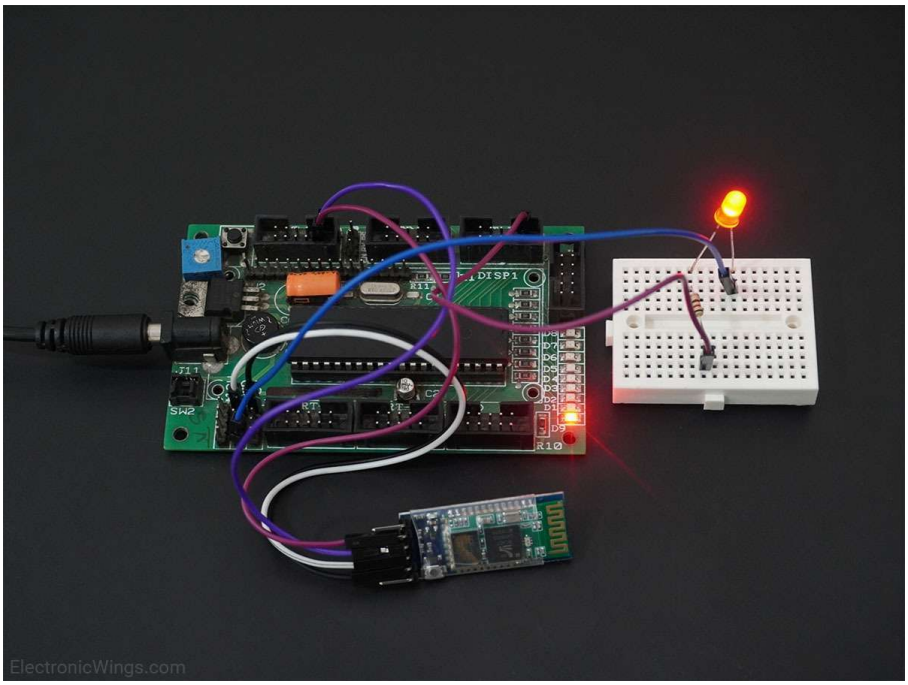
HC-05 Bluetooth Module Interfacing with AVR ATmega16/ATmega32



Overview of Bluetooth

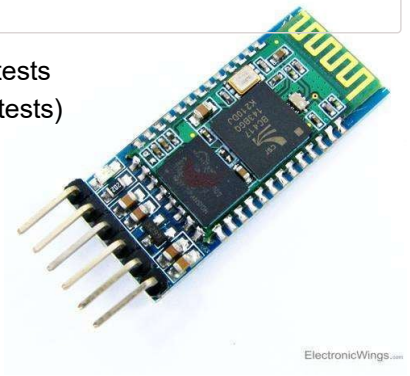
HC-05 is a Bluetooth device used for wireless communication. It works on serial communication (USART).

- It is a 6 pin module.
- The device can be used in 2 modes; data mode and command mode.
- The data mode is used for data transfer between devices whereas command mode is used for changing the settings of the Bluetooth module.
- AT commands are required in command mode.
- The module works on 5V or 3.3V. It has an onboard 5V to 3.3V regulator.

As the HC-05 Bluetooth module has a 3.3 V level for RX/TX and the microcontroller can detect 3.3 V level, so, no need to shift the transmit level of the HC-05 module. But we need to shift the transmit voltage level from the microcontroller to RX of the HC-05 module.

For more information about the HC-05 Bluetooth module and how to use it, refer to the topic **Bluetooth module HC-05** (http://electronicwings.com/sensors-modules/bluetooth-module-hc-05-) in the sensors and modules section.

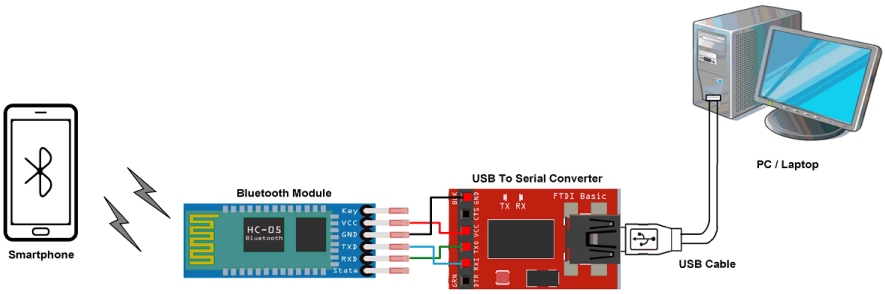
For information on USART in AVR ATmega16/ATmega32 and how to use it, refer the topic on **USART in AVR ATmega16/ATmega32** (http://electronicwings.com/avr-atmega/atmega1632-usart) in the ATmega basics section.



HC-05 Bluetooth Module

HC-05 Bluetooth Modules Pins

1. **Key:** It is used to bring Bluetooth module in AT commands mode. If key pin is set to high, then this module will work in command mode. Otherwise by default it is in data mode. The default baud rate of HC-05 in command mode is 38400 bps.
2. **VCC:** 5 V or 3.3 V.
3. **GND:** Ground.
4. **TXD:** Transmit Serial data (wirelessly received data by Bluetooth module transmitted out serially on TXD pin)
5. **RXD:** Receive data serially (received data will be transmitted wirelessly by Bluetooth module).
6. **State:** It tells that module is connected or not (here not used).



Testing via Computer Terminal

Following are some AT command generally used to change setting, customising of Bluetooth module.

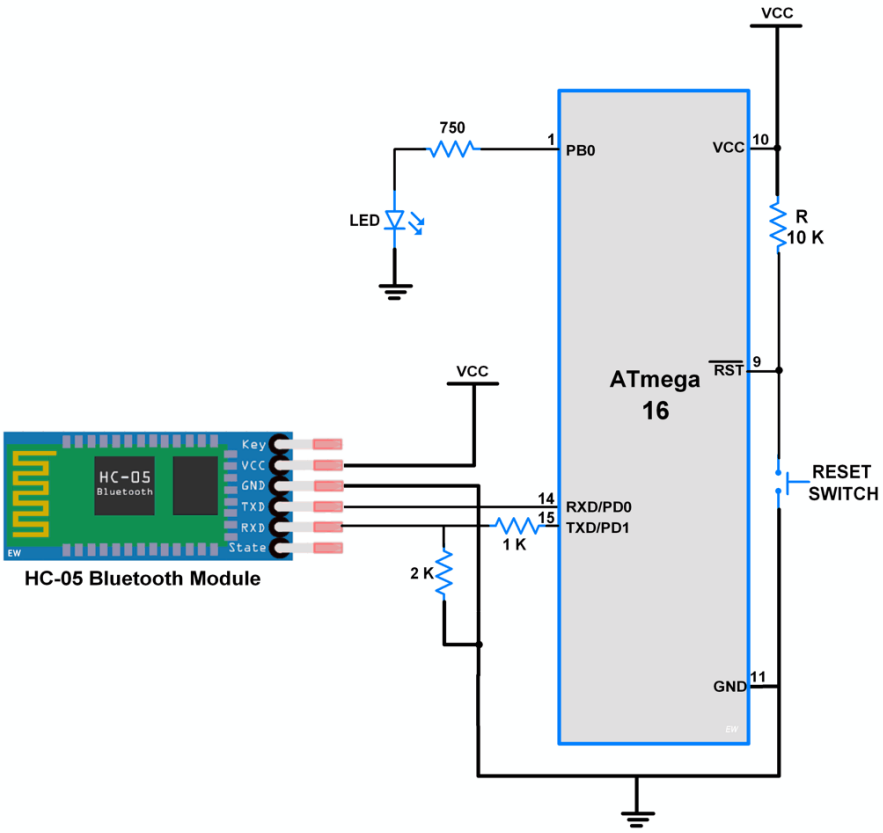
To send these commands, we have to connect HC-05 Bluetooth module to the PC via serial to USB converter and transmit these commands through serial terminal of PC.

However, without changing any settings, we can also use bluetooth module HC-05 with it's default settings.

Command	Description	Response
AT	**Checking communication**	**OK**
AT+PSWD=XXXX	**Set Password** **e.g. AT+PSWD=4567**	**OK**

AT+NAME=XXXX	Set Bluetooth Device Name e.g. AT+NAME=MyHC-05	OK
AT+UART=Baud rate, stop bit, parity bit	Change Baud rate e.g. AT+UART=9600,1,0	OK
AT+VERSION?	Respond version no. of Bluetooth module	+Version: XX OK e.g. +Version: 2.0 20130107 OK
AT+ORGL	Send detail of setting done by manufacturer	Parameters: device type, module mode, serial parameter, passkey, etc.

Connection Diagram of HC-05 Bluetooth Module With ATmega16/32



HC05 Bluetooth Module Interfacing with ATmega microcontroller

Controle the LED using HC-05 Bluetooth and ATmega16/32

Here let's develop a small application in which we can control LED ON-OFF through a smartphone.

This is done by interfacing AVR-based ATmega16/ATmega32 with the HC-05 Bluetooth module. Data from HC-05 is received/ transmitted serially by ATmega16/32.

In this application, when 1 is sent from the smartphone, LED will Turn ON and if 2 is sent LED will get Turned OFF. If received data is other than 1 or 2, it will return a message to mobile that select the proper option.

Programming steps

1. Initialize ATmega16/ATmega32 USART communication.
2. Receive data from the HC-05 Bluetooth module.
3. Check whether it is '1' or '2' and take respective controlling action on the LED.

HC-05 Bluetooth Code for ATmega16/32

```
/*
  Bluetooth_Interface with ATmega16 to Control LED via smartphone
  http://www.electronicwings.com
 */

#include <avr/io.h>
#include "USART_RS232_H_file.h"    /* include USART library */

#define LED PORTB          /* connected LED on PORT pin */

int main(void)
{
        char Data_in;
        DDRB = 0xff;              /* make PORT as output port */
        USART_Init(9600);         /* initialize USART with 9600 baud rate */
        LED = 0;

        while(1)
        {
                Data_in = USART_RxChar();          /* receive data from Blu
                if(Data_in =='1')
                {
```

Video of Bluetooth Communication using ATmega16

Components Used

ATmega 16 ATmega 16	X 1	(https://www.mouser.in/ProductDetail/Microchip-Technology-Atmel/ATMEGA16L-8PU?qs=%2Fha2pyFaduiGCJtTvs2wv8fVZbVAalLu7Iq%2FglTS0tALAx6fMenLvg%3D%3D&utm_source=electronicswings&utm_medium=display&utm_campaign=mouser-componentslisting&utm_content=0x0) Datasheet (/components/atmega-16/1/datasheet)
Atmega32 Atmega32	X 1	(https://www.mouser.in/ProductDetail/Microchip-Technology-Atmel/ATMEGA32-16PU?qs=aqrrBurbvGdpkmgj7RWmsQ%3D%3D&utm_source=electronicswings&utm_medium=display&utm_campaign=mouser-componentslisting&utm_content=0x0) Datasheet (/components/atmega32/1/datasheet)

Components Used

Powered By

Bluetooth Module HC-05 Bluetooth is a wireless communication protocol ...	X 1	(https://www.mouser.in/ProductDetail/Seeed-Studio/113020008?qs=%2Fha2pyFadujxGtKPZQOIsfAELhtMLc13%2FotJz6J0MPjFYdv7Yo3kbw%3D%3D&utm_source=electronicswings&utm_medium=display&utm_campaign=mouser-componentslisting&utm_content=0x0) Datasheet (/components/bluetooth-module-hc-05/1/datasheet)
LED 5mm LED 5mm	X 1	(https://www.mouser.in/ProductDetail/Lite-On/LTL-307EE?qs=Yz4wJs0d%252BpgyXm%2FpkMp2pg%3D%3D&utm_source=electronicswings&utm_medium=display&utm_campaign=mouser-componentslisting&utm_content=0x0) Datasheet (/components/led-5mm/1/datasheet)

Components Used

Breadboard Breadboard	X 1	(https://www.mouser.com/ProductDetail/Bus Board-Prototype-Systems/BB830?qs=VEfmQw3KOauhPeTwYxNCaA%3D%3D&utm_source=electronicswings&utm_medium=display&utm_campaign=mouser-componentslisting&utm_content=0x0) Datasheet (/components/breadboard/1/datasheet)

Downloads

ATMEGA16/32 HC-05 Interfacing Project File	Dow nloa d (/api/download/platform-attachment/242)

Comments

Comment

sahasayan16 (/users/sahasayan16/profile)
2018-03-12 13:25:07

Shows ? in the bluetooth terminal
Code didn't work.
Reply Like

lokeshc
(/users/lokeshc/profile)
2018-03-12 20:01:45

Check your connections properly.
Download the proper bluetooth terminal application on your smartphone. Some application have output in different format.
If still it not work then let me know.
Reply Like

sahasayan16
(/users/sahasayan16/profile)
2018-03-13 11:25:30

It didn't work.
I feel there is some problem with Usart file.
Reply Like

lokeshc
(/users/lokeshc/profile)
2018-03-31 22:40:17

You can try this application, it works for me

https://play.google.com/store/apps/details?id=ptah.apps.bluetoothterminal
Reply Like

Benax
(/users/Benax/profile)
2018-05-12 10:22:10

Hello, code dont work for me too :/ in terminal when i send 1 or 2 or 3 ... the answer always a lot of : ?? (question marks) ://
Reply Like

husainwamique
(/users/husainwamique/profile)
2018-04-05 10:08:56 • Edited

Sir for this one only..... can you give me the codes for cv avr as this one seems for arduino
Reply Like

lokeshc
(/users/lokeshc/profile)
2018-04-05 20:24:47

This code is for avr atmega which built on Atmel Studio.
Do you want to build this code on code vision (cv) avr?
Reply Like 2

Samkelisiwe
(/users/Samkelisiwe/profile)
2018-09-30 14:29:37

hi
I need to connect two HC-05 to communicate with each other, how do i do that? which one must be a master and which must be a slave?

Thanks in advance
Reply Like

lokeshc
(/users/lokeshc/profile)
2018-10-01 22:50:59

You can use any one HC-05 Bluetooth as a master and another one will be a slave. Just you have to configure them as master/slave using AT commands.
For establishing communication between two HC-05 Bluetooth, you need AT command to connect them.
This can be done by sending AT command to the slave device from controller.
After establishing a connection between them, you can transfer communicate data between master and slave.
Reply Like 1

Samkelisiwe
(/users/Samkelisiwe/profile)
2018-10-02 01:52:22

thank you Sir
Reply Like

sekay003
(/users/sekay003/profile)
2019-03-11 03:36:56

Pour moi le code marche sur atmega 328p mais le bluetooth ne reçoit pas encore les données pouvez vous m'aider Mr?
Reply Like

lokeshc
(/users/lokeshc/profile)
2019-03-11 11:48:43

check your Bluetooth connection.
Reply Like

madhumansukh
(/users/madhumansukh/profile)
2019-03-29 16:33:21

SAme problem is occurring, the connection are okay but the commands are not properly working. it shows "??????", please help
Reply Like

mohamedsobhy2282
(/users/mohamedsobhy2282/profile)
2019-06-26 03:21:55

hi bro... I write the code and no errors show and the program on phone is connected to hc05 but no action happens when running the code !!
Reply Like

olcaycaliskan
(/users/olcaycaliskan/profile)
2019-07-06 04:07:50 • Edited

program is running . but how can we read the analog value ?
example : int deneme = 50;
deneme ??
Reply Like

pandeashutos
(/users/pandeashutos/profile)
2019-12-12 12:33:08

We can get it here,
https://www.youtube.com/watch?v=mCVtozmq3_0
Reply Like

shani0tnt
(/users/shani0tnt/profile)
2020-05-14 21:23:27

if i want to send String like " Total" from Bluetooth then how to handle this string and make my logic accordingly ...? Is there any function to convert string to char ?
Reply Like

shani0tnt

(/users/shani0tnt/profile)
2020-05-14 21:23:40
if i want to send String like " Total" from Bluetooth then how to handle this string and make my logic accordingly ...? Is there any function to convert string to char ?
Reply Like

lokeshc
(/users/lokeshc/profile)
2020-05-15 07:55:07

Though you are sending string but UART will transmit it character by character. You can receive each character and store them into the array for comparison. Once you received your desired string, you can compare the string and take control action.
Ex.

```
int i=0;
char data_in[size];
char received_char;
while(1){

while((received_char = USART_RxChar()) ! = '\0')){
data_in[i] = received_char;
i++;
}
data_in[i] = '\0'; // adding null as last element in the array
//{now compare your string with array element }
}
```

I have not tested it but you can write logic like this.
Reply Like

shani0tnt
(/users/shani0tnt/profile)
2020-05-15 21:36:43

Thank you Mr. Lokeshc .. i tried that way as you mention but its not working.. still i can't get it.. plz help me please try once in hardware and then send that code.. your reply is very valuable for me . i am waiting .... thankyou so muchh
Reply Like

Msadr471
(/users/Msadr471/profile)
2020-08-14 20:37:11

Hi.
For Interfacing HC-06 is different? or not? same as this should I write?

thanks.
Reply Like

MortezaAskari
(/users/MortezaAskari/profile)
2020-12-07 15:07:53

hi how can use delay
and can I change the number 1 to A
for on the led
Reply Like

RUTUJAGOGULWAR
(/users/RUTUJAGOGULWAR/profile)
2021-06-11 20:25:05

how to send data from microcontroller to bluetooth device
Reply Like

ThurunuChalitha
(/users/ThurunuChalitha/profile)
2021-08-10 17:25:36

Anyone working with HC-12 serial communication module between two ATmega32A?
Reply Like

josiaagt
(/users/josiaagt/profile)
2021-12-06 15:06:29

Hello, i have connected everthing to plan and i also used the same bluetooth terminal application on my smartphone. When i send 1,2 i get ??? on the terminal app.... I really need it for my project. Do you know what could be the reason?

My Controller is also Atmega32/16

Also the LED doesnt light up when i send 1 through bluetooth
Reply Like 1

JidanABC
(/users/JidanABC/profile)
2022-06-08 15:33:45

How do I get the library #include "USART_RS232_H_file.h"
Reply Like