

# HM-10 and HM-11

## 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-10/11 added the new self-learning feature.

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

Since V6xx firmware, Module support self-learning function.

Since V7xx firmware, Module add powerful self-learning function.

The work beginning to be simple.

In V6xx firmware, you can use “HMConfigAssistant.exe” to generate AT commands list, then use them to start communication.

Also, you can update module firmware to V7xx through UART.

Please look at “How to update Modules firmware.pdf”, you can find it in [www.jnhuamao.cn](http://www.jnhuamao.cn), Download center, Rom download.

The follow documents are show you how to use self-learning function through AT command.

## 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 module under manual operation mode

(AT+IMME1)

2.1.3 Set the module work in master role.

(AT+ROLE1)

Note: Above process only need to set up once.

2.1.4 Connect to slave device.

(AT+CO command)

2.1.5 Get characteristic UUID handle.

2.1.6 Enable notify or indicate through UUID handle.

2.1.7 Set send data method and send data used 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.

Fast speed method

#### 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

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

#### 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
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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+INDICA_ON<P1>	P1: Handle	Enable indicate by handle
AT+NOTIFYOFF<P1>	P1: handle	Disable notify, indicate 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+SAV<P1><P2><P3>	P1: Notify Handle P2: Send method P3: Send Handle	Save notify handle and send data method and send data handle
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: 4 or 16 Bytes, Services UUID.



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: 4 or 16 Bytes, Services UUID.

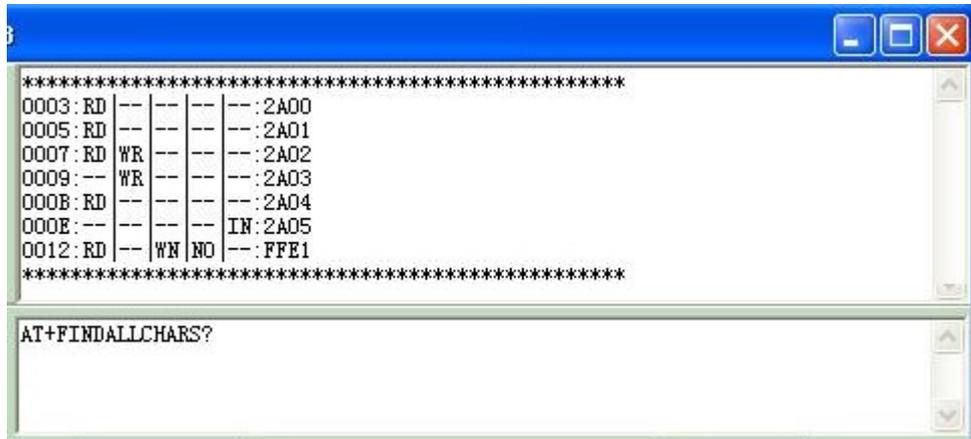


Figure 2

#### 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 or Indicate

6.1 AT+NOTIFY\_ON<P1>, this command is used to enable notify.

6.2 AT+INDICA\_ON<P1>, this command is used to enable indicate

6.3 AT+NOTIFYOFF<P1>, this command is used to disable notify or indicate.

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 or indicate 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. Send once data through Char property and handle

AT+SEND\_DATA<P1><P2><P3> command is used to send data through Char property and handle.

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

P2: Characteristic handle 4 Bytes.

P3: The data you want to send.

## 9. Different between AT+SET\_WAY and AT+SEND\_DATA

After AT+SET\_WAY setup, you can start data transfer, when you want use another Char handle to send once more data, you can use AT+SEND\_DATA command.

If you only use one Char handle, you can forget the AT+SEND\_DATA command.

## 10. Save handles

After you get all details, maybe you want to save those handles.

AT+SAV<P1><P2><P3> used to save those handles.

P1: 4 Bytes, Notify handle.

P2: 2 Bytes, Write property, (WR or WN)

P3: 4 Bytes, Write handle

If send ok, you will get "OK+SEND-OK\r\n"

If send failed, you will get "OK+SEND-ER\r\n"

After save those parameters, when you connected to this device next time. Module will use those parameters to enable notify and set send data method. You don't need do anything, just start send your personal data.

## **11.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+IMME0' to get the module working in automatic mode.

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