

HM-16 and HM-17

Self-Learning Function

Introduction

The communication of BLE is based on the UUID and properties of UUID to be accomplished. However, the manufacturer generally created their own unique UUID, which means it would be unable to communicate between different UUIDs. In order to solve the communication challenge, the HM-16/17 added the new self-learning feature.

1. Which firmware version start support the self-learning feature?

Since V107, we added powerful self-learning feature. The work beginning to be simple.

The follow documents are show you how to config by yourself.

2. How to use self-learning function

2.1 Configuration Process

2.1.1 Try to find all used UUID in slave device.

2.1.2 Set the HM-16/17 under manual operation mode

(AT+IMME1)

2.1.3 Set the HM module work in master mode.

(AT+ROLE1)

Note: Above process only need to set up once.

2.1.4 Connect to slave device.

(AT+CO command and AT+CONNL command)

2.1.5 Get characteristic UUID handle.

2.1.6 Enable notify UUID through UUID handle.

2.1.7 Set send data method and send data UUID handle.

2.1.8 Start send data and receive data process.

2.1.9 Disconnect from slave device. (AT)

2.2 How to get characteristic UUID handle

UUID included Service UUID and Characteristic UUID.

Characteristic UUID is grouped by a Service UUID.

Every UUID have a handle.

UUID handle is 4 bytes length, UUID handle value between 0001 to FFFF, Hex format.

Characteristic UUID have one or more properties.

Properties contains five attributes

2.2.1 WR(Write)

Usually used to send data to slave device.

Low speed method.

2.2.2 WN(Write-Without-Response)

Usually used to send data to slave device.

2.2.3 NO(Notify)

Enable notify could let slave device start send data to master device.

2.2.4 IN(Indicate)

Usually used to send data to master device by slave device

Low speed method

2.2.5 RD(Read)

Usually used to read data from slave device.

So, now we can see the most important parameters is UUID Handle and UUID properties.

3. Useful AT commands List

Command	Parameters	Memo
AT+DISC?	None	Search BLE devices
AT+CO<P1><P2>	P1: Device Type P2: Device MAC	Make BLE connection
AT+CONNL	None	Connect last successful device
AT+FINDSERVICES?	None	Find all services on slave device.
AT+FINDALLCHARS?	None	Find all characteristic not grouped by services
AT+CHAR<P1><P2>?	P1: Start Handle P2: End Handle	Find characteristic by start handle and end handle.
AT+NOTIFY_ON<P1>	P1: handle	Enable notify by handle

AT+NOTIFYOFF<P1>	P1: handle	Disable notify by handle
AT+READDATA<P1>?	P1: handle	Read data by handle
AT+SET_WAY<P1><P2>	P1: properties P2: handle	Set send data method
AT	None	Disconnect connection

4. How to get UUID handle and properties

4.1 AT+FINDSERVICES? Command

This command is used to get a services list.

“*****\r\n” --> command start. (58 Bytes)

<Value1>:<Value2>:<Value3>\r\n

...

<Value1>:<Value2>:<Value3>\r\n

“*****\r\n” --> command end (58 Bytes)

Value1: 4 Bytes, Service start Handle.

Value2: 4 Bytes, Service end handle.

Value3: Services UUID.



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*****
0001:000E:1800
000C:000F:1801
0010:FFFF:FE0
*****
AT+FINDSERVICES?|

```

Figure 1

4.2 AT+FINDALLCHARS? Command

This command is used to get a characteristic list not grouped by service.

“*****\r\n” --> command start. (58 Bytes)

<Value1>:<Value2>:<Value3>\r\n

...

<Value1>:<Value2>:<Value3>\r\n

“*****\r\n” --> command end (58 Bytes)

Value1: 4 Bytes, characteristic Handle.

Value2: 14 Bytes, characteristic properties, full properties is

“RD|WR|WN|NO|IN”, missed property replaced by “--”.

Value3: Services UUID.

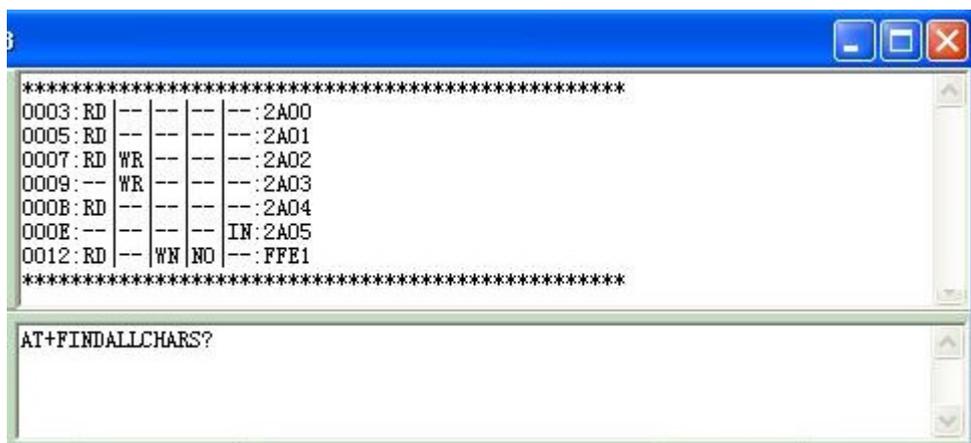


Figure 2

4.3 AT+CHAR<P1><P2>? command

This command is used to get a characteristic list by start handle and end handle.

P1: Start handle, 4 bytes, this value could get through
AT+FINDSERVICES?

P2: End handle, 4 bytes, this value could get through
AT+FINDSERVICES?

This command return value as same as AT+FINDALLCHARS?
Command.

e.g. "AT+CHAR0010FFFF?", 0010 is start handle, FFFF is end
handle.

This start handle and end handle you can find in figure 1.

5. How to read a data through a characteristic handle

5.1 "AT+READDATA<P1>?" Command

This command is used to read a data from characteristic handle.

P1: Characteristic handle, 4 bytes.

e.g. "AT+READDATA0012?", 0012 is characteristic handle.

Please make sure the characteristic UUID have "RD" property.

If send error, you will be got "OK+SEND-ER\r\n"

If data error, you will be got "OK+DATA-ER\r\n"

Note: this command is read, not receive data from slave device.

6. How to enable Notify and set send data method

6.1 AT+NOTIFY_ON<P1>, this command is used to enable notify.

6.2 AT+NOTIFYOFF<P1>, this command is used to disable notify.

P1: Characteristic handle, 4 bytes.

If send error, you will be got "OK+SEND-ER\r\n"

If data error or property missed, you will be got "OK+DATA-ER\r\n"

If all is okay, you will be got "OK+DATA-OK\r\n"

Note: Please make sure characteristic handle have notify property.

7. How to set send data method

7.1 AT+SET_WAY<P1><P2> command

This command is used to set send data method.

P1: Property, 2 Bytes, Possible value "WR", "WN", "NO", "IN"

P2: Characteristic handle 4 Bytes.

e.g. "AT+SET_WAYWR0012", WR is Write, 0012 is handle.

That mean we plan use WR (write) method through 0012 handle to send our data.

If all is okay, you will be got "OK+DATA-OK\r\n".

Note: Please make sure that characteristic have the same property.

8. Start send your data

After enable notify and set send data method. Now you can start send and receive your data.

When communication is finished you can send "AT" to disconnect from slave device.

NOTE1: If the slave and master device all is HM products, you can

forget this document, after connect, you can start send and receive data, doesn't need any AT commands.

NOTE2: If you know the device type and MAC address, you could ignore the searching steps and directly use 'AT+CO' command to make the connection.

NOTE3: After configuration, you also could use 'AT+IMMEO' to get the HM-16/17 working in automatic mode.

Jinan Huamao Technologies Co Ltd

webmaster@jnhuamao.cn

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