Connecting 2 Arduinos by Bluetooth using a HC-05 and a HC-06: Pair, Bind, and Link

In a <u>previous post</u> I showed how the HC-05 can auto connect to other Bluetooth devices by setting the HC-05 to pair with any device using CMODE=1. This is quick and easy but does not give any control over which other device the HC-05 connects to.

In this post I show how to set up the HC-05 to always connect to the same HC-06 (or HC-05 in Slave mode). For this we use PAIR, BIND, and LINK.

NOTE: There are now newer modules that use a 3.0-20170601 firmware. This guide does not work for these modules (AT+INQ gives an error). I do not have any of the new modules and cannot find a reliable supplier. I have ordered 3 sets of BT modules believing they were the newer ones only to receive old ones.

If you have not yet bought BT Classic modules. I recommend buying the original HC ones. These are slightly (just a little bit) more expensive but are well supported and full documentation is available. Original HC modules have the HC logo screen printed on the main BT board and the current boards have a blue LED top left.

I am using 2 separate Arduino IDEs; version 1.6.3 which is installed, and version 1.0.5 which I run from a folder (it is the non install version). This allows me to use 2 IDEs at the same time, each connected to a different Arduino. It also gives me 2 serial monitors, one for each Arduino.

The modules used are the zs-040 versions of the HC-05 and the HC-06. The HC-05 has the Wavesen/HC firmware 2.0-20100601 and any any module running the same firmware will be the same.

The HC-05 has 2 AT command modes which I refer to as "mini" AT mode and "full" AT mode and some commands only work when in "full" AT mode. To enter "full" AT mode pin 34 needs to be HIGH and kept HIGH. To accomplish this I have made a connection from pin 34 to +3.3v. See the diagram below (or after the jump).

If you are not sure about At command mode take a look at <u>Arduino with HC-05 (ZS-040) Bluetooth module – AT MODE</u>

If you are not familiar with how the HC-06 and HC-05 work it may be worth while checking out some of the other posts:
<u>HC-05 and HC-06 zs-040 Bluetooth modules</u>

Connections

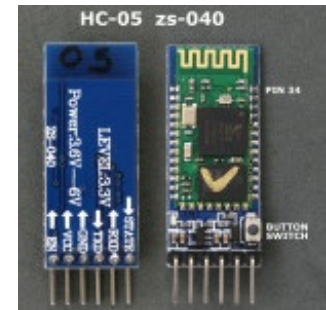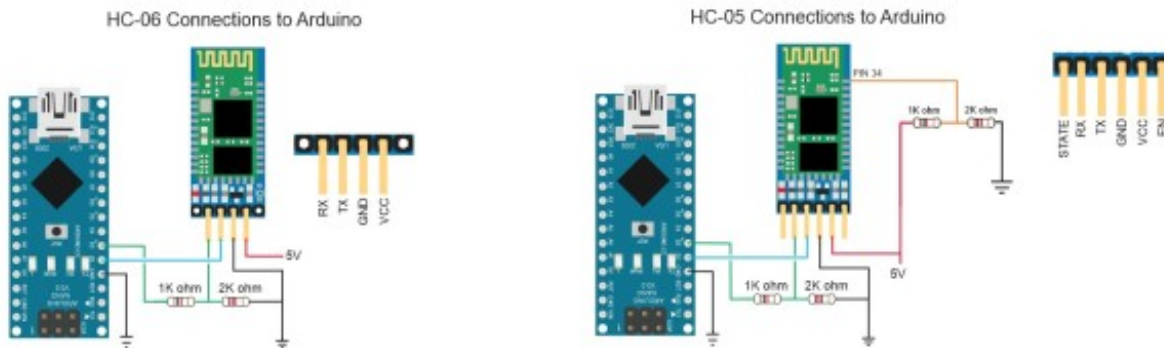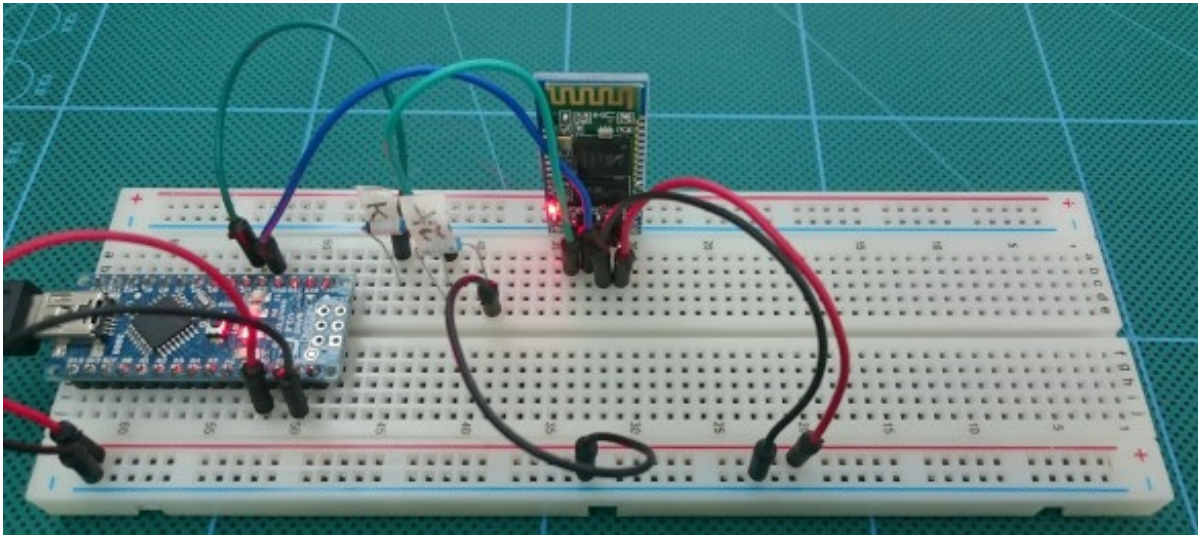I have 2 Arduinos. One connected to a HC-05 zs-040 and one connected to a HC-06 zs-040.

The HC-05 has a connection from pin 34 to +3.3v. This activates "full" AT mode.
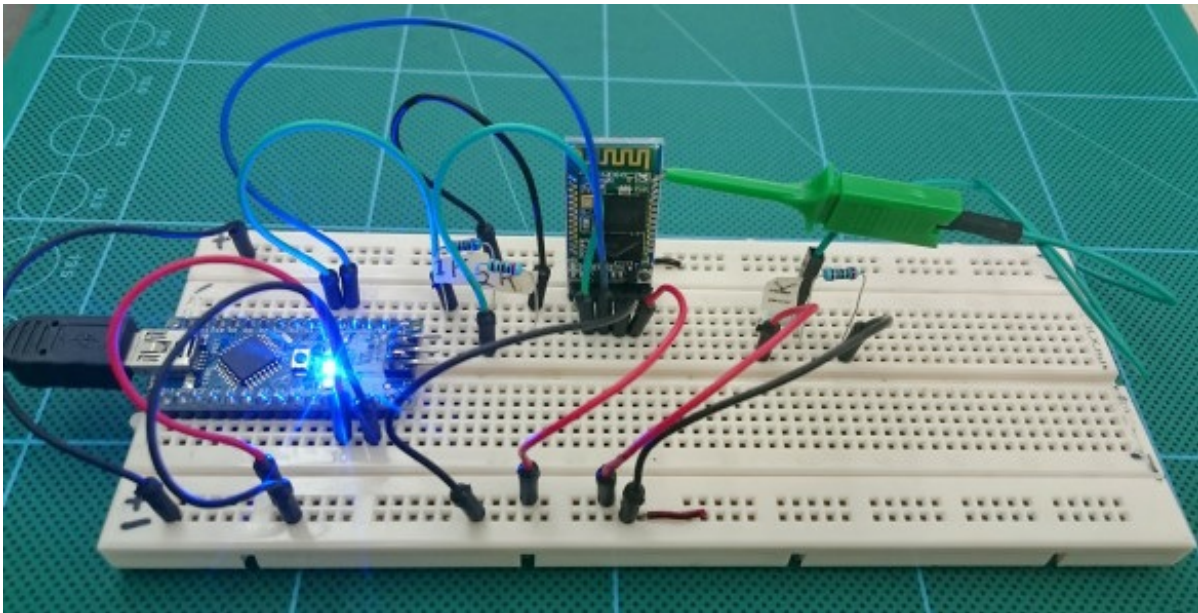
HC-05 Set Up

I have the HC-05 set with the following values:

– ROLE = 0 (slave mode)
– UART = 9600 (baud rate for communication mode)
– CMODE = 0 (only connect to paired devices)
– PSWD = 1234 (password/PIN for pairing)

In AT mode I will be using a baud rate of 38400.

Build the circuit, power on and load the following sketch.

```
// Basic Bluetooth sketch HC-05_02_38400
// Connect the HC-05 module and communicate using the serial monitor
//
// The HC-05 defaults to commincation mode when first powered on.
// Needs to be placed in to AT mode
// After a factory reset the default baud rate for communication mode is
38400
//
//
//  Pins
//  BT VCC to Arduino 5V out.
//  BT GND to GND
//  BT RX to Arduino pin 3 (through a voltage divider)
//  BT TX to Arduino pin 2 (no need voltage divider)


#include <SoftwareSerial.h>
SoftwareSerial BTserial(2, 3); // RX | TX
// Connect the HC-05 TX to Arduino pin 2 RX.
// Connect the HC-05 RX to Arduino pin 3 TX through a voltage divider.

char c = ' ';

void setup()
{
    // start th serial communication with the host computer
    Serial.begin(9600);
    Serial.println("Arduino with HC-05 is ready");

    // start communication with the HC-05 using 38400
    BTserial.begin(38400);
    Serial.println("BTserial started at 38400");
}

void loop()
{

     // Keep reading from HC-05 and send to Arduino Serial Monitor
    if (BTserial.available())
    {
        c = BTserial.read();
        Serial.write(c);
    }

    // Keep reading from Arduino Serial Monitor and send to HC-05
    if (Serial.available())
    {
        c =  Serial.read();

        // mirror the commands back to the serial monitor
        // makes it easy to follow the commands
        Serial.write(c);
        BTserial.write(c);
    }

}
```

Because pin 34 on the Bluetooth module is brought HIGH, the HC-05 should enter AT mode on power on.

Open the serial monitor on the host computer and confirm you are in AT mode by typing "AT"

(no quotes). You should get a reply of "OK"
Remember that the HC-05 requires "Both NL & CR" to be set.

The sketch echos the commands you enter back to the serial monitor. This makes it a bit easier to follow.
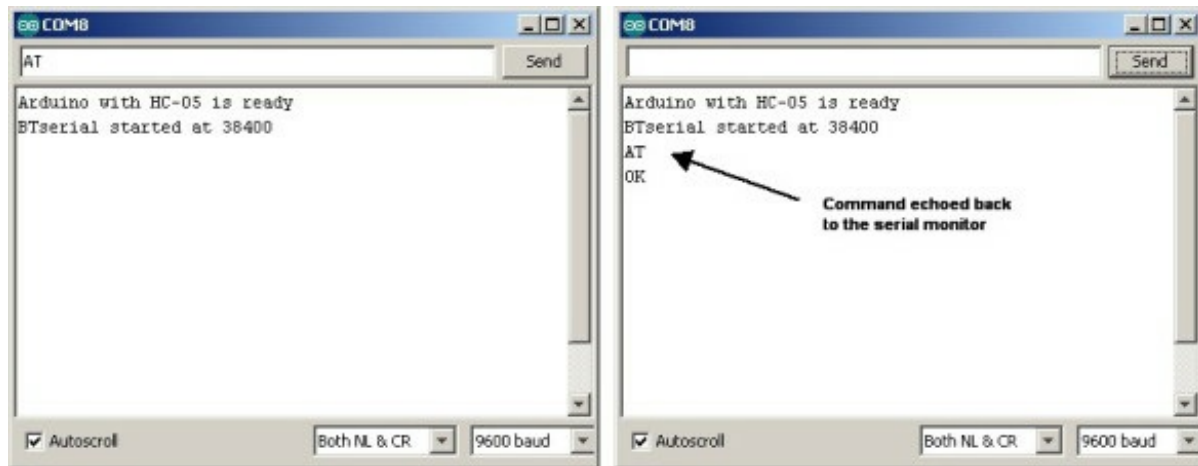
HC-06 Set Up

Build the HC-06 circuit, power on and load the following sketch. My HC-06 is set to use 9600 baud rate. If yours is using a different speed then you will need to change the sketch. Change the following lines:
BTSerial.begin(9600);
Serial.println("BTserial started at 9600");
Change the 9600 to what ever speed your HC-06 is using.

```
// Basic bluetooth test sketch. HC-06_01_9600
// HC-06 ZS-040
//
//
//  Uses hardware serial to talk to the host computer and software serial for
communication with the bluetooth module
//
//  Pins
//  BT VCC to Arduino 5V out.
//  BT GND to GND
//  BT RX to Arduino pin 3 (through a voltage divider)
//  BT TX to Arduino pin 2 (no need voltage divider)
//
//  When a command is entered in the serial monitor on the computer
//  the Arduino will relay it to the bluetooth module and display the result.
//
//  These HC-06 modules require capital letters and no line ending
//

#include <SoftwareSerial.h>
SoftwareSerial BTSerial(2, 3); // RX | TX

void setup()
{
    Serial.begin(9600);
    Serial.println("Arduino with HC-06 is ready");

    // HC-06 default baud rate is 9600
    BTSerial.begin(9600);
    Serial.println("BTserial started at 9600");
}

void loop()
{

  // Keep reading from HC-06 and send to Arduino Serial Monitor
  if (BTSerial.available())
    Serial.write(BTSerial.read());

  // Keep reading from Arduino Serial Monitor and send to HC-06
  if (Serial.available())
  BTSerial.write(Serial.read());
}
```

HC-06 modules start in AT mode so we can start entering commands as soon as we open the serial monitor. Remember that the HC-06 requires commands to be upper case and does not want new lines or carriage returns so set "No line endings" at the bottom of the serial monitor window. Open the serial monitor on the host computer and confirm you are in AT mode by typing "AT" (no quotes). You should get a reply of "OK"
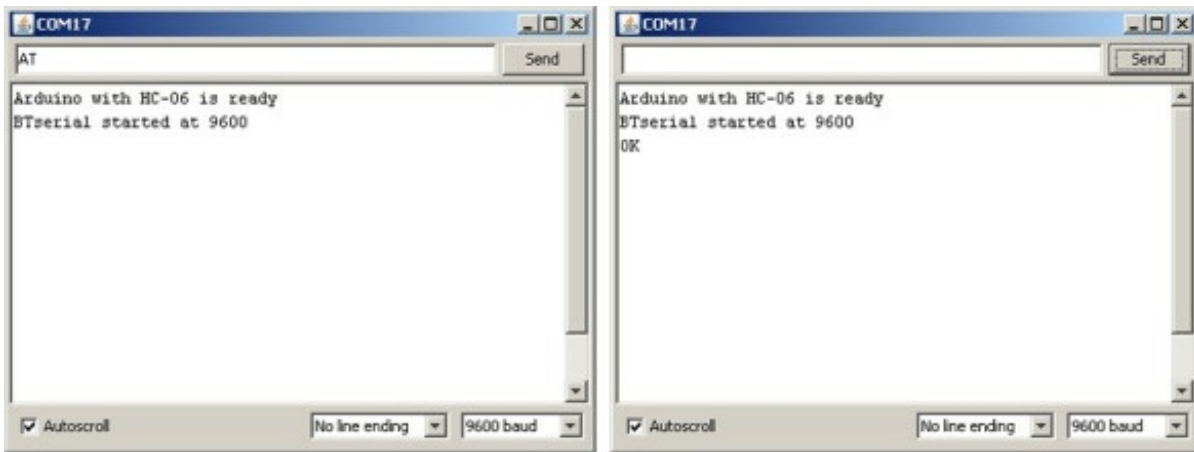
We don't need to do much to prepare the HC-06. Just make sure the password is the same as the HC-05.

To change the password/PIN to 1234 enter "AT+PSWD1234" (no quotes) and click Send
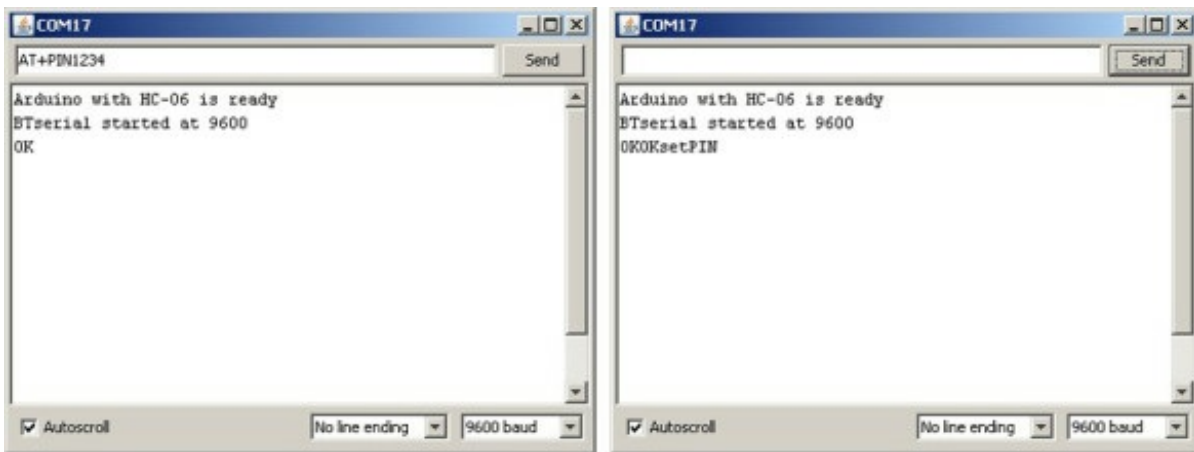
Pairing and Binding

At this point we should have the HC-06 waiting for a connection. The password/PIN is 1234.

The HC-05 should be in "full" AT mode. If you are not sure what this is see Arduino with HC-05 (ZS-040) Bluetooth module – AT MODE

The steps to connect to the HC-06 are
1. set the same baud rate on both devices.
2. make sure the passwords on the HC-05 and the HC-06 are the same
3. find the address of the HC-06
4. pair the HC-05 with the HC-06
5. bind the HC-06 to the HC-05
6. set the HC-05 to only connect with paired devices
7. link to the HC-06

1. Set the same baud rate on both devices.

Set the communication mode baud rate to 9600 on the HC-05 and the HC-06. I have already done this.
This is only for the purpose of this example. Once you have got everything working you can change the baud rates.

2. Make sure the passwords on the HC-05 and the HC-06 are the same

We have already set the passwords.

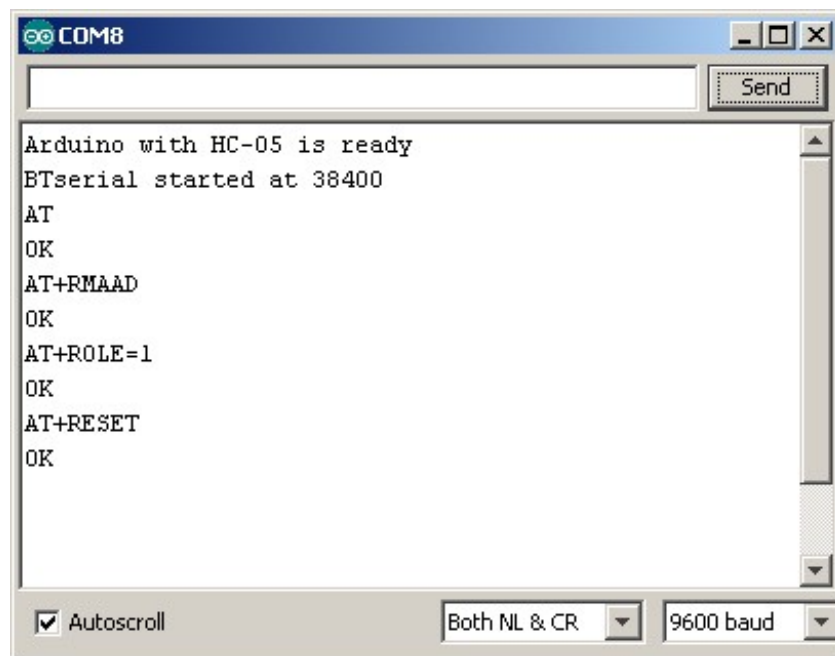## 3. Find the address of the HC-06

You can do this with an Android device or you can do it with the HC-05. Here is how to it with the HC-05.

Make sure the HC-05 is in AT mode and enter the following commands.
AT+RMAAD
AT+ROLE=1
AT+RESET

```
@@ COM8                                          _ □ ×
┌─────────────────────────────────────────┐ ┌──────┐
│                                          │ │ Send │
└─────────────────────────────────────────┘ └──────┘
Arduino with HC-05 is ready
BTserial started at 38400
AT
OK
AT+RMAAD
OK
AT+ROLE=1
OK
AT+RESET
OK


☑ Autoscroll              Both NL & CR  ▼   9600 baud  ▼
```

AT+RMAAD clears any previously paired devices.
AT+ROLE=1 puts the HC-05 in Master Mode
AT+RESET reset the HC-05. This is sometimes needed after changing roles.
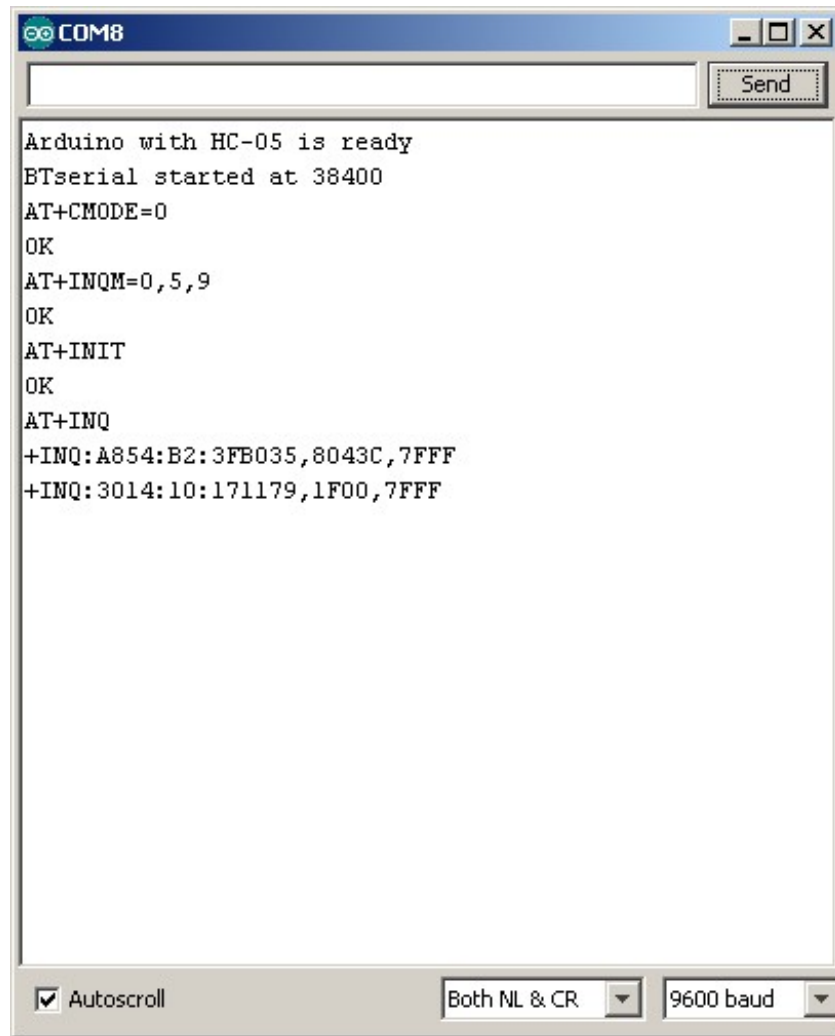
Now enter the following
AT+CMODE=0
AT+INQM=0,5,9
AT+INIT
AT+INQ

AT+INQM=0,5,9, AT+INIT and AT+INQ require pin 34 to be HIGH. If pin 34 is not HIGH then you will not receive any reply from these commands. No message, no error message.

```
COM8                                                    _ □ X
[                                                    ]  [ Send ]
Arduino with HC-05 is ready
BTserial started at 38400
AT+CMODE=0
OK
AT+INQM=0,5,9
OK
AT+INIT
OK
AT+INQ
+INQ:A854:B2:3FB035,8043C,7FFF
+INQ:3014:10:171179,1F00,7FFF




☑ Autoscroll                      Both NL & CR  ▼   9600 baud  ▼
```

AT+CMODE=0 allows the HC-05 to connect to any device
AT+INQM=0,5,9 set inquiry to search for up to 5 devices for 9 seconds
AT+INIT initiates the SPP profile. If SPP is already active you will get an error(17) which you can ignore.
AT+INQ searches for other Bluetooth devices.

In the above screen shot you can see that the HC-05 found 2 Bluetooth devices.
+INQ:A854:B2:3FB035,8043C,7FFF
+INQ:3014:10:171179,1F00,7FFF
One of these is the HC-06. To find out we can use the AT+RNAME? command.

AT+INQ returns 3 values, the first is the address and this is the value we need. The second value is the class of the device and the third value is the signal strength (RSSI).
AT+INQ will only work if the HC-05 is in Master Mode and after a AT+INIT command.

To get the name of the found devices we use the AT+RNAME? command. The address is the first field returned by AT+INQ; A854:B2:3FB035 and 3014:10:171179.

When we enter the address we need to replace the colons with commas. The format is AT+RNAME?A854,B2,3FB035 and AT+RNAME?3014,10,171179
Of course, you would use the address of your HC-06.
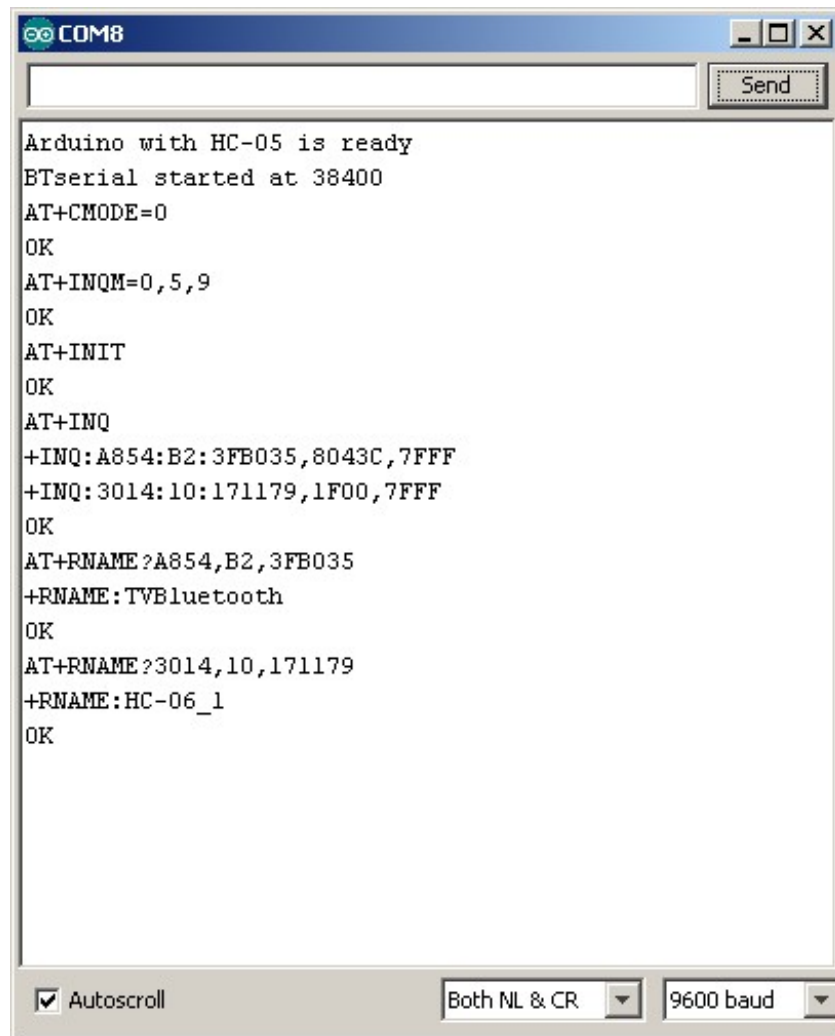
You can see from the above. A854:B2:3FB035 is my TV and 3014:10:171179 is the HC-06.

Now we have the address of the HC-06 we can finish making the connection.

4. Pair the HC-05 with the HC-06

To pair we use the AT+PAIR=<addr>,<timeout> command.
Enter "AT+PAIR=3014,10,171179,9" (no quotes)
If the HC-05 cannot pair with the HC-06 within 9 seconds you will get an error message. If the pairing is successful you will get an "OK"

5. Bind the HC-06 to the HC-05
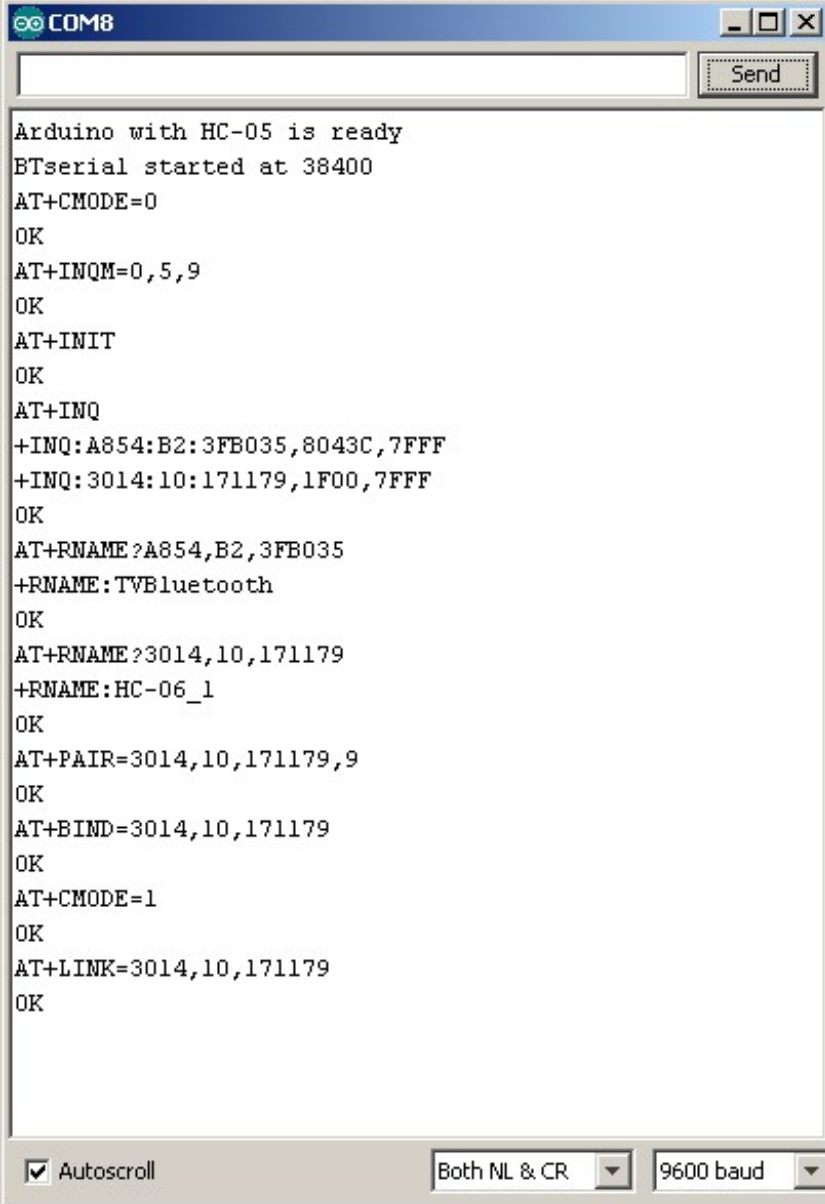
Bind using "AT+BIND=3014,10,171179"

6. Set the HC-05 to only connect with paired devices

We do this with the CMODE command – "AT+CMODE=1"

7. Link to the HC-06

Use the link command AT+LINK=<addr>
In my case "AT+LINK=3014,10,171179". If all is well you will get the "OK" reply.

```
COM8                                    _ □ X
                                         Send

Arduino with HC-05 is ready
BTserial started at 38400
AT+CMODE=0
OK
AT+INQM=0,5,9
OK
AT+INIT
OK
AT+INQ
+INQ:A854:B2:3FB035,8043C,7FFF
+INQ:3014:10:171179,1F00,7FFF
OK
AT+RNAME?A854,B2,3FB035
+RNAME:TVBluetooth
OK
AT+RNAME?3014,10,171179
+RNAME:HC-06_1
OK
AT+PAIR=3014,10,171179,9
OK
AT+BIND=3014,10,171179
OK
AT+CMODE=1
OK
AT+LINK=3014,10,171179
OK



✔ Autoscroll            Both NL & CR  ▼   9600 baud  ▼
```

The LED on the HC-05 should have 2 quick blinks every 2 seconds (or so).
The LED on the HC-06 should be on (not blinking).
You have now connected the HC-05 and the HC-06

Now that the connection has been formed, the HC-05 will automatically connect to the HC-06 every time they are turned on.

Once the connection is formed the HC-05 will switch to communication mode. If you want to continue with AT Mode then you will need to reset the module with pin 34 HIGH or with the button switch closed.

Test The Connection

On the HC-05, remove the connection to pin 34 and upload the following sketch to the Arduino connected to it. The sketch opens the BTserial at 9600 for communication mode.

```
// Basic Bluetooth sketch HC-05_03_9600
// Connect the HC-05 module and communicate using the serial monitor
//
// The HC-05 defaults to commincation mode when first powered on.
// Needs to be placed in to AT mode
// After a factory reset the default baud rate for communication mode is
38400
//
//
//  Pins
//  BT VCC to Arduino 5V out.
//  BT GND to GND
//  BT RX to Arduino pin 3 (through a voltage divider)
//  BT TX to Arduino pin 2 (no need voltage divider)


#include <SoftwareSerial.h>
SoftwareSerial BTserial(2, 3); // RX | TX
// Connect the HC-05 TX to Arduino pin 2 RX.
// Connect the HC-05 RX to Arduino pin 3 TX through a voltage divider.

char c = ' ';

void setup()
{
    // start the serial communication with the host computer
    Serial.begin(9600);
    Serial.println("Arduino with HC-05 is ready");

    // start communication with the HC-05 using 9600
    BTserial.begin(9600);
    Serial.println("BTserial started at 9600");
}

void loop()
{

     // Keep reading from HC-05 and send to Arduino Serial Monitor
    if (BTserial.available())
    {
        c = BTserial.read();
        Serial.write(c);
    }

    // Keep reading from Arduino Serial Monitor and send to HC-05
    if (Serial.available())
    {
        c =  Serial.read();
        BTserial.write(c);
    }

}
```

Reset both Arduinos and remove power from the HC-05 and the HC-06

Power on the HC-06. The LED should be rapidly blinking 5 times per second. This indicates it is waiting for a connection or to be paired.

Power on the HC-05. The LED will blink a couple of times when first on and then change to a

the regular pattern of blinking quickly every couple of seconds.

The LED on the HC-06 will turn on full time (no blinking).

The modules are now connected.

Open the serial monitors and what ever you enter in one will appear the the other and visa versa

Every time the modules are powered on they should connect. If you find they do not connect then cycle the power to the Arduinos. Sometimes the HC-05 will get stuck trying to make a connection. In this case the LED on the HC-05 will either

1. quickly blink 3 times every couple of seconds.

2. blink on/off twice a second.

This normally happens when the HC-06 is turned off and then back on again without resetting the HC-05.

The devices seem to connect more quickly when the HC-06 is started first.

Additional information

For more information about AT commands look at the HC-05 user guide or the EGBT-046S/EGBT-045MS user guide

Phillipe Cantin has a similar article here

Next step. Get Arduinos talking over Bluetooth. Arduino to Arduino by Bluetooth