

# Communication Concept Between Bluetooth As a Master and Slave To Exchange Digital Information



Agus Wibowo

**Abstract:** In this digital era and the increasingly developing human resources, it is possible to create new research in this era of development. One example of its development is the discussion of the concept of serial communication. In technology, we know the name of the serial communication. In today's world serial communication is the forerunner of communication between platforms in general. In this journal we will know what serial communication is, it is a communication method that is carried out one way and the concept of sending data is bit by bit or, in other words serial communication is one method of data communication that is sent over a cable which gets one bit of data in a certain time simultaneously and alternately. In this study using the main tool namely the HC-05 Bluetooth module which is used as a master and slave.

**Keywords:** HC-05 Bluetooth Module, Serial Communication, Bit of Data.

## I. INTRODUCTION

In an all-digital era and increasingly the development of human resources allows the creation of a new research in this era of development. One example of its development is the discussion of the concept of serial communication.

In technology, we know the name of the serial communication. In today's world serial communication is the forerunner of communication between platforms in general. In this journal we will know what serial communication is, it is a communication method that is carried out one way and the concept of sending data is bit by bit or, in other words serial communication is one method of data communication that is sent over a cable which gets one bit of data in a certain time simultaneously and alternately. Configuration pins for serial communication include RXD (receive channel) and TXD (send channel) and ground.

In this study using the main tool namely the HC-05 Bluetooth module which is used as a master and slave. What is meant by the master is where the module.

This Bluetooth as the central point of connection for the direction of sending data, while the slave functions as a client

or as a producer of data that will be sent to the master.

## II. LITERATURE REVIEW

### A. Communication Series

Serial communication is communication that transmits per-bit data sequentially and in turn. This communication has an advantage that only requires one line and less cable compared to parallel communication. In principle, serial communication is communication where data transmission is done per bit so that it is slower than parallel communication, or in other words serial communication is one method of data communication that is sent over a cable which obtains one bit of data at a certain time simultaneously and alternately. Basically serial communication is a special case of parallel communication with a value of  $n = 1$ , or in other words it is a form of parallel communication with only one cable and only sends one bit of data simultaneously. This can be juxtaposed with actual parallel communication where  $n$ -bits of data are sent together, with a general value of  $8 \leq n \leq 128$ . (Triansah, 2017).

### B. Bluetooth Module HC-05

Bluetooth is a wireless data communication module that uses radio frequencies. The main function of this module is to replace the serial communication that used to be wired now to be wireless. Bluetooth consists of two types of devices, namely Master (data sender) and Slave (receiver). This HC-05 module is set by 9.600 bps by default (can be customized between 1200 bps to 1.35 Mbps). There are 2 types of types namely Bluetooth Module HC-06 series which can only act as slave devices, and Bluetooth Module HC-05 can also play a role as a bluetooth master device or slave, by default slave. (Dendi, Dkk, 2016).



Figure 1. Bluetooth HC-05 Module

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Source: <https://www.google.com/search?q=bluetooth+hc+05>

### III. METHODOLOGY

Arduino Uno is a microcontroller that uses IC ATmega328. This microcontroller has 14 digital input / output pins with the functions of each pin as follows: 6 pins are used as PWM outputs, 6 pins for analog input, USB connections, 16MHz crystal oscillator, reset button. Each arduino pin has its own function. This board can be connected by USB on a computer or with batteries and adapters with DC mains voltage.

Inside this microcontroller has additional features namely SDA and SCL pins which are located adjacent to the aref pin and two other new pins placed close to the RESET pin, another feature is the IO REF which functions to allow the device as a buffer to adapt to the voltage provided from system board. In its development Arduino Uno is compatible with AVR processors, operating at 5v DC power (Syahwil, 2014).



Figure 2 Arduino Uno R3 Board

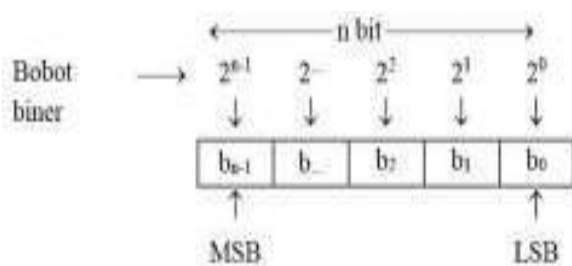
Source:

<https://www.makerlab-electronics.com/product/arduino-uno-r3atmega328p-ch340g/>

#### A. Bit Numbers In Digital

Digital or binary systems are electronic data that are only worth 1/0, high / low. The purpose of these words is Logic 1 (High) is known as light or voltage, while logic 0 (Low) is known as dead or has no voltage. Therefore, binary number systems are most often used to represent quantities and represent conditions in digital systems including computer systems. Binary digit digits are called binary digits or bits. Four bits are called nibbles and eight bits are bytes (Freddy, 2018).

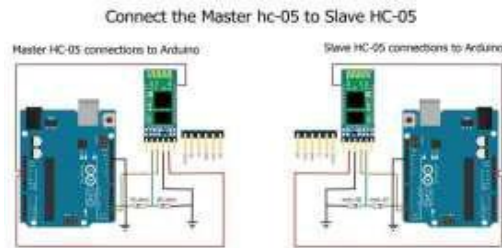
Figure 3 Representation of Binary Integers



Source: Kurniawan, 2018

### IV. RESULT ANALYSIS

Figure 4 Concept of Serial Communication



From the explanation above, we can see that there are two Bluetooth modules that act as Master and Slave. Because the functions of the two Bluetooth modules are different, so they have different configurations, that is:

```

ERROR: (0)
OK ← "AT"
+UART: 38400, 0, 0 ← "AT+UART?"
OK
+ROLE: 0 ← "AT+ROLE?"
OK
+ADDR: 98d3:31:3069b0 ← "AT+ADDR?"
OK
    
```

Figure 5 Configuration for the Bluetooth module as a Slave

Source: <https://howtomechatronics.com/>

- 1) AT is a command that functions to check whether the Bluetooth module is properly connected. If connected, the Arduino serial monitor will give an answer "OK", if not connected will give an answer 1. "ERROR: (0)"
- 2) AT + UART? is a command that functions for the Bluetooth module response speed value. By default this speed is at 38400.
- 3) AT + ROLE? is a command that functions to set the Bluetooth module as Slave or Master. If the answer "+ ROLE: 0" then the Bluetooth module is in the Slave position, but if "+ ROLE: 1" then the Bluetooth module is in the Master position.
- 4) AT + ADDR? is a command to check the address / serial code in the Bluetooth module which will later be used as an introduction to the connection process between the Bluetooth modules.

```

ERROR: (0)
OK ← "AT"
+UART: 38400, 0, 0 ← "AT+UART?"
OK ← "AT+ROLE=1"
OK ← "AT+CMODE=0"
OK ← "AT+BIND=98d3,31,3069b0"
    
```

Figure 6 Configuration for the Bluetooth module as a Slave

Source: <https://howtomechatronics.com/>

AT + ADDR? is a command to check the address / serial code in the Bluetooth module which will later be used as an introduction to the connection process between the Bluetooth modules.

1. AT, AT + UART, AT + ROLE = 1 command that has the same meaning as the description in Figure 4 above.
2. AT + BIND is a command to bind / connect slaves that have been predetermined.
3. AT + CMODE = 0 is a command that functions to pairing devices between Bluetooth modules that act as

In Master and Slave, there are 3 configurations, namely:

- AT + CMODE = 0 ambungkan connect to the Bluetooth module whose address has been specified in the AT + Command.
- AT + CMODE = 1 ambungkan connect to the Bluetooth module whose address is not specified (all Bluetooth signals are received) in the AT + Command.
- AT + CMODE = 2 □ slave loop mode, only applies to ROLE = 0.

### Digital Information Exchange Process Using Arduino Uno R3

```

void loop() {
  if(Serial.available() > 0) { // Checks whether data is coming from the serial port
    state = Serial.read(); // Reads the data from the serial port
  }

  // Reading the button
  buttonState = digitalRead(button);
  if (buttonState == HIGH) {
    Serial.write('1'); // Sends '1' to the master to turn on LED
  }

  else {
    Serial.write('0');
  }
}

```

Figure 7 Example Program Code To Slave Send Data To The Master

In the program there is a command "Serial.write ('1') is a command to send binary data "1" to the master that the master will receive the data and executed by the output in this case the output is an LED light that will light if logic 1 and will die if it has logic 0.

```

void loop() {
  if(Serial.available() > 0) { // Checks whether data is coming from the serial port
    state = Serial.read(); // Reads the data from the serial port
  }

  // Controlling the LED
  if (state == '1') {
    digitalWrite(ledPin, HIGH); // LED ON
    state = 0;
  }
  else if (state == '0') {
    digitalWrite(ledPin, LOW); // LED OFF
    state = 0;
  }
  delay(10);
}

```

Figure 8 Example Program Code for the Master

### Receiving Data from the Slave

1. In the "Controlling the LED" sub program provides a logic function if the data received in the state variable has a value of 1, then the LED light will turn on but vice versa if the received state variable has a value of 0 then the LED light will turn off. Because of this, the data sent is binary / bit data, that is, the values 1 and 0.

### V. CONCLUSIONS

This research is to analyse the communication between bluetooth as a master and slave to exchange information, which later can be useful for many people, the cost is due to the small system. The main thing that as a household, was issued even relatively inexpensive installation requires cables that this concept is the concept of its implementation widely used examples: to control equipment as a smart key, and so forth.

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