

User Guide

(簡易使用手冊)

產品名稱 (Product):	Demo Board
	for MDBT50Q-ATMS / MDBT50Q-PATMS
產品型號 (Model No.):	MDBT50Q – DB – ATMS
韌體版本 (FW Revision):	1.1

DEFAULT ROLE IS “PERIPHERAL / SLAVE”

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1. Introduction

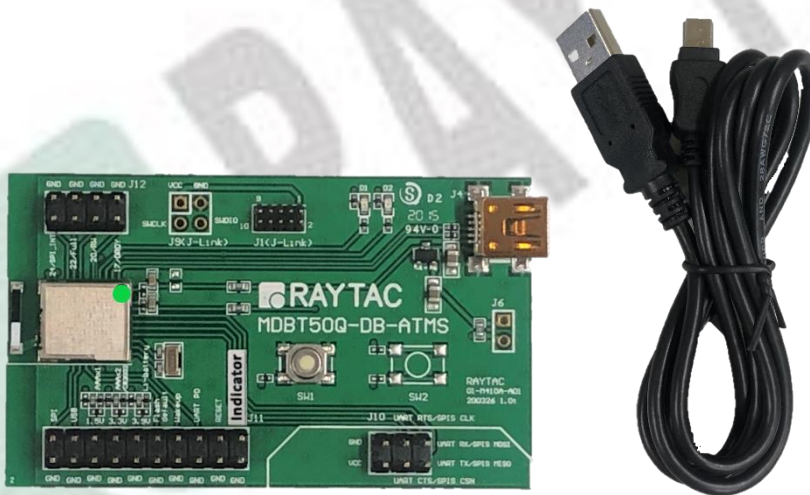
This document shows how to use the demo board (MDBT50Q-DB-ATMS) to test function of MDBT50Q-ATMS & MDBT50Q-PATMS.

MDBT50Q-DB-ATMS is designed for testing and debugging without building your own board. The board is only available with MDBT50Q-ATMS (chip antenna) module. MDBT50Q-ATMS will be pre-programmed with Raytac's AT command firmware. If you don't need such pre-programming and is looking for nRF52833 module, please check MDBT50Q-512K and MDBT50Q-P512K.

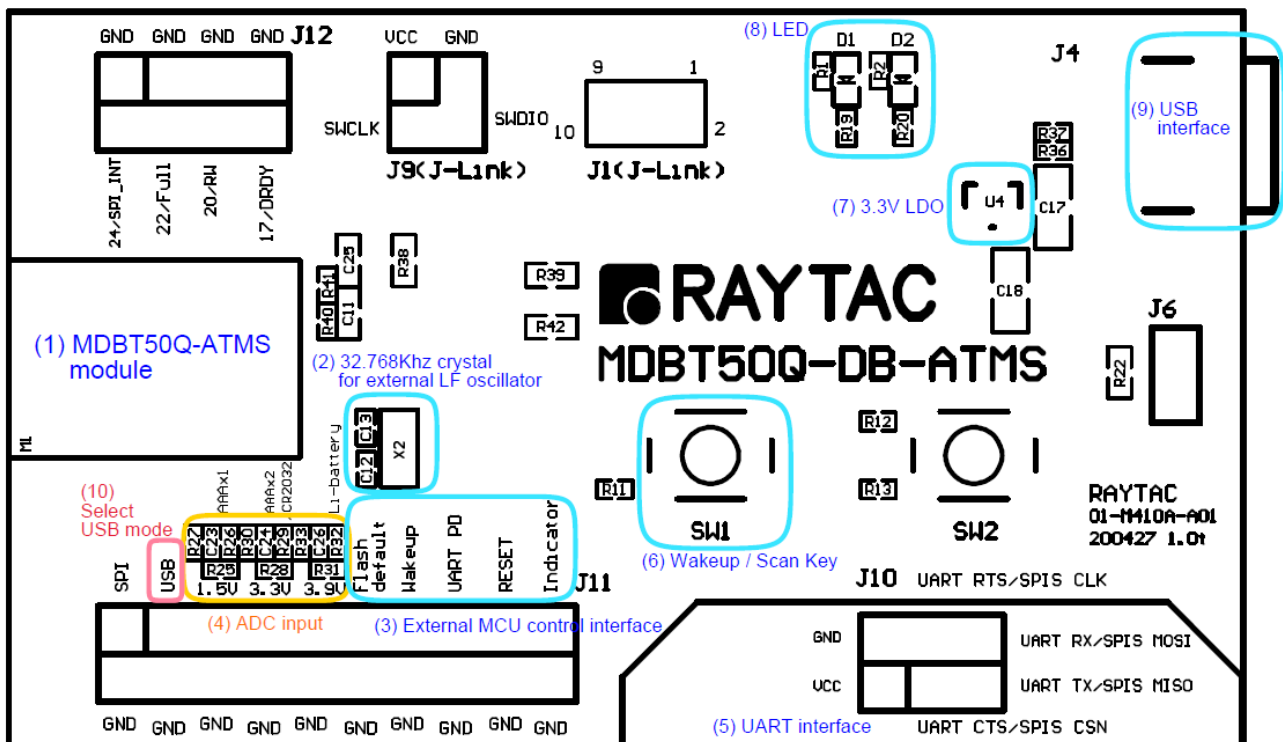
Please visit our [website](#) for spec sheet of every module mentioned above.

1.1. Contents of the Set

Each set includes **MDBT50Q-DB-ATMS x 1** and **mini-USB cable x 1**.



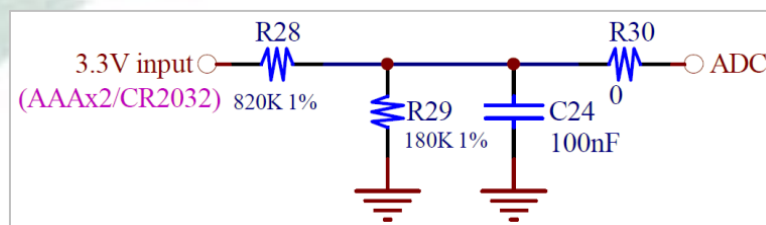
2. Hardware Description



Top Overlay

- (1) MDBT50Q-ATMS BLE module based on nRF52833.
- (2) 32.768KHz crystal for external LF oscillator .
- (3) External MCU control Interface
- (4) ADC input for battery detection only. Reference voltage is 0.6V.

Example:



$$\text{formula: Input Voltage} \times \frac{R1}{R1 + R2} = \text{Reference Voltage}$$

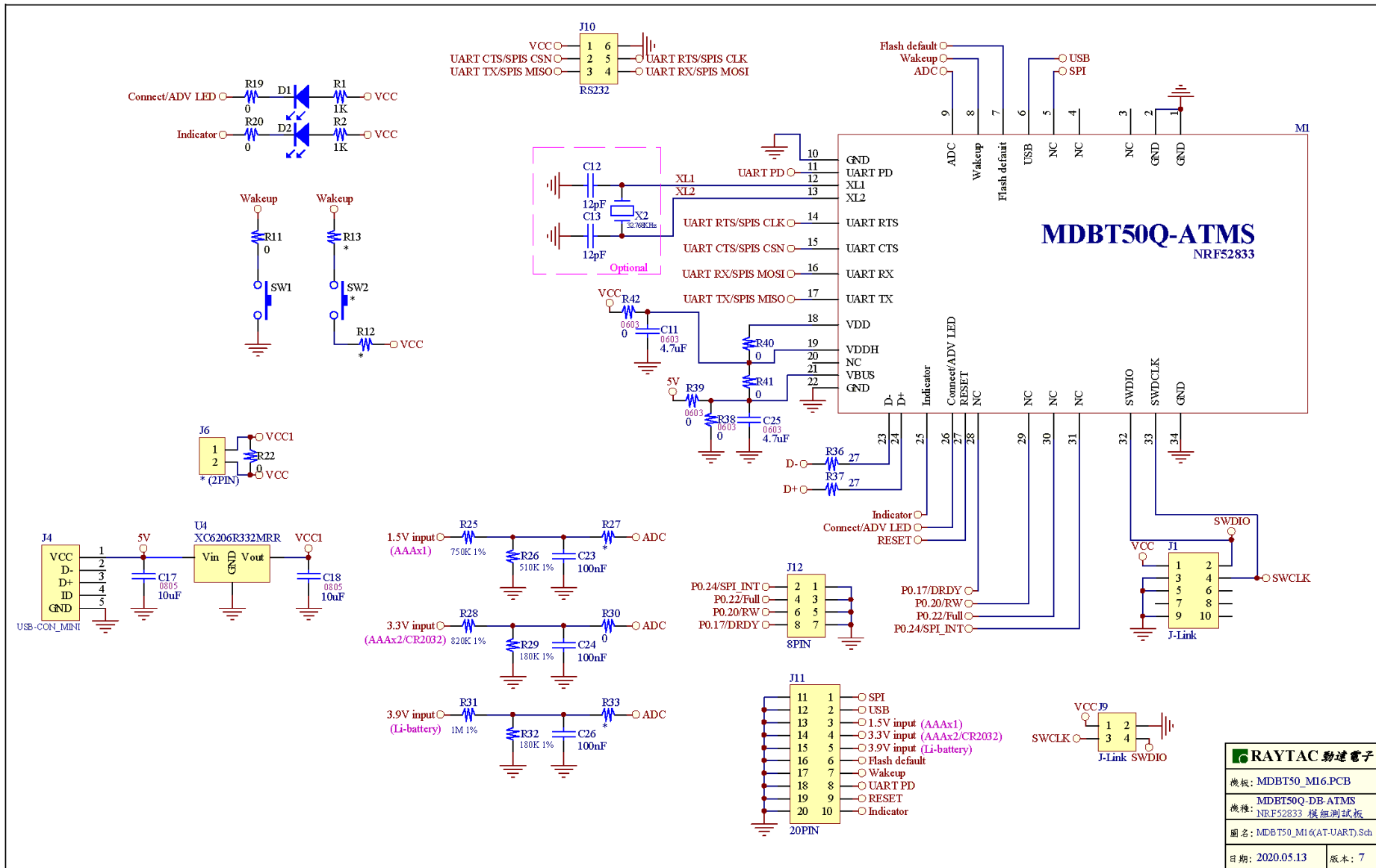
$$\rightarrow 3.3V \times \frac{180}{820 + 180} = 0.594 \approx 0.6V$$

- (5) UART interface for data bridge or AT commands.

- (6) Wake-up(Scan) key.
- (7) 3.3V LDO to power up MDBT50Q-ATMS.
- (8) LED for status indicator
- (9) USB interface for USB Mode.
- (10) Select USB Mode



3. Reference Circuit



4. AT Command

4.1. List of supported commands

4.1.1. Central

- Hardware selecting of UART or USB interface
- Enable/disable interface of UART hardware for saving power
- Setting of device role as Central or Peripheral
- Setting of scanned device name
- Setting of scanned base UUID / service UUID / TX character / RX character
- Setting of scanned RSSI threshold
- Select data rate of 1 Mbps, 2 Mbps or 125 Kbps on-air
- Select output power in 6 levels.
- Select connection interval mode
- Select UART baud rates / auto baud rates under USB mode
- Select LDO or DC-to-DC power mode
- Select external or internal RC 32.768KHz oscillator
- System reset of software or hardware
- Recover-to-default setting with hardware and software method
- Set scanning/ idle time
- Start or stop scanning
- Set LED pattern indicating scanning, idle or connecting status
- Enable/disable UART flow control
- Power-down mode for power saving and GPIO wake-up
- Support DLE / maximum MTU 247 bytes / data payload up to maximum 244 bytes
- Print out scan list including RSSI, MAC address and device name
- Support direct connection to the device with specific MAC address
- Scan beacon company ID/UUID (support extended advertising beacon)
- Enable/Disable beacon information printed out through USB/UART interface (support extended advertising beacon)

4.1.2. Peripheral

- Hardware selecting of UART or USB interface
- Enable/disable interface of UART hardware for saving power
- Setting of device role as Central or Peripheral
- Setting of advertising device name
- Setting of base UUID / service UUID / TX character / RX character
- Select data rate of 1 Mbps, 2 Mbps or 125 Kbps on-air
- Select output power in 6 levels.
- Select connection interval mode
- Select UART baud rates / USB mode auto baud rates
- Select LDO or DC-to-DC power mode
- Select external or internal RC 32.768KHz oscillator
- System reset of software or hardware
- Recover-to-default setting with hardware and software method
- Set advertising time
- Setting of advertising interval
- Start or stop advertising
- Set LED pattern indicating advertising or connecting status
- Enable/disable UART flow control
- Power-down mode for power saving and GPIO wake-up
- Set serial number and retrieve
- Set or retrieve MAC Address
- Retrieve ADC value for battery detection, delivering the information through battery service
- Support DLE / maximum MTU 247 bytes / data payload up to maximum 244 bytes

No.	Command	Description
(18)	AT+CONNECTINTERVALMODE0	Set connection interval mode for Peripheral 20ms/40ms usage (min. 20ms / Max. 40ms),
(19)	AT+CONNECTINTERVALMODE1	Set connection interval mode for Peripheral 8ms/8ms usage (min. 8ms / Max. 8ms)
(20)	AT+CONNECTINTERVALMODE2	Set connection interval mode for Peripheral usage (programmable: min. / Max. range is 8 ms ~ 1,000 ms)
(21)	AT+CONNECTINTERVALTIME $nnnnffff$	Set the range of connection interval for Mode 2, e.g. $nnnn$ = min. time / 0x0008 (Min. 8ms) $ffff$ = Max. time / 0x03E8 (Max. 1,000ms)
(22)	AT+BAUDRATE9600	Set UART baud rate at 9600 bps,n,8,1
(23)	AT+BAUDRATE19200	Set UART baud rate at 19200 bps,n,8,1
(24)	AT+BAUDRATE38400	Set UART baud rate at 38400 bps,n,8,1
(25)	AT+BAUDRATE57600	Set UART baud rate at 57600 bps,n,8,1
(26)	AT+BAUDRATE115200	Set UART baud rate at 115200 bps,n,8,1
(27)	AT+BAUDRATE230400	Set UART baud rate at 230400 bps,n,8,1
(28)	AT+BAUDRATE460800	Set UART baud rate at 460800 bps,n,8,1
(29)	AT+BAUDRATE921600	Set UART baud rate at 921600 bps,n,8,1
(30)	AT+DCDCDIS	Disable DC to DC converter (LDO mode)
(31)	AT+DCDCEN	Enable DC to DC converter (DC-to-DC mode)
(32)	AT+XTALINTERNAL	Use internal RC 32.768 KHZ oscillator
(33)	AT+XTALEXTERNAL	Use external crystal 32.768 KHZ oscillator
(34)	AT+RESET	Set to reset system
(35)	AT+SCANOLDTIME $tttt$	Set time of scanning of paired device (Hex) e.g. 0x001E (min. 30secs), 0x0258 (Max. 600secs) 0x0000 (forever)
(36)	AT+SCANNEWTIME $tttt$	Set time of scanning ALL devices (Hex) e.g. 0x001E (min. 30secs), 0x0258 (Max. 600secs) 0x0000 (forever)

No.	Command	Description
(37)	AT+IDLETIMEtttt	Set idle time (Hex) e.g. 0x001E (min. 30secs), 0x0258 (Max. 600secs) 0x0000 (forever)
(38)	AT+SCANOLDSTART	Set to start scanning paired device
(39)	AT+SCANNEWSTART	Set to start scanning ALL devices
(40)	AT+SCANSTOP	Set to stop scanning
(41)	AT+DISCONNECT	Terminate the connection
(42)	AT+IDLEPATTERNnnnnnffff	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)
(43)	AT+CONNECTPATTERNnnnnnffff	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)
(44)	AT+SCANOLDPATTERNnnnnnffff	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)
(45)	AT+SCANNEWPATTERNnnnnnffff	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)

No.	Command	Description
(46)	AT+FLOWCONTROLDIS	Disable UART flow control
(47)	AT+FLOWCONTROLEN	Enable UART flow control
(48)	AT+CONNECTINDICATORLOW	Set logic low output when connecting BT
(49)	AT+CONNECTINDICATORHIGH	Set logic high output when connecting BT
(50)	AT+WAKEUPLow	Set logic low at wake-up when in deep sleep
(51)	AT+WAKEUPHIGH	Set logic high at wake-up when in deep sleep
(52)	AT+SLEEP	Set to get into deep sleep mode
(53)	AT+SERIALNO <code>nnnnnnnn</code>	Set serial number e.g. AB000001, fixed 8-character length
(54)	AT+RESPONSEDIS	Disable response when sending "write" command
(55)	AT+RESPONSEEN	Enable response when sending "write" command
(56)	AT+DEFAULT	Back to default

Set to output the list of all devices which meet the setting of **base UUID**. Output information in sequence includes:
 (1) RSSI (2) MAC address (3) device name
 e.g. -40, AABBCCDDEEFF, Raytac AT-UART (ASCII)
 stands for

(57) **AT+SCANLIST**

(1) RSSI: -40dBm
 (2) MAC address: AABBCCDDEEFF
 (3) device name: Raytac AT-UART

Note: Use "AT+SCANSTOP" to stop scanning
 (see command (40)).

Set to directly connect to the device with specific MAC address, where `nnnnnnnnnnnn` is 12 bytes high byte to low byte ASCII code MAC address.
 e.g. AT+CONNECTMACAABBCCDDEEFF (**ASCII**)

(58) **AT+SCANNEWMAC`nnnnnnnnnnnn`**

Note: This command is like "AT+SCANNEWSTART" command, but only scans the device with **specified** MAC address. Setting of scanning time is the same as "AT+SCANNEWTIME`tttt`" command.

No.	Command	Description
(59)	AT+COMPANYIDdddd	Set company ID for beacon (Hex) , e.g. 0x004C (for Apple ID)
(60)	AT+BEACONUUI aaaaaaaaaaaaaaaaaaaa aaaaaaaaaaaaaaaaaaaa	Set UUID for beacon (Hex) , e.g. 0112233445566778899AABBCCDDEEFF0
(61)	AT+BEACONINFOEN	Enable scanning beacon data When AT+BEACONINFOEN is set, the device become a BEACON SCANNER only. If you want to exchange data, please set "AT+BEACONINFODIS".
(62)	AT+BEACONINFODIS	Disable scanning beacon data
(63)	AT+COMMANDEN	Switch to command mode when BLE is connected (USB communication mode only)
(64)	AT+COMMANDDIS	Switch to transmission mode when BLE is connected (USB communication mode only)
(65)	AT+BOOTLOADER	For Raytac Test only

● Central “Read”

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

No.	Command	Description
(29)	AT?RESPONSE	To retrieve status of response
(30)	AT?VERSION	To retrieve firmware version
(31)	AT?COMPANYID	To retrieve company ID value (Hex)
(32)	AT?BEACONUUID	To retrieve beacon UUID value (Hex)
(33)	AT?BEACONINFO	To retrieve beacon information
(34)	AT?ALLPARAMETERS	To retrieve value of all parameters
(35)	AT?BLESTATUS	To retrieve status of BLE



4.2.2. “Peripheral” Commands

● Peripheral “Write”

No.	Command	Description
(1)	AT+CENTRAL	Set device role to central
(2)	AT+PERIPHERAL	Set device role to peripheral
(3)	AT+NAME	Set device name. Max. length of 20 characters e.g. AT+NAME123 (device name 123, 3 characters)
(4)	AT+BASEUUID xxxxxxxxxxxxxxxxxxxx xxxxxxxxxxxxxxxxxxxx	Set base UUID for NUS (Hex), e.g. 9ECADC240EE5A9E093F3A3B50000406E 13 th & 14 th byte is reserved for service / TX character RX character UUID, always be 0000.
(5)	AT+SERVICEUUIDuuuu	Set service UUID for NUS (Hex), e.g. 0x0001
(6)	AT+TXCHARACTERUUIDuuuu	Set TX character UUID for NUS (Hex), e.g. 0x0003
(7)	AT+RXCHARACTERUUIDuuuu	Set RX character UUID for NUS (Hex), e.g. 0x0002
(8)	AT+PHYMODE2MBPS	Set PHY mode at 2Mbps
(9)	AT+PHYMODE1MBPS	Set PHY mode at 1Mbps
(10)	AT+PHYMODE125KBPS	Set PHY mode at 125Kbps
(11)	AT+TXPOWER8DBM	Set RF TX power at + 8dBm
(12)	AT+TXPOWER4DBM	Set RF TX power at + 4dBm
(13)	AT+TXPOWER0DBM	Set RF TX power at 0dBm
(14)	AT+TXPOWER-4DBM	Set RF TX power at – 4dBm
(15)	AT+TXPOWER-8DBM	Set RF TX power at – 8dBm
(16)	AT+TXPOWER-20DBM	Set RF TX power to – 20dBm

No.	Command	Description
(17)	AT+CONNECTINTERVALMODE0	Set connection interval mode for Peripheral 20ms/40ms usage (min. 20ms / Max. 40ms),
(18)	AT+CONNECTINTERVALMODE1	Set connection interval mode for Peripheral 8ms/8ms usage (min. 8ms / Max. 8ms)
(19)	AT+CONNECTINTERVALMODE2	Set connection interval mode for Peripheral usage (programmable: min. / Max. range is 8 ms ~ 1,000 ms)
(20)	AT+CONNECTINTERVALTIME $nnnnffff$	Set the range of connection interval for Mode 2, e.g. $nnnn$ = min. time / 0x0008 (Min. 8ms) $ffff$ = Max. time / 0x03E8 (Max. 1,000ms) "min. time \leq connection interval \leq Max. time"
(21)	AT+BAUDRATE9600	Set UART baud rate at 9600 bps,n,8,1
(22)	AT+BAUDRATE19200	Set UART baud rate at 19200 bps,n,8,1
(23)	AT+BAUDRATE38400	Set UART baud rate at 38400 bps,n,8,1
(24)	AT+BAUDRATE57600	Set UART baud rate at 57600 bps,n,8,1
(25)	AT+BAUDRATE115200	Set UART baud rate at 115200 bps,n,8,1
(26)	AT+BAUDRATE230400	Set UART baud rate at 230400 bps,n,8,1
(27)	AT+BAUDRATE460800	Set UART baud rate at 460800 bps,n,8,1
(28)	AT+BAUDRATE921600	Set UART baud rate at 921600 bps,n,8,1
(29)	AT+DCDCDIS	Disable DC to DC converter (LDO mode)
(30)	AT+DCDCEN	Enable DC to DC converter (DC-to-DC mode)
(31)	AT+XTALINTERNAL	Use internal RC 32.768 KHZ oscillator
(32)	AT+XTALEXTERNAL	Use external crystal 32.768 KHZ oscillator
(33)	AT+RESET	Set to reset system
(34)	AT+ADVTIME $tttt$	Set advertising time (HEX) e.g. 0x001E(min. 30secs) 0x0E10(Max. 3600secs) 0x0000(never)
(35)	AT+ADVINTERVALTIME $nnnn$	Set advertising interval (Hex), in units of 0.625 ms. e.g. 0x0040(min. 40ms) 0x1900(Max. 4,000ms)
(36)	AT+ADVSTART	Set to start advertising
(37)	AT+ADVSTOP	Set to stop advertising

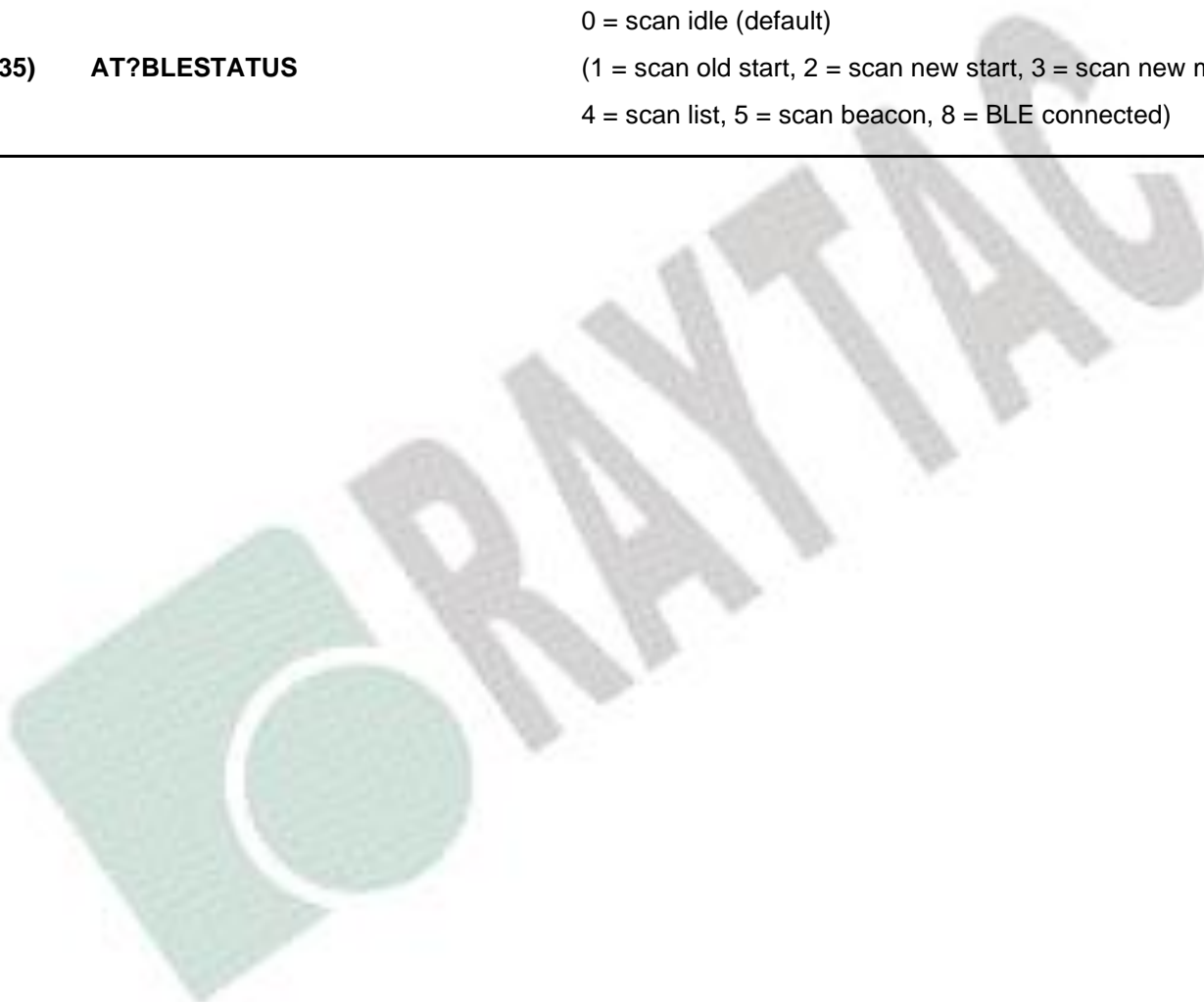
No.	Command	Description
(38)	AT+DISCONNECT	Terminate the connection
(39)	AT+ADVPATTERNnnnnnffff	Set LED advertising pattern (Hex), where N = time when LED on, f = time when LED off e.g. 0x0064 (min. 100ms); 0x1388 (Max. 5000ms), 0x00000000 (off) 0xFFFFFFFF (on)
(40)	AT+CONNECTPATTERNnnnnnffff	Set LED 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)
(41)	AT+FLOWCONTROLDIS	Disable UART flow control
(42)	AT+FLOWCONTROLEN	Enable UART flow control
(43)	AT+CONNECTINDICATORLOW	Set logic low output when connecting BT
(44)	AT+CONNECTINDICATORHIGH	Set logic high output when connecting BT
(45)	AT+WAKEUPLOW	Set logic low at wake-up when in deep sleep
(46)	AT+WAKEUPHIGH	Set logic high at wake-up when in deep sleep
(47)	AT+SLEEP	Set to get into deep sleep mode
(48)	AT+SERIALNOnnnnnnnnnn	Set serial number e.g. AB000001, fixed 8-character length
(49)	AT+MACADDRnnnnnnnnnnnnnnnn	Set IC MAC address, where n is Hex. Written order is from MSB byte to LSB byte.
(50)	AT+RESPONSEDIS	Disable response when sending "write" command
(51)	AT+RESPONSEEN	Enable response when sending "write" command
(52)	AT+DEFAULT	Back to default setting
(53)	AT+COMMANDEN	Switch to command mode when BLE is connected (USB communication mode only)
(54)	AT+COMMANDDIS	Switch to transmission mode when BLE is connected (USB communication mode only)
(55)	AT+BOOTLOADER	For Raytac Test only

● Peripheral “Read”

No.	Command	Description
(1)	AT?ROLE	To retrieve device role
(2)	AT?NAME	To retrieve scanned device name
(3)	AT?BASEUUID	To retrieve base UUID value (Hex)
(4)	AT?SERVICEUUID	To retrieve service UUID value (Hex)
(5)	AT?TXCHARACTERUUID	To retrieve TX character UUID value (Hex)
(6)	AT?RXCHARACTERUUID	To retrieve RX character UUID value (Hex)
(7)	AT?PHYMODE	To retrieve status of PHY mode
(8)	AT?TXPOWER	To retrieve RF TX power
(9)	AT?CONNECTINTERVALMODE	To retrieve status of connection interval mode
(10)	AT?CONNECTINTERVALTIME	To retrieve value of connection interval time under Mode 2
(11)	AT?BAUDRATE	To retrieve current UART baud rate
(12)	AT?DCDC	To retrieve DC to DC converter status
(13)	AT?XTAL	To retrieve status of 32.768 KHZ oscillator
(14)	AT?ADVTIME	To retrieve advertising time (Hex)
(15)	AT?ADVINTERVALTIME	To retrieve advertising interval time setting.
(16)	AT?ADVPATTERN	To retrieve LED advertising pattern (Hex)
(17)	AT?CONNECTPATTERN	To retrieve LED connecting pattern (Hex)
(18)	AT?FLOWCONTROL	To retrieve UART status of flow control
(19)	AT?WAKEUP	To retrieve logic of wake-up pin
(20)	AT?CONNECTINDICATOR	To retrieve logic of pin for BT-connecting indicator
(21)	AT?SERIALNO	To retrieve serial number
(22)	AT?MACADDR	To retrieve IC MAC address
(23)	AT?ADCVALUE	To retrieve 10bit ADC value
(24)	AT?CONNECTRSSI	To retrieve RSSI value when in BLE connection (Ascii)
(25)	AT?RESPONSE	To retrieve status of response
(26)	AT?VERSION	To retrieve firmware version
(27)	AT?ALLPARAMETERS	To retrieve value of all parameters
(28)	AT?BLESTATUS	To retrieve status of BLE

No.	Command	Response
(16)	AT?IDLETIME	0000 (default: Hex, forever advertising with no timeout, tttt: 0x0000)
(17)	AT?SCANOLDTIME	0000 (default: Hex , forever scanning paired device with no timeout, tttt: 0x0000)
(18)	AT?SCANNEWTIME	0000 default: Hex , forever scanning ALL devices with no timeout, tttt: 0x0000)
(19)	AT?IDLEPATTERN	00640f3c (default: Hex , 0.1sec on / 3.9sec off, nnnn: 0x0064, ffff: 0x0f3c)
(20)	AT?CONNECTPATTERN	00c80708 (default: Hex , 0.2sec on / 1.8sec off, nnnn: 0x00c8, ffff: 0x0708)
(21)	AT?SCANOLDPATTERN	03e803e8 (default: Hex , 1sec on / 1sec off, nnnn: 0x03e8, ffff: 0x03e8)
(22)	AT?SCANNEWPATTERN	00640064 (default: Hex , 0.1sec on / 0.1sec off, nnnn: 0x0064, ffff: 0x0064)
(23)	AT?FLOWCONTROL	0 flowcontrol dis (default) (0 = disable; 1 = enable)
(24)	AT?WAKEUP	0 wakeup low (default) (0 = low active; 1 = high active)
(25)	AT?CONNECTINDICATOR	0 connect indicator low (default) (0 = output low; 1 = output high)
(26)	AT?SERIALNO	Display " no data! " string (default)
(27)	AT?MACADDR	e.g. D352BDE1E414
(28)	AT?ADCVALUE	Value varies from input voltage
(29)	AT?RESPONSE	1 response en (default) (0 = disable response; 1 = enable response)
(30)	AT?VERSION	e.g. version: 1.1
(31)	AT?COMPANYID	004C (default: Hex , dddd: 0x004C)

No.	Command	Response
(32)	AT?BEACONUUID	0112233445566778899AABBCCDDEEFF0 (default: Hex , <code>xx</code> : 0x0112233445566778899AABBCCDDEEFF0)
(33)	AT?BEACONINFO	0 beaconinfo dis (default) (0 = disable to print beacon info.; 1 = enable to print beacon info.)
(34)	AT?ALLPARAMETERS	Display value of all parameters, separated by "0x0d0x0a"
(35)	AT?BLESTATUS	0 = scan idle (default) (1 = scan old start, 2 = scan new start, 3 = scan new mac, 4 = scan list, 5 = scan beacon, 8 = BLE connected)



No.	Command	Response
(15)	AT?ADVINTERVALTIME	0040 (default:Hex, 40 ms)
(16)	AT?ADVPATTERN	01F1001F4 (default: Hex, 0.5sec on / 0.5sec off, nnnn: 0x01F4, fff: 0x01F4)
(17)	AT?CONNECTPATTERN	00c80708 (default: Hex, 0.2sec on / 1.8sec off, nnnn: 0x00c8, ffff: 0x0708)
(18)	AT?FLOWCONTROL	0 flowcontrol dis (default) (0 = disable; 1 = enable)
(19)	AT?WAKEUP	0 wakeup low (default) (0 = low active; 1 = high active)
(20)	AT?CONNECTINDICATOR	0 connect indicator low (default) (0 = output low; 1 = output high)
(21)	AT?SERIALNO	Display " no data! " string (default)
(22)	AT?MACADDR	e.g. D352BDE1E414
(23)	AT?ADCVALUE	Value varies from input voltage
(24)	AT?CONNECTRSSI	-30 (dBm, value varies from RSSI)
(25)	AT?RESPONSE	1 response en (default) (0 = disable response; 1 = enable response)
(26)	AT?VERSION	e.g. version: 1.1
(27)	AT?ALLPARAMETERS	Display value of all parameters, separated by "0x0d0x0a"
(28)	AT?BLESTATUS	7 = adv. start (default) (6 = adv. stop, 7 = adv. start, 8 = BLE connected)

4.3. Default Info

4.3.1. Central

No.	Description	Default
(1)	Scanned device name	MDBT50Q-ATMS
(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)	Scanning new RSSI threshold	-51 (Ascii).
(5)	PHY mode	1Mbps
(6)	RF TX power	+8dBm
(7)	Connection interval mode	Mode 0 (min. 20ms / Max. 40ms),
(8)	Baud rate	9600bps,n,8,1
(9)	Status of DC-to-DC converter	Disabled (LDO mode)
(10)	32.768Khz oscillator	Using internal RC oscillator with 1,000ms calibration time
(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)	Idle LED pattern	0.1sec on / 3.9sec off
(15)	Connecting LED pattern	0.2sec on / 1.8secs off
(16)	LED pattern for scanning paired device	1sec on / 1sec off
(17)	LED pattern for scanning all devices	0.1sec on / 0.1sec off
(18)	Status of flow control	Disabled
(19)	Logic of wake-up pin	Set logic low to wake up in deep sleep
(20)	Logic of BT connecting indicator	Output set as logic low when BT is connecting
(21)	Serial number	Display " no data! " string
(22)	ADC value	Value varies from input voltage between 0x0000 ~ 0x03FF (Hex).

No.	Description	Default
(23)	State of response	Enabled
(24)	Firmware version	1.1
(25)	Company ID	0x004C
(26)	Beacon UUID	0x01, 0x12, 0x23, 0x34, 0x45, 0x56, 0x67, 0x78, 0x89, 0x9A, 0xAB, 0xBC, 0xCD, 0xDE, 0xEF, 0xF0
(27)	Communication Interface	By hardware setting



4.3.2. Peripheral

No.	Description	Default
(1)	Device name	MDBT50Q-ATMS
(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)	PHY mode	1Mbps
(5)	RF TX power	+8dBm
(6)	Connection interval mode	Mode 0(min. 20ms / Max. 40ms)
(7)	Baud rate	9600bps,n,8,1
(8)	Status of DC-to-DC converter	Disable (LDO mode)
(9)	32.768KHz oscillator	Using internal RC oscillator with 1000ms calibration time
(10)	Advertising time	Forever advertising with no timeout
(11)	Advertising Interval	0x0040 Advertising interval is 40 ms
(12)	Advertising LED pattern	0.5sec on / 0.5sec off
(13)	Connecting LED pattern	0.2sec on / 1.8secs off
(14)	Status of flow control	Disable
(15)	Logic of wake-up pin	Set logic low to wake up in deep sleep
(16)	Logic of BT connecting indicator	Output set as logic low when BT is connecting
(17)	Serial number	Display “ no data! ” string
(18)	ADC value	Value varies from input voltage between 0x0000 ~ 0x03FF (Hex).
(19)	State of response	Enabled
(20)	Firmware version	1.1

5. How to Control External via MCU

5.1. How to Send AT Commands

5.1.1. UART Mode

- **When BT is **NOT** connected, for ALL commands**

1. Output low to **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. **Please wait for at least 250 ms between sending each command.**
3. **Send command “ AT+RESET ” (not HW reset) to save all your settings.**
4. Output high or NC to **UART PD** pin to turn off UART interface.

- **When BT is connected, for following commands ONLY**

Write: AT+RESET, AT+DISCONNECT, AT+SCANNEWSTART

Read: AT?PHYMODE, AT?CONNECTRSSI

1. Output low to **flash default** pin to enable the module to receive AT commands. Please keep it enabling during the whole time when sending AT commands.
2. Send “AT+RESET” or “AT+DISCONNECT” or “AT+SCANNEWSTART” or “AT?PHYMODE” or “AT?CONNECTRSSI”.
3. Output high or NC to **flash default** pin to disable the module to receive the AT commands.

5.1.2. USB Mode

- **When BT is NOT connected, for ALL commands**

1. Send any AT commands you want through COM port software. **Please wait for at least 250 ms between sending each command.**
2. Send command “ AT+RESET ” (**not HW reset**) to save all your settings through COM port software.

- **When BT is connected, for following commands ONLY**

Write: AT+RESET, AT+DISCONNECT, AT+SCANNEWSTART

Read: AT?PHYMODE, AT?CONNECTRSSI

1. Send “AT”COMMANDEN” to enter **command** mode when BLE is connected.
2. Send “AT+RESET” or “AT+DISCONNECT” or “AT+SCANNEWSTART” or “AT?PHYMODE” or “AT?CONNECTRSSI”.
3. Send “AT+COMMANDDIS” to go back to **data** mode when BLE is connected.

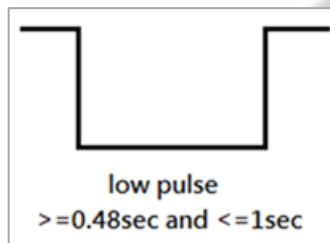
5.2. How to Return to Flashed Default Setting

*** Only when BT is NOT connected ***

*** Note that default baud rate is “9600bps,n,8,1”. For other default, please check [“4.3 Default Info”](#)**

● Use Hardware Method

1. Read [indicator](#) pin first to check if BT is *NOT* in connection.
2. Output a low pulse to [flash default](#) pin, then system will return to default setting.

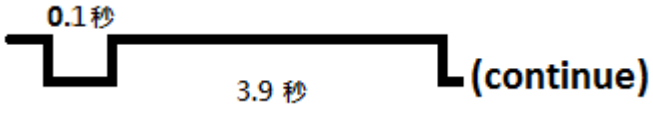
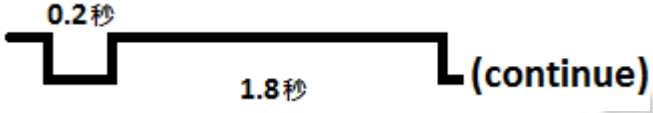
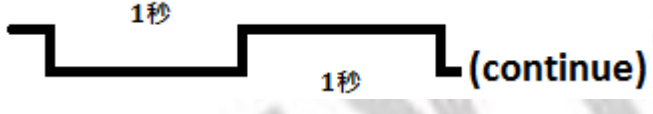



● Use Software method

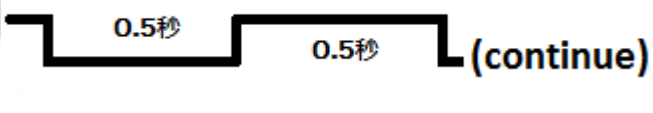
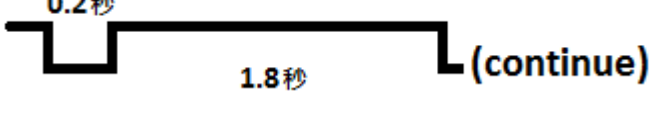
1. Output low to [UART PD](#) pin to enable UART interface. Please keep it enabling during the whole time when sending AT commands.
2. Send command “AT+DEFAULT”, then system will return to default setting.

5.3. Default Definition of Connect/ADV LED Status

● Central

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

● Peripheral

Mode	LED Status
Advertising	 <p>0.5秒 0.5秒 (continue)</p> <p>Breathing light</p>
Connected	 <p>0.2秒 1.8秒 (continue)</p> <p>0.2 sec ON / 1.8 secs OFF</p>

5.4. 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	✓	
RF Data Rate	✓	✓

● 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).

DISCONNECT BLE Connection

- When the device is in BLE connection, press the button for less than 2 seconds and release it to disconnect the paired device.

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

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.

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

5.5. Throughput Test

Here **D.L.** means “**Data Length**” and **D.I.** means “**Data Interval**” in the table.

- MCU→ Peripheral (MDBT50Q-ATMS UART)→ Central (MDBT50Q-ATMS UART)→ PC Console
- Under **PHY mode** at **2 Mbps**

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 = 20 ms Max = 40 ms	min = 20 ms Max = 40 ms	9600	X V	244	255	1049200	1095	0.93
min = 20 ms Max = 40 ms	min = 20 ms Max = 40 ms	115200	X V	244	23	1049200	98	10.45
min = 20 ms Max = 40 ms	min = 20 ms Max = 40 ms	460800	X V	244	7	1049200	30	34.15
min = 20 ms Max = 40 ms	min = 20 ms Max = 40 ms	921600	X V	244	4	1049200	16	64.03
min = Max = 8ms	min = Max = 8ms	9600	X V	244	255	1049200	1095	0.93
min = Max = 8ms	min = Max = 8ms	115200	X V	244	23	1049200	97	10.56
min = Max = 8ms	min = Max = 8ms	460800	X V	244	7	1049200	29	35.33
min = Max = 8ms	min = Max = 8ms	921600	X V	244	4	1049200	16	64.03

- Under **PHY mode** at **1 Mbps**

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 = 20 ms Max = 40 ms	min = 20 ms Max = 40 ms	9600	X V	244	255	1049200	1095	0.93
min = 20 ms Max = 40 ms	min = 20 ms Max = 40 ms	115200	X V	244	23	1049200	98	10.45
min = 20 ms Max = 40 ms	min = 20 ms Max = 40 ms	460800	X V	244	7	1049200	30	34.15
min = 20 ms Max = 40 ms	min = 20 ms Max = 40 ms	921600	X V	244	4	1049200	16	64.03
min = Max = 8ms	min = Max = 8ms	9600	X V	244	255	1049200	1095	0.93
min = Max = 8ms	min = Max = 8ms	115200	X V	244	23	1049200	97	10.56
min = Max = 8ms	min = Max = 8ms	460800	X V	244	7	1049200	29	35.33
min = Max = 8ms	min = Max = 8ms	921600	X V	244	4	1049200	16	64.03

- Under **PHY mode** at **125 Kbps**

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 = 20 ms Max = 40 ms	min = 20 ms Max = 40 ms	9600	X V	244	255	1049200	1095	0.93
min = 20 ms Max = 40 ms	min = 20 ms Max = 40 ms	115200	X V	244	39	1049200	167	6.13
min = 20 ms Max = 40 ms	min = 20 ms Max = 40 ms	460800	X V	244	39	1049200	167	6.13
min = 20 ms Max = 40 ms	min = 20 ms Max = 40 ms	921600	X V	244	39	1049200	167	6.13
min = Max = 8ms	min = Max = 8ms	9600	X V	244	255	1049200	1095	0.93
min = Max = 8ms	min = Max = 8ms	115200	X V	244	77	1049200	330	3.10
min = Max = 8ms	min = Max = 8ms	460800	X V	244	77	1049200	330	3.10
min = Max = 8ms	min = Max = 8ms	921600	X V	244	77	1049200	330	3.10

● MCU→ Central (MDBT50Q-ATMS UART)→ Peripheral (MDBT50Q-ATMS UART)→ PC Console

- Under **PHY mode** at **2 Mbps**

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 = 20 ms Max = 40 ms	min = 20 ms Max = 40 ms	9600	X V	244	255	1049200	1095	0.93
min = 20 ms Max = 40 ms	min = 20 ms Max = 40 ms	115200	X V	244	39	1049200	167	6.13
min = 20 ms Max = 40 ms	min = 20 ms Max = 40 ms	460800	X V	244	30	1049200	129	7.94
min = 20 ms Max = 40 ms	min = 20 ms Max = 40 ms	921600	X V	244	28	1049200	119	8.61
min = Max = 8ms	min = Max = 8ms	9600	X V	244	255	1049200	1095	0.93
min = Max = 8ms	min = Max = 8ms	115200	X V	244	23	1049200	97	10.56
min = Max = 8ms	min = Max = 8ms	460800	X V	244	9	1049200	38	26.96
min = Max = 8ms	min = Max = 8ms	921600	X V	244	8	1049200	34	30.13

- Under **PHY mode** at **1 Mbps**

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 = 20 ms Max = 40 ms	min = 20 ms Max = 40 ms	9600	X V	244	255	1049200	1095	0.93
min = 20 ms Max = 40 ms	min = 20 ms Max = 40 ms	115200	X V	244	39	1049200	167	6.13
min = 20 ms Max = 40 ms	min = 20 ms Max = 40 ms	460800	X V	244	30	1049200	128	8.00
min = 20 ms Max = 40 ms	min = 20 ms Max = 40 ms	921600	X V	244	28	1049200	119	8.61
min = Max = 8ms	min = Max = 8ms	9600	X V	244	255	1049200	1095	0.93
min = Max = 8ms	min = Max = 8ms	115200	X V	244	23	1049200	97	10.56
min = Max = 8ms	min = Max = 8ms	460800	X V	244	9	1049200	37	27.69
min = Max = 8ms	min = Max = 8ms	921600	X V	244	9	1049200	37	27.69

- Under **PHY mode** at **125 Kbps**

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 = 20 ms Max = 40 ms	min = 20 ms Max = 40 ms	9600	<u>X</u> V	244	255	1049200	1095	0.93
min = 20 ms Max = 40 ms	min = 20 ms Max = 40 ms	115200	<u>X</u> V	244	46	1049200	197	5.20
min = 20 ms Max = 40 ms	min = 20 ms Max = 40 ms	460800	<u>X</u> V	244	46	1049200	197	5.20
min = 20 ms Max = 40 ms	min = 20 ms Max = 40 ms	921600	<u>X</u> V	244	46	1049200	197	5.20
min = Max = 8ms	min = Max = 8ms	9600	<u>X</u> V	244	255	1049200	1095	0.93
min = Max = 8ms	min = Max = 8ms	115200	<u>X</u> V	244	77	1049200	330	3.10
min = Max = 8ms	min = Max = 8ms	460800	<u>X</u> V	244	77	1049200	330	3.10
min = Max = 8ms	min = Max = 8ms	921600	<u>X</u> V	244	77	1049200	330	3.10

● MCU→ Peripheral (MDBT50Q-ATMS UART)→ Central (MDBT50Q-RX-ATM)→ PC Console

- Under **PHY mode** at **2 Mbps**

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 = 20 ms Max = 40 ms	min = 20 ms Max = 40 ms	9600	X V	244	255	1049200	1095	0.93
min = 20 ms Max = 40 ms	min = 20 ms Max = 40 ms	115200	X V	244	22	1049200	93	11.01
min = 20 ms Max = 40 ms	min = 20 ms Max = 40 ms	460800	X V	244	6	1049200	25	40.98
min = 20 ms Max = 40 ms	min = 20 ms Max = 40 ms	921600	X V	244	3	1049200	12	85.38
min = Max = 8ms	min = Max = 8ms	9600	X V	244	255	1049200	1095	0.93
min = Max = 8ms	min = Max = 8ms	115200	X V	244	23	1049200	98	10.45
min = Max = 8ms	min = Max = 8ms	460800	X V	244	6	1049200	25	40.98
min = Max = 8ms	min = Max = 8ms	921600	X V	244	3	1049200	12	85.38

- Under **PHY mode** at **1 Mbps**

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 = 20 ms Max = 40 ms	min = 20 ms Max = 40 ms	9600	X V	244	255	1049200	1095	0.93
min = 20 ms Max = 40 ms	min = 20 ms Max = 40 ms	115200	X V	244	22	1049200	93	11.01
min = 20 ms Max = 40 ms	min = 20 ms Max = 40 ms	460800	X V	244	6	1049200	25	40.98
min = 20 ms Max = 40 ms	min = 20 ms Max = 40 ms	921600	X V	244	3	1049200	12	85.38
min = Max = 8ms	min = Max = 8ms	9600	X V	244	255	1049200	1095	0.93
min = Max = 8ms	min = Max = 8ms	115200	X V	244	22	1049200	93	11.01
min = Max = 8ms	min = Max = 8ms	460800	X V	244	8	1049200	33	31.04
min = Max = 8ms	min = Max = 8ms	921600	X V	244	8	1049200	33	31.04

- Under **PHY mode** at **125 Kbps**

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 = 20 ms Max = 40 ms	min = 20 ms Max = 40 ms	9600	X V	244	255	1049200	1095	0.93
min = 20 ms Max = 40 ms	min = 20 ms Max = 40 ms	115200	X V	244	39	1049200	167	6.13
min = 20 ms Max = 40 ms	min = 20 ms Max = 40 ms	460800	X V	244	39	1049200	167	6.13
min = 20 ms Max = 40 ms	min = 20 ms Max = 40 ms	921600	X V	244	39	1049200	167	6.13
min = Max = 8ms	min = Max = 8ms	9600	X V	244	255	1049200	1095	0.93
min = Max = 8ms	min = Max = 8ms	115200	X V	244	78	1049200	334	3.06
min = Max = 8ms	min = Max = 8ms	460800	X V	244	78	1049200	334	3.06
min = Max = 8ms	min = Max = 8ms	921600	X V	244	78	1049200	334	3.06

● MCU→ Peripheral (MDBT50Q-ATMS UART)→ Central (MDBT42Q-ATM/PATM)→ PC Console

- Under **PHY mode** at **2 Mbps**

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 = 20 ms Max = 75 ms	min = 20 ms Max = 40 ms	9600	X V	244	255	1049200	1095	0.93
min = 20 ms Max = 75 ms	min = 20 ms Max = 40 ms	115200	X V	244	26	1049200	111	9.23
min = 20 ms Max = 75 ms	min = 20 ms Max = 40 ms	460800	X V	244	8	1049200	34	30.13
min = Max = 8ms	min = Max = 8ms	9600	X V	244	255	1049200	1095	0.93
min = Max = 8ms	min = Max = 8ms	115200	X V	244	26	1049200	111	9.23
min = Max = 8ms	min = Max = 8ms	921600	X V	244	8	1049200	33	31.04

- Under **PHY mode** at **1 Mbps**

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 = 20 ms Max = 75 ms	min = 20 ms Max = 40 ms	9600	X V	244	255	1049200	1095	0.93
min = 20 ms Max = 75 ms	min = 20 ms Max = 40 ms	115200	X V	244	26	1049200	111	9.23
min = 20 ms Max = 75 ms	min = 20 ms Max = 40 ms	460800	X V	244	8	1049200	34	30.13
min = Max = 8ms	min = Max = 8ms	9600	X V	244	255	1049200	1095	0.93
min = Max = 8ms	min = Max = 8ms	115200	X V	244	26	1049200	111	9.23
min = Max = 8ms	min = Max = 8ms	921600	X V	244	8	1049200	33	31.04

6. 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 Developer Zone: <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 nRF52833 :
<https://www.nordicsemi.com/Products/Low-power-short-range-wireless/nRF52833>
A brief introduction to nRF52833 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		2020/05/30	1 st release.	99-52833-03A
1.1		2020/10/20	(1) Fixed HardFault_Handler error when sending large amounts of data in Central mode. (2) Fixed error of output data when receiving long length of data in scan beacon mode. (3) Added "AT?BLESTATUS" command.	99-52833-03B

Release Note

- 2020/05/30 Version A: 1st release
- 2020/10/21 Version B

(1) See [History of Firmware Revision](#) for FW revision 1.1

