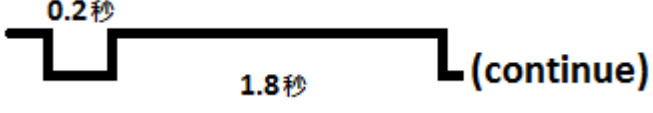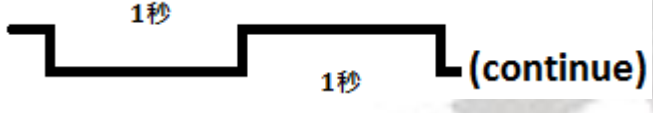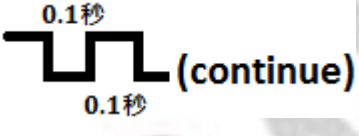
● Use Hardware Method

1. Read P0.03 (indicator pin) first to check if BT is *NOT* in connection.

2. Output a low pulse to P0.11 (flash default pin), then system will return to default setting.

low pulse
>=0.48sec and <=1sec

● Use Software method

1. Output low to P0.10 (UART PD pin) to enable UART interface. Please keep in enabling during the whole time when sending AT commands.

2. Send command " AT+DEFAULT ", then system will return to default setting.

● Default Definition of LED (P0.4) Status

Mode	LED Status
Idle	0.1秒 / 3.9秒 (continue) 0.1 sec ON / 3.9 secs OFF
Connected	0.2秒 / 1.8秒 (continue) 0.2 sec ON / 1.8 secs OFF
Scan the paired device	1秒 / 1秒 (continue) 1 sec ON / 1 sec OFF
Scan all devices	0.1秒 / 0.1秒 (continue) 0.1 sec ON / 0.1 sec OFF

6.3. How to Start Scanning

This section describes how to start scanning using a physical button (hardware) or the AT Command (firmware) under various occasions. Before getting started, here are some notes applied to both methods.

● Each central device is only able to pair with 1 Peripheral.

● The device will be in idle directly when it is powered or not in BLE connection. It will go into deep sleep after a given timeout (no timeout in default).

● A few criteria must be met in order to complete BLE connection:

	Under Paired Scanning	Under All-Devices Scanning
Base UUID	√	√
Service UUID	√	√
Device name	√	√
RSSI Threshold		√
Mac Address in Paired Record	√	

● Use Key/Button

START Scanning Paired Device --- (a)

- Press the button for less than 2 seconds and release it to start scanning paired device.

START Scanning All Devices --- (b)

- Press the button for 2 seconds or longer directly to start scanning all devices.

STOP Scanning Paired / All Device(s)

- Press the button for less than 2 seconds and release it to stop scanning. The device will be back to idle and go into deep sleep after a given a timeout (no timeout in default).

	How to Start Scanning	
	Paired Device	All Devices
Device Status		
Idle	(a)[1]	(b)
BLE Connection	Not Available	(b)
Scanning Paired Device	Not Available	(b)

Remark 1: The device stays in idle when there is no paired record.

● Use AT Command

START Scanning Paired Device --- (a)
-    Enter "AT+SCANOLDSTART" to start scanning paired device.

START Scanning All Devices --- (b)
-    Enter "AT+SCANNEWSTART" to start scanning all devices.

STOP Scanning Paired / All Device(s)
-    Enter "AT+SCANSTOP" to stop scanning. The device will be back to idle and go into deep sleep after a given timeout.

	How to Start Scanning	
Device Status	Paired Device	All Devices
Idle	(a)[1]	(b)
BLE Connection	Not Available	(b)
Scanning Paired Device	Not Available	(b)

Remark 1: The device stays in idle when there is no paired record.

7. Report of Data Transmission

All testing is done under **PHY mode at 1M bps** and **D.L.** means "**Data Length**" and **D.I.** means "**Data Interval**" in the table.

7.1.   MCU → Peripheral (MDBT42Q-AT/MDBT42Q-PAT) → Central → Console

Central Connection Interval	Peripheral Connection Interval	Baud Rate	Flow Control	MCU D.L. (bytes)	MCU D.I. (ms)	Total D.L. (bytes)	Total Trans. Time (sec)	Data Rate (k-bytes/sec)
min = 20ms Max = 75ms	min = 20ms Max = 40ms	9600	X	64	60	262152	273	0.96
				244	250	999432	1,042	
			V	244	250	999432	1,042	
min = 20ms Max = 75ms	min = 20ms Max = 40ms	115200	X	64	8	262152	33	7.9
				244	30	999432	124	8
			V	244	30	999432	124	8
min = 20ms Max = 75ms	min = 20ms Max = 40ms	460800	X	244	25	999432	103	9.7
			V					
min = Max = 8ms	min = Max = 8ms	9600	X	64	60	262152	273	0.96
				244	250	999432	1,042	
			V	244	250	999432	1,042	
min = Max = 8ms	min = Max = 8ms	115200	X	64	8	262152	33	7.9
				244	30	999432	124	8
			V	244	30	999432	124	8
min = Max = 8ms	min = Max = 8ms	460800	X	244	15	999432	62	16.1
			V					

7.2. MCU → Central → Peripheral (MDBT42Q-AT/MDBT42Q-PAT) → Console

Central Connection Interval	Peripheral Connection Interval	Baud Rate	Flow Control	MCU D.L. (bytes)	MCU D.I. (ms)	Total D.L. (bytes)	Total Trans. Time (sec)	Data Rate (k-bytes/sec)
min = 20ms Max = 75ms	min = 20ms Max = 40ms	9600	X	64	60	262152	273	0.96
				244	250	999432	1,042	
			V	244	250	999432	1,042	
min = 20ms Max = 75ms	min = 20ms Max = 40ms	115200	X	64	8	262152	33	7.9
				244	30	999432	124	8
			V	244	30	999432	124	8
min = 20ms Max = 75ms	min = 20ms Max = 40ms	460800	X	244	18	999432	74	13.5
			V					
min = Max = 8ms	min = Max = 8ms	9600	X	64	60	262152	273	0.96
				244	250	999432	1,042	
			V	244	250	999432	1,042	
min = Max = 8ms	min = Max = 8ms	115200	X	64	8	262152	33	7.9
				244	30	999432	124	8
			V	244	30	999432	124	8
min = Max = 8ms	min = Max = 8ms	460800	X	244	15	999432	61	16.3
			V					

8. Useful Links

- Nordic Infocenter: https://infocenter.nordicsemi.com/index.jsp
  All the necessary technical files and software development kits of Nordic's chip are on this website.

- Nordic DevZone: https://devzone.nordicsemi.com/questions/
  A highly recommended website for firmware developer. Interact with other developers and Nordic's employees will help with your questions. The site also includes tutorials in detail to help you get started.

- Official Page of nRF52832 :
  https://www.nordicsemi.com/eng/Products/Bluetooth-low-energy/nRF52832
  A brief introduction to nRF52810 and download links for Nordic's developing software and SoftDevices.

History of Firmware Revision

FW Ver.	Compatible HW Build	Release Date	Description of Revision	Note
1.0		2018/10/15	1st release.	99-52832-12A
1.1		2019/05/17	Fixed bug of not sending PHY information to peripheral device after BLE connection.	99-52832-12B
1.2		2020/04/13	Fixed issues of reading MAC address.	99-52832-12C

Release Note

- 2018/10/30   Version A: 1st release

- 2019/09/23   Version B:

  (1) Corrected the illustration and note from "wake-up key" to "pairing key" in Chapter 2: Hardware Description.

  (2) Added how to connect the demo board for the 1st time in Chapter 4: Connecting for the 1st Time.

- 2020/04/22   Version C:

  (1)   See *History of Firmware Revision* for FW revision 1.2.