6 Communication Protocol

6.1 Data Format

Module upload Flag=0x61 (Angle, Angular velocity, Acceleration) data default.

Flag=0x71(Magnetic field) need to send the corresponding register instruction.

Upload data format of Ble: uploads up to 20 bytes per data

6.1.1 Data Packet(Default)

Packet heading 1Byte	Flag bit 1Byte	axL	axH	……	YawL	YawH
0x55	Flag	0xNN	0xNN	……	0xNN	0xNN

Note: 0xNN is an accurate value received. Data return sequence: Acceleration X Y Z, Angular velocity X Y Z, Angle X Y Z, low byte first, high byte last.

Flag = 0x61 Data content: 18Byte is Acceleration, Angular velocity, Angle.

0x55	Packet header
0x61	Flag bit
axL	X Acceleration low 8 byte
axH	X Acceleration high 8 byte
ayL	Y Acceleration low 8 byte
ayH	Y Acceleration high 8 byte
azL	Z Acceleration low 8 byte
azH	Z Acceleration high 8 byte
wxL	X Angular velocity low 8 byte
wxH	X Angular velocity high 8 byte
wyL	Y Angular velocity low 8 byte
wyH	Y Angular velocity high 8 byte
wzL	Z Angular velocity low 8 byte
wzH	Z Angular velocity high 8 byte
RollL	X Angle low 8 byte
RollH	X Angle high 8 byte
PitchL	Y Angle low 8 byte
PitchH	Y Angle high 8 byte
YawL	Z Angle low 8 byte
YawH	Z Angle high 8 byte

Acceleration calculation method: Unit: g

a_x=((axH<<8)|axL)/32768*16g(g is Gravity acceleration, 9.8m/s^2)
a_y=((ayH<<8)|ayL)/32768*16g(g is Gravity acceleration, 9.8m/s^2)
a_z=((azH<<8)|azL)/32768*16g(g is Gravity acceleration, 9.8m/s^2)

Angular Calculation method: Unit:°/s

w_x=((wxH<<8)|wxL)/32768*2000(°/s)
wy=((wyH<<8)|wyL)/32768*2000(°/s)
wz=((wzH<<8)|wzL)/32768*2000(°/s)

Angle Calculation method: Unit: °

Roll(X axis)Roll=((RollH<<8)|RollL)/32768*180(°)
Pitch(Y axis)Pitch=((PitchH<<8)|PitchL)/32768*180(°)
Yaw angle(Z axis)Yaw=((YawH<<8)|YawL)/32768*180(°)

Note:

1. The coordinate system used for attitude angle settlement is the northeast sky coordinate system. Place the module in the positive direction, as shown in Chapter 3.3, direction forward is the X-axis, the direction left is the Y-axis, and direction upward is the Z-axis. Euler angle represents the rotation order of the coordinate system when the attitude is defined as Z-Y-X, that is, first turn around the Z-axis, then turn around the Y-axis, and then turn around the X-axis.

2. Although the range of the roll angle is ± 180 degrees, in fact, since the coordinate rotation sequence is Z-Y-X, when expressing the attitude, the range of the pitch angle (Y-axis) is only ± 90 degrees, and it will change to less than 90 after exceeding 90 degrees Degrees while making the X-axis angle greater than 180 degrees. For detailed principles, please Google Euler angle and posture-related information.

3. Since the three axes are coupled, they will show independent changes only at small angles, and the attitude angles will change at large angles. For example, when the Y-axis is close to 90 degrees, even if the attitude only rotates around the Y-axis, the angle of the axis will also change greatly, which is an inherent problem with Euler angles indicating attitude.

Description:

1. The data is sent in hexadecimal not ASCII code.
2. Each data is transmitted in order of low byte and high byte, and the two are combined into a signed short type data. For example, the X-axis acceleration data Ax, where AxL is the low byte and AxH is the high byte. The conversion method is as follows:

For example:

Assuming that Data is actual data, DataH is the high byte part, and DataL is the low byte part, then: Data = ((short) DataH << 8) | DataL. It must be noted here that DataH needs to be converted to a signed short data first and then shifted, and the data type of Data is also a signed short type, so that it can represent negative numbers.