Bluetooth Message Protocol State Machine

Command Characteristic: uint8\_t [10]

|  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Bluetooth Header | Module | Sub Message #1 | Sub Message #2 | Sub Message #3 | Sub Message #4 | Sub Message #5 | Sub Message #6 | Sub Message #7 | Bluetooth Footer |

Response Characteristic: uint8\_t [4]

|  |  |  |  |
| --- | --- | --- | --- |
| Response #1 | Response #2 | Response #3 | Response #4 |

Bluetooth Header = 0XBA

Bluetooth Footer = 0XBB

**Module**

enum MODULE\_COMMAND\_CONSTANTS

{

NRF52\_MODULE = 0X01,

TMP117\_MODULE = 0X02,

BMI160\_MODULE = 0X03,

MAX30003\_MODULE = 0X04,

FT201X\_MODULE = 0X05,

BLUETOOTH\_MODULE = 0x06,

ECG\_MODULE = 0x07,

CY15B108QI\_MODULE = 0X08,

SERIAL\_SLAVE\_MODULE = 0X09

};

**Sub Message #1**

enum NRF52\_COMMAND\_CONSTANTS

{

NRF52\_HF\_CLOCK\_COMMAND = 0x01,

NRF52\_LF\_CLOCK\_COMMAND = 0x02,

NRF52\_CLOCK\_COMMAND = 0X03,

NRF52\_RTC\_CLOCK\_COMMAND = 0X04,

NRF52\_POWER\_COMMAND = 0X05,

NRF52\_COMMON\_COMMAND = 0X06,

NRF52\_I2C\_COMMAND = 0X07,

NRF52\_SPI\_COMMAND = 0X08

};

enum SERIAL\_SLAVE\_COMMAND\_CONSTANTS

{

USB\_COMMAND\_HEADER = 0XAA,

USB\_COMMAND\_FOOTER = 0XAB,

USB\_LOG\_HEADER = 0XAC,

USB\_LOG\_FOOTER = 0XAD,

ENABLE\_USB\_HANDLER\_COMMAND = 0X07,

DISABLE\_USB\_HANDLER\_COMMAND = 0X08,

BLUETOOTH\_COMMAND\_HEADER = 0XBA,

BLUETOOTH\_COMMAND\_FOOTER = 0XBB,

BLUETOOTH\_LOG\_HEADER = 0XBC,

BLUETOOTH\_LOG\_FOOTER = 0XBD,

NRF52\_INITIALIZATION\_COMMAND = 0X01,

TMP117\_INITIALIZATION\_COMMAND = 0X02,

CY15B108QI\_INITIALIZATION\_COMMAND = 0X03,

MAX30003\_INITIALIZATION\_COMMAND = 0X04,

STARTUP\_INITIALIZATION\_COMMAND = 0X05,

ENABLE\_BLUETOOTH\_HANDLER\_COMMAND = 0X06,

};

enum NRF52\_COMMAND\_CONSTANTS

{

NRF52\_HF\_CLOCK\_COMMAND = 0x01,

NRF52\_LF\_CLOCK\_COMMAND = 0x02,

NRF52\_CLOCK\_COMMAND = 0X03,

NRF52\_RTC\_CLOCK\_COMMAND = 0X04,

NRF52\_POWER\_COMMAND = 0X05,

NRF52\_COMMON\_COMMAND = 0X06,

NRF52\_I2C\_COMMAND = 0X07,

NRF52\_SPI\_COMMAND = 0X08

};

enum FT201X\_COMMAND\_CONSTANTS

{

FT201X\_READ\_CHIP\_ID\_COMMAND = 0X01,

FT201X\_SET\_VCP\_COMMAND = 0X02,

FT201X\_WRITE\_EEPROM\_COMMAND = 0X03,

FT201X\_READ\_EEPROM\_COMMAND = 0X04,

FT201X\_WRITE\_DATA\_ARRAY\_COMMAND = 0X05,

FT201X\_READ\_DATA\_COMMAND = 0X06

};

enum BMI160\_COMMAND\_CONSTANTS

{

BMI160\_READ\_CHIP\_ID\_COMMAND = 0X01,

BMI160\_INIT\_COMMAND = 0X02,

BMI160\_READ\_ACCEL\_GYRO\_COMMAND = 0X03

};

enum TMP117\_COMMAND\_CONSTANTS

{

TMP117\_READ\_CHIP\_ID\_COMMAND = 0X01,

TMP117\_INIT\_COMMAND = 0X02,

TMP117\_SET\_OPERATING\_MODE\_COMMAND = 0X03,

TMP117\_TEMP\_UINT16\_COMMAND = 0X04,

TMP117\_TEMP\_CHAR\_ARRAY\_COMMAND = 0X05,

TMP117\_READ\_REVISION\_NUMBER\_COMMAND = 0X06,

TMP117\_UNLOCK\_EEPROM\_COMMAND = 0X07,

TMP117\_GENERAL\_CALL\_RESET\_COMMAND = 0X08

};

enum MAX30003\_COMMAND\_CONSTANTS

{

MAX30003\_READ\_INFO\_REGISTER\_COMMAND = 0X01,

MAX30003\_READ\_GENERAL\_CONFIGURATION\_COMMAND = 0X02,

MAX30003\_WRITE\_GENERAL\_CONFIGURATION\_COMMAND = 0X03,

MAX30003\_READ\_CALIBRATION\_CONFIGURATION\_COMMAND = 0X04,

MAX30003\_WRITE\_CALIBRATION\_CONFIGURATION\_COMMAND = 0X05,

MAX30003\_READ\_INPUT\_MULTIPLEXER\_CONFIGURATION\_COMMAND = 0X06,

MAX30003\_WRITE\_INPUT\_MULTIPLEXER\_CONFIGURATION\_COMMAND = 0X07,

MAX30003\_READ\_ECG\_CONFIGURATION\_COMMAND = 0X08,

MAX30003\_WRITE\_ECG\_CONFIGURATION\_COMMAND = 0X09,

MAX30003\_READ\_RTOR1\_CONFIGURATION\_COMMAND = 0X0A,

MAX30003\_WRITE\_RTOR1\_CONFIGURATION\_COMMAND = 0X0B,

MAX30003\_READ\_RTOR2\_CONFIGURATION\_COMMAND = 0X0C,

MAX30003\_WRITE\_RTOR2\_CONFIGURATION\_COMMAND = 0X0D,

MAX30003\_READ\_ECG\_FIFO\_MEMORY\_COMMAND = 0X0E,

MAX30003\_SOFT\_RESET\_COMMAND = 0X0F,

MAX30003\_SYNC\_COMMAND = 0X10,

MAX30003\_INIT\_INTERRUPT\_COMMAND = 0X11,

MAX30003\_ENABLE\_PIN\_INTERRUPT\_COMMAND = 0X12,

MAX30003\_DISABLE\_PIN\_INTERRUPT\_COMMAND = 0X13,

MAX30003\_GET\_ECG\_VOLTAGE\_COMMAND = 0X14,

MAX30003\_READ\_STATUS\_REGISTER\_COMMAND = 0X15,

MAX30003\_READ\_INTERRUPT1\_REGISTER\_COMMAND = 0X16,

MAX30003\_WRITE\_INTERRUPT1\_REGISTER\_COMMAND = 0X17,

MAX30003\_READ\_INTERRUPT2\_REGISTER\_COMMAND = 0X18,

MAX30003\_WRITE\_INTERRUPT2\_REGISTER\_COMMAND = 0X19,

MAX30003\_READ\_INTERRUPT\_MANAGER\_REGISTER\_COMMAND = 0X1A,

MAX30003\_WRITE\_INTERRUPT\_MANAGER\_REGISTER\_COMMAND = 0X1B,

MAX30003\_INIT\_COMMAND = 0X1C,

MAX30003\_INTERRUPT1\_DISABLE\_COMMAND = 0X1D,

MAX30003\_START\_RECORDING\_COMMAND = 0X1E,

MAX30003\_WRITE\_FIFO\_RESET\_REGISTER\_COMMAND = 0X1F,

};

enum NRF52\_BLUETOOTH\_COMMAND\_CONSTANTS

{

BLUETOOTH\_INIT\_GAP\_PARAMS\_COMMAND = 0X01,

BLUETOOTH\_INIT\_GATT\_COMMAND = 0X02,

BLUETOOTH\_INIT\_SERVICES\_COMMAND = 0X03,

BLUETOOTH\_INIT\_CONN\_PARAMS\_COMMAND = 0X04,

BLUETOOTH\_INIT\_BLE\_STACK\_COMMAND = 0X05,

BLUETOOTH\_INIT\_PEER\_MANAGER\_COMMAND = 0X06,

BLUETOOTH\_INIT\_ADVERTISING\_COMMAND = 0X07,

BLUETOOTH\_SET\_ADVERTISING\_POWER\_COMMAND = 0X09,

BLUETOOTH\_START\_ADVERTISING\_COMMAND = 0X0A,

BLUETOOTH\_WRITE\_RESPONSE\_CHAR\_COMMAND = 0X0B,

BLUETOOTH\_WRITE\_CRC\_CHAR\_COMMAND = 0X0C,

BLUETOOTH\_TRANSMIT\_FIRMWARE\_VERSION\_COMMAND = 0X10,

BLUETOOTH\_TRANSMIT\_HARDWARE\_BOARD\_VERSION\_COMMAND = 0X11,

BLUETOOTH\_WRITE\_TEMP\_CHAR\_COMMAND = 0X0D,

BLUETOOTH\_TRANSMIT\_TEMPERATURE\_RECORDING\_SESSION\_COMMAND = 0X0F,

BLUETOOTH\_WRITE\_ECG\_CHAR\_COMMAND = 0X0E,

BLUETOOTH\_TRANSMIT\_ECG\_RECORDING\_SESSION\_COMMAND = 0X08,

};

enum NRF52\_CLOCK\_COMMAND\_CONSTANTS

{

NRF52\_HF\_CLOCK\_START = 0X01,

NRF52\_HF\_CLOCK\_STOP = 0X02,

NRF52\_NRFX\_CLOCK\_DRIVER\_INIT = 0X03,

NRF52\_NRFX\_CLOCK\_DRIVER\_UNINIT = 0X04,

NRF52\_LF\_CLOCK\_START = 0X05,

NRF52\_LF\_CLOCK\_STOP = 0X06

};

enum NRF52\_RTC\_FT201X\_COMMAND\_CONSTANTS

{

NRF52\_RTC\_FT201X\_INIT = 0X01,

NRF52\_RTC\_FT201X\_SET\_COUNTER = 0X02,

NRF52\_RTC\_FT201X\_START = 0X03,

NRF52\_RTC\_FT201X\_STOP = 0X04,

NRF52\_RTC\_FT201X\_RESTART = 0X05,

NRF52\_RTC\_FT201X\_UNINIT = 0X06,

};

enum NRF52\_RTC\_TMP117\_COMMAND\_CONSTANTS

{

NRF52\_RTC\_TMP117\_INIT = 0X07,

NRF52\_RTC\_TMP117\_SET\_COUNTER = 0X08,

NRF52\_RTC\_TMP117\_START = 0X09,

NRF52\_RTC\_TMP117\_STOP = 0X10,

NRF52\_RTC\_TMP117\_RESTART = 0X11,

NRF52\_RTC\_TMP117\_UNINIT = 0X12

};

enum NRF52\_POWER\_COMMAND\_CONSTANTS

{

NRF52\_POWER\_DCDC\_CONVERTER\_ENABLE = 0X01,

NRF52\_POWER\_DCDC\_CONVERTER\_DISABLE = 0X02,

NRF52\_POWER\_SLEEP\_MODE\_ENTER = 0X03,

NRF52\_POWER\_DEEP\_SLEEP\_MODE\_ENTER = 0X04,

NRF52\_POWER\_MANAGER\_HANDLER = 0X05,

NRF52\_POWER\_MANAGER\_INIT = 0X06

};

enum NRF52\_LED\_COMMAND\_CONSTANTS

{

NRF52\_LED\_INIT = 0X10,

NRF52\_LED\_IND\_LED\_ON = 0X11,

NRF52\_LED\_IND\_LED\_OFF = 0X12,

NRF52\_LED\_IND\_BLINK = 0X13,

NRF52\_LED\_BLE\_LED\_ON = 0X14,

NRF52\_LED\_BLE\_LED\_OFF = 0X15,

NRF52\_LED\_BLE\_BLINK = 0X16

};

enum NRF52\_COMMON\_COMMANDS\_CONSTANTS

{

NRF52\_LOG\_INIT = 0X01,

NRF52\_GPIOTE\_INIT = 0X02,

NRF52\_LDO\_INIT = 0X03,

NRF52\_VCC\_LDO\_EN = 0X04,

NRF52\_INPUT\_OUTPUT\_INIT = 0X05,

NRF52\_MAX30003\_POWER\_LDO\_EN = 0X06,

};

enum NRF52\_I2C\_COMMANDS\_CONSTANTS

{

NRF52\_I2C\_TWIM\_INIT = 0X01,

NRF52\_I2C\_TWIM\_UNINIT = 0X02,

NRF52\_I2C\_TWIM\_SETUP = 0X03,

NRF52\_I2C\_TWIM\_ENABLE = 0X04,

NRF52\_I2C\_TWIM\_DISABLE = 0x05,

};

enum NRF52\_SPI\_COMMANDS\_CONSTANTS

{

NRF52\_SPI\_SPIM\_INIT = 0X01,

NRF52\_SPI\_SPIM\_ENABLE = 0X02,

NRF52\_SPI\_SPIM\_DISABLE = 0X03,

NRF52\_SPI\_SPIM\_UNINIT = 0X04,

NRF52\_SPI\_SPIM\_SELECT\_CS\_PIN = 0X05,

NRF52\_SPI\_SPIM\_SETUP = 0X06,

NRF52\_SPI\_SPIM\_INIT\_CS\_PIN = 0X07

};

enum NRF52\_LED\_COMMANDS\_CONSTANTS

{

NRF52\_LED\_IND\_CUSTOM\_BLINK = 0X01,

NRF52\_LED\_IND\_SHORT\_BLINK = 0X02,

NRF52\_LED\_IND\_MEDIUM\_BLINK = 0X03,

NRF52\_LED\_IND\_LONG\_BLINK = 0X04

};

enum ECG\_COMMANDS\_CONSTANTS

{

ECG\_INIT = 0X01,

ECG\_START\_RECORDING\_SESSION = 0X02

};

enum CY15B108QI\_COMMANDS\_CONSTANTS

{

CY15B108QI\_INIT\_COMMAND = 0X01,

CY15B108QI\_UNINIT\_COMMAND = 0X02,

CY15B108QI\_ENTER\_DEEP\_POWER\_DOWN\_MODE\_COMMAND = 0X03,

CY15B108QI\_EXIT\_DEEP\_POWER\_DOWN\_MODE\_COMMAND = 0X04,

CY15B108QI\_ENTER\_HIBERNATION\_MODE\_COMMAND = 0X05,

CY15B108QI\_EXIT\_HIBERNATION\_MODE\_COMMAND = 0X06,

CY15B108QI\_SET\_WRITE\_ENABLE\_LATCH\_COMMAND = 0X07,

CY15B108QI\_RESET\_WRITE\_ENABLE\_LATCH\_COMMAND = 0X08,

CY15B108QI\_READ\_DEVICE\_ID\_COMMAND = 0X09,

CY15B108QI\_READ\_UNIQUE\_ID\_COMMAND = 0X0A,

CY15B108QI\_WRITE\_STATUS\_REGISTER\_COMMAND = 0X0B,

CY15B108QI\_READ\_STATUS\_REGISTER\_COMMAND = 0X0C,

};

**Response Values**

enum NRF52\_BLUETOOTH\_RESPONSE\_CHAR\_CONSTANTS

{

BLUETOOTH\_RESPONSE\_CHAR\_MESSAGE\_RECEIVED = 0X00000001,

BLUETOOTH\_RESPONSE\_CHAR\_HEADER\_FOOTER\_INCORRECT = 0X00000002,

BLUETOOTH\_RESPONSE\_CHAR\_RECORDING\_SESSION\_FINISHED = 0X00000003,

BLUETOOTH\_RESPONSE\_CHAR\_ECG\_DATA\_READY\_FOR\_TRANSMISSION = 0X00000004,

BLUETOOTH\_RESPONSE\_CHAR\_RECORDING\_SESSION\_STARTED = 0X00000006,

BLUETOOTH\_RESPONSE\_CHAR\_TEMP\_DATA\_READY\_FOR\_TRANSMISSION = 0X00000005,

};

Example Commands:

Blink IND LED, short duration

|  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| BLUETOOTH HEADER | NRF52 MODULE | NRF52 COMMON COMMAND | NRF52 LED IND BLINK | NRF52 LED IND MEDIUM BLINK | 0X00 | 0X00 | 0X00 | 0X00 | BLUETOOTH FOOTER |

ECG Start Recording Session

|  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| BLUETOOTH HEADER | ECG MODULE | ECG START RECORDING SESSION | 0X00 | 0X00 | 0X00 | 0X00 | 0X00 | 0X00 | BLUETOOTH FOOTER |

Transmit ECG Recording Session

|  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| BLUETOOTH HEADER | BLUETOOTH MODULE | BLUETOOTH TRANSMIT ECG RECORDING SESSION COMMAND | 0X00 | 0X00 | 0X00 | 0X00 | 0X00 | 0X00 | BLUETOOTH FOOTER |

Transmit Temperature Recording Session

|  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| BLUETOOTH HEADER | BLUETOOTH MODULE | BLUETOOTH TRANSMIT TEMPERATURE RECORDING SESSION COMMAND | 0X00 | 0X00 | 0X00 | 0X00 | 0X00 | 0X00 | BLUETOOTH FOOTER |

Get Firmware Version

|  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| BLUETOOTH HEADER | BLUETOOTH MODULE | BLUETOOTH TRANSMIT FIRMWARE VERSION COMMAND | 0X00 | 0X00 | 0X00 | 0X00 | 0X00 | 0X00 | BLUETOOTH FOOTER |

Get Hardware Board Version

|  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| BLUETOOTH HEADER | BLUETOOTH MODULE | BLUETOOTH TRANSMIT HARDWARE BOARD VERSION COMMAND | 0X00 | 0X00 | 0X00 | 0X00 | 0X00 | 0X00 | BLUETOOTH FOOTER |