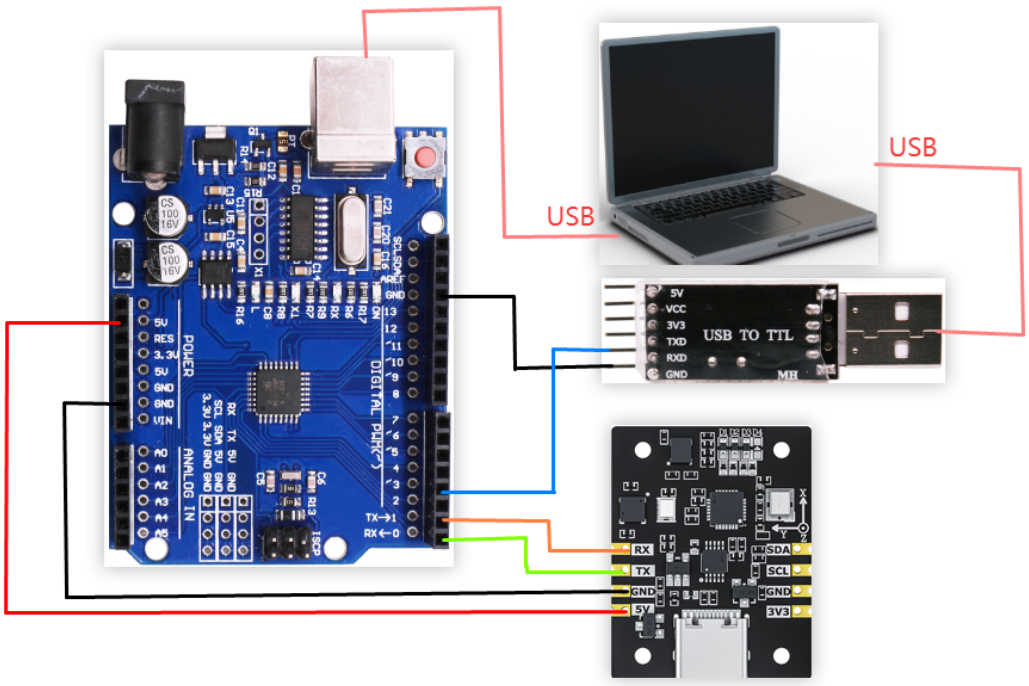
Reading Data from Arduino Serial Port

This example uses the Arduino Uno development board, a Windows computer, several DuPont wires, an IMU attitude sensor, and a USB to TTL module.

1. Connecting Devices



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IMU Attitude Sensor	Arduino
RX	TX (1)
TX	RX (0)
GND	GND
5V	5V

USB to TTL	Arduino
RXD	3
GND	GND

2. Key Code Analysis

Please refer to the source code in the documentation for specific code.

```
//Process RX ring buffer, parse frames and update internal cache

void IMU_UART_Process(void)
{
    enum {
        RX_STATE_EXPECT_HEAD1 = 0,
        RX_STATE_EXPECT_HEAD2,
        RX_STATE_EXPECT_LENGTH,
        RX_STATE_EXPECT_FUNCTION,
        RX_STATE_COLLECT_DATA
    };

    static uint8_t  rx_state = RX_STATE_EXPECT_HEAD1;
    static uint8_t  frame_length = 0;
    static uint8_t  frame_function = 0;
    static uint8_t  frame_buffer[64]; /* data section + checksum */
    static uint16_t frame_index = 0;

    uint8_t current_byte = 0;

    while (_rxbuf_pop(&current_byte) == 0) {
        switch (rx_state) {
        case RX_STATE_EXPECT_HEAD1:
            rx_state = (current_byte == FRAME_HEAD1) ? RX_STATE_EXPECT_HEAD2 :
RX_STATE_EXPECT_HEAD1;
            break;

        case RX_STATE_EXPECT_HEAD2:
            rx_state = (current_byte == FRAME_HEAD2) ? RX_STATE_EXPECT_LENGTH :
RX_STATE_EXPECT_HEAD1;
            break;

        case RX_STATE_EXPECT_LENGTH:
            frame_length = current_byte;
            rx_state = RX_STATE_EXPECT_FUNCTION;
            break;

        case RX_STATE_EXPECT_FUNCTION:
            frame_function = current_byte;
            frame_index = 0;
            rx_state = RX_STATE_COLLECT_DATA;
            break;

        case RX_STATE_COLLECT_DATA: {
            uint16_t data_length = (frame_length >= 4) ? (uint16_t)(frame_length
- 4) : 0;
            if (data_length == 0 || data_length > sizeof(frame_buffer)) {
                rx_state = RX_STATE_EXPECT_HEAD1;
                break;
            }

            frame_buffer[frame_index++] = current_byte;
            if (frame_index >= data_length) {
```

```
                uint8_t calculated_checksum = (uint8_t)(FRAME_HEAD1 +
FRAME_HEAD2 + frame_length + frame_function);
                for (uint16_t i = 0; i < data_length - 1; ++i) {
                    calculated_checksum = (uint8_t)(calculated_checksum +
frame_buffer[i]);
                }

                uint8_t received_checksum = frame_buffer[data_length - 1];
                if (calculated_checksum == received_checksum) {
                    _parse_frame_data(frame_function, frame_buffer);
                }
                rx_state = RX_STATE_EXPECT_HEAD1;
            }
        } break;

        default:
            rx_state = RX_STATE_EXPECT_HEAD1;
            break;
        }
    }
}


/* ----------  Parse one complete frame ---------- */
static void _parse_frame_data(uint8_t frame_function, const uint8_t *frame_data)
{
    if (frame_function == IMU_FUNC_RAW_ACCEL) {
        float accel_ratio = 16.0f / 32767.0f;
        s_ax = to_int16(&frame_data[0])  * accel_ratio;
        s_ay = to_int16(&frame_data[2])  * accel_ratio;
        s_az = to_int16(&frame_data[4])  * accel_ratio;

        float deg_to_rad = 3.14159265358979323846f / 180.0f;
        float gyro_ratio  = (2000.0f / 32767.0f) * deg_to_rad;
        s_gx = to_int16(&frame_data[6])  * gyro_ratio;
        s_gy = to_int16(&frame_data[8])  * gyro_ratio;
        s_gz = to_int16(&frame_data[10]) * gyro_ratio;

        float mag_ratio = 800.0f / 32767.0f;
        s_mx = to_int16(&frame_data[12]) * mag_ratio;
        s_my = to_int16(&frame_data[14]) * mag_ratio;
        s_mz = to_int16(&frame_data[16]) * mag_ratio;
    } else if (frame_function == IMU_FUNC_EULER) {
        s_roll  = to_float(&frame_data[0]);
        s_pitch = to_float(&frame_data[4]);
        s_yaw   = to_float(&frame_data[8]);
    } else if (frame_function == IMU_FUNC_QUAT) {
        s_q0 = to_float(&frame_data[0]);
        s_q1 = to_float(&frame_data[4]);
        s_q2 = to_float(&frame_data[8]);
        s_q3 = to_float(&frame_data[12]);
    } else if (frame_function == IMU_FUNC_BARO) {
        s_height            = to_float(&frame_data[0]);
        s_temperature       = to_float(&frame_data[4]);
        s_pressure          = to_float(&frame_data[8]);
        s_pressure_contrast = to_float(&frame_data[12]);
    } else if (frame_function == IMU_FUNC_VERSION) {
        s_version_high = frame_data[0];
```

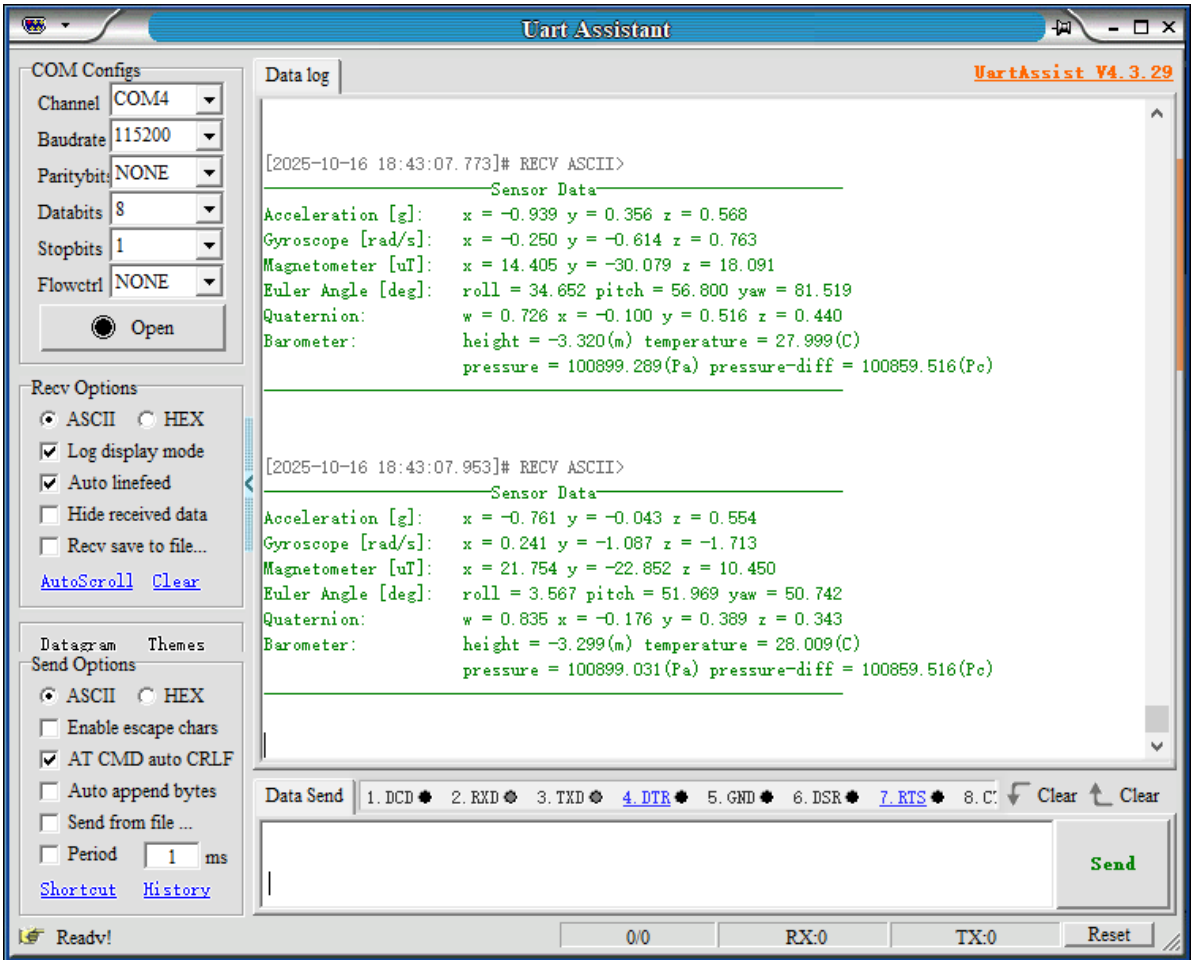
```
        s_version_mid  = frame_data[1];
        s_version_low  = frame_data[2];
    } else if (frame_function == IMU_FUNC_RETURN_STATE) {
        s_last_rx_function = frame_data[0];
        s_last_rx_state    = (int16_t)frame_data[1];
    }
}
```

IMU_UART_Process(): Reads the cached data and calls _parse_frame_data to parse the data conforming to the communication protocol.

_parse_frame_data(): Parses the data.

3. Reading IMU Data

After the program is downloaded into Arduino, open the serial port assistant (configuration parameters are shown in the figure below). You can see that the IMU module's data is continuously printed. When we change the IMU module's attitude, the data will change.



Note: The above is the data reading of a 10-axis IMU, 6-axis without magnetometer and barometer data, and 9-axis without barometer data.