Attitude & Heading Reference Module

Universal Data Logger with 9-Axis Sensor, On-board Recording & Real-Time Streaming

Acgyma

AGM-Series

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1. GENERAL DESCRIPTION

1.1. Overview of Acgyma Model

Acgyma is a complete Inertial Attitude and Heading Reference Module (AHRS) that includes a three-axis gyroscope, a three-axis accelerometer, and a three-axis magnetometer. This module is designed to provide high-precision attitude and heading data for motion tracking and measurement, featuring extensive configuration, processing, and filtering capabilities. It is suitable for applications requiring precise positioning and attitude control, such as unmanned aerial vehicles (UAVs), robots, autonomous vehicles, and industrial automation equipment.

Main Features:

- High-Precision Sensors: Equipped with advanced MEMS technology to provide accurate and reliable data in dynamic environments.
- Low Power Consumption: Optimized for portable and battery-powered devices to extend operating time without sacrificing performance.
- Plug-and-Play: Supports multiple communication protocols (Type C, UART, CAN, RS485, SPI, and I2C, depending on the model) for seamless system integration.
- Strong Anti-Interference: Utilizes efficient filtering algorithms to ensure stable operation in complex electromagnetic environments.
- Host Software: Includes a dedicated tool for real-time 3D visualization and system calibration.
- RoHS Compliant.

1.2. System Architecture

Figure 1.2 illustrates the simplified architecture of the Acgyma module. Acgyma incorporates a 3-axis gyroscope, a 3-axis accelerometer, a 3-axis magnetometer, and an MCU. The MCU is responsible for synchronizing the operation of various sensors and running AWAN's proprietary algorithm, providing precise 3-axis attitude data at an update rate of up to 200Hz. Users can communicate with the Acgyma module through six different communication interfaces: Type C, UART, CAN, RS485, SPI, and I2C. These interfaces offer flexible system integration options to accommodate various application needs.

NOTE: COMPONENTS MARKED WITH " * " MAY VARY BY MODEL.

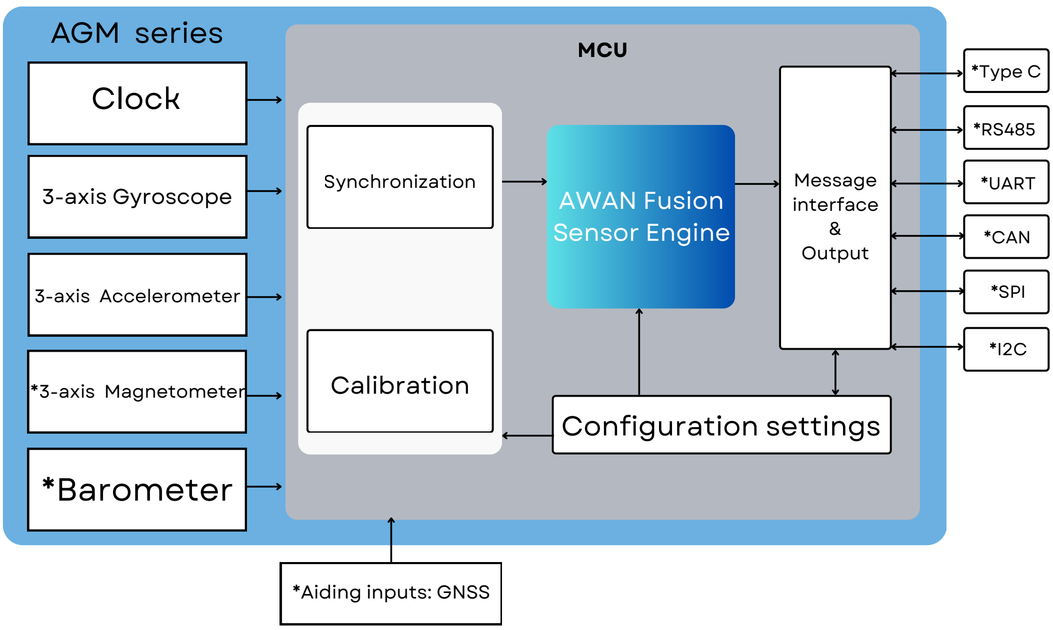

Figure 1.2 Acgyma Architecture Diagram

2. ATTITUDE AND HEADING REFERENCE SYSTEM FEATURES

2.1 Acgyma Performance Specifications

The accuracy of the Acgyma series is influenced by factors such as sensor fusion algorithms, measurement range, environmental conditions, and sensor manufacturing variances. The following performance specifications (Table 2.1) represent average values derived from ten tested sample units and are provided for reference only.

AHRS	AGM-210	AGM-510	AGM-610	AGM-720	AGM-810
(Roll, Pitch, Yaw) Measurement Range	±180°、±85°、±180°				
(Roll, Pitch) Dynamic Accuracy	< 0.6°	< 0.5°	< 0.5°	< 0.5°	< 0.5°
(Yaw) Dynamic Accuracy	< 3.0°	< 2.0°	< 1.0°	< 0.8°	< 0.8°
(Roll, Pitch, Yaw) Resolution	0.0055°				

Table 2.1: Acgyma Performance Specifications

In Acgyma, all necessary motion tests and calibrations are part of the factory automation production process, significantly reducing system integration time while enhancing system accuracy and reliability.

2.2 Sensor Specifications

Gyroscope Specifications	Unit	Value
		AGM-210/510/610/720/810
Full Scale Range	dps	±2000
Bandwidth	Hz	539
Resolution	mdps/LSB	70
Zero Bias Instability	deg/h	3
Noise Density	mdps/√Hz	5
Sensitivity Tolerance	%	±5

Table 2.2.1 Acgyma Gyroscope Specifications

Accelerometer Specifications	Unit	Value
		AGM-210/510/610/720/810
Full Scale Range	g	±16
Resolution	mg/LSB	0.488
Bandwidth	Hz	10~3000
Static Bias	mg	± 80
Temperature Drift	mg/°C	± 0.10
Noise Density	µg/√Hz	60
Sensitivity Tolerance	%	±5

Table 2.2.2 Acgyma Accelerometer Specifications

Magnetometer Specifications	Unit	Value
		AGM-210/610/720/810
Magnetic Range	µT	4915.2
Sensitivity	µT/LSB	1.5
RMS Noise	µT	3

Table 2.2.3 Acgyma Magnetometer Specifications

GNSS Specifications	AGM-810
Dual Frequency	L1/L5
CEP	< 1 m

Table 2.2.4 Acgyma GNSS Specifications

2.3 Mechanical Specifications

The mechanical outlines and dimensions for the Acgyma series are as follows:

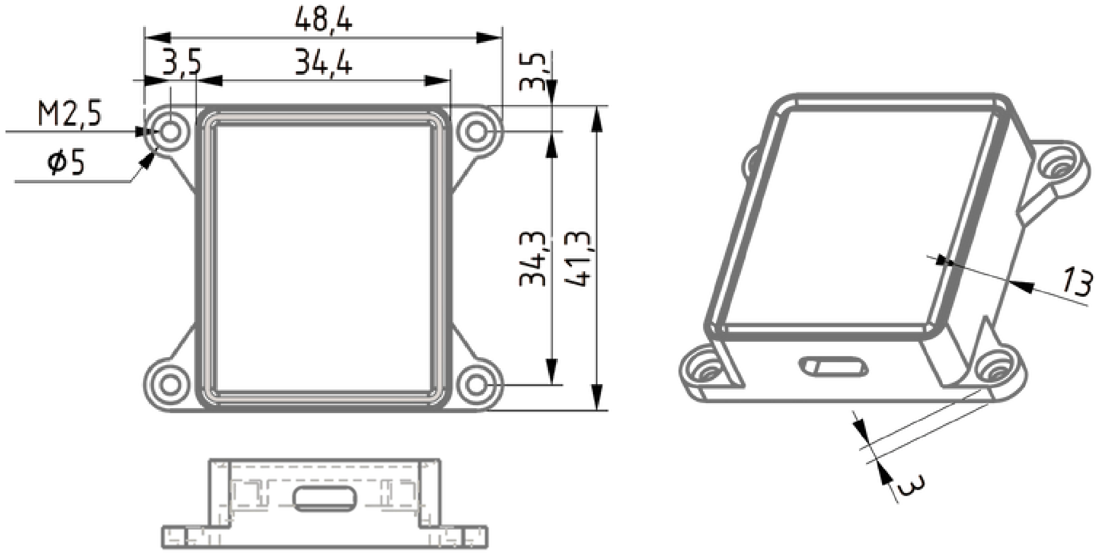

Figure 2.3.1 AGM-510/610/720 External Dimensions Specifications (Unit: mm)

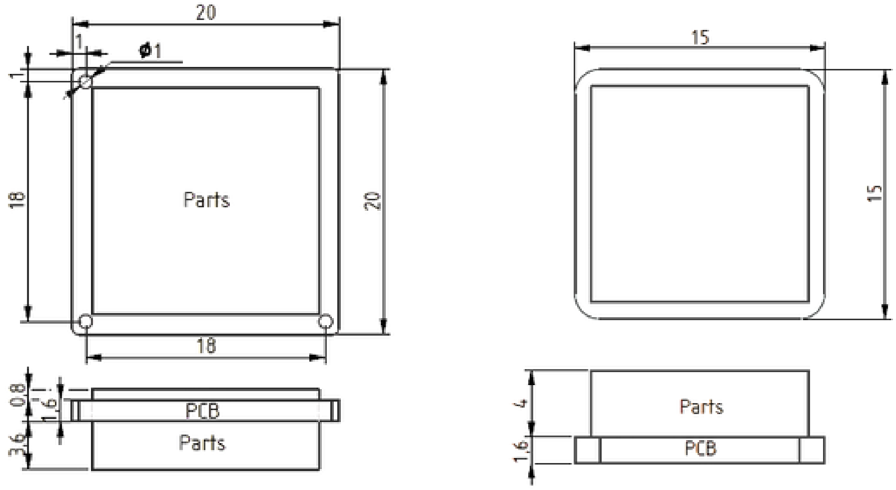

Figure 2.3.2 AGM-210 External Dimensions (Unit: mm)

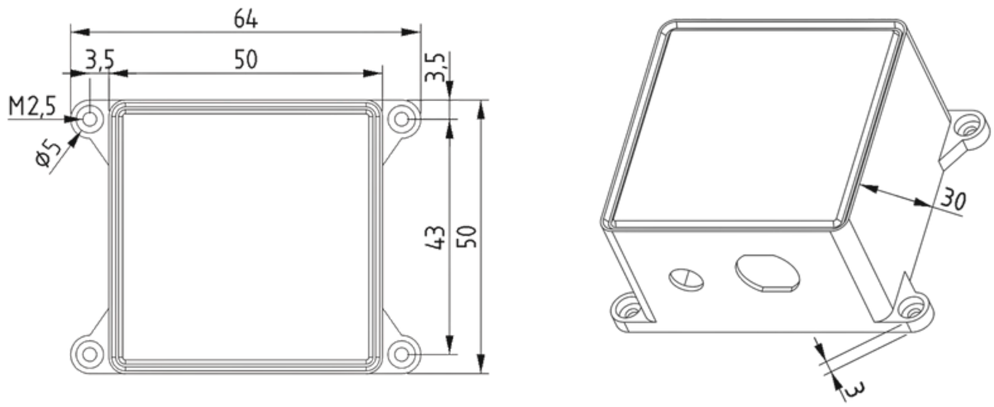

Figure 2.3.3 AGM-810 External Dimensions (Unit: mm)

2.4 Other Features

The Acgyma model also includes the following features:

1. Three-axis output for angle, angular velocity, and acceleration.
2. Factory-calibrated sensitivity, bias, and axis alignment.
3. Single power operation: range from 4.75 V to 5.4 V; typical at 5.0 V.
4. Operating temperature range: -40°C to +85°C.
5. 1500 g mechanical shock survival capability.
6. Communication interfaces: Type-C, UART, CAN, RS485, SPI, I2C.
7. Adjustable and controllable functions include:
   - Automatic and manual bias correction control.
   - Adjustable output data frequency.

3. ACGYMA HARDWARE

3.1 Connector Pinout and Function Description

Pin	Definition	Type	Description
1	5.0 VDC	Supply	Power Supply
2	UART3_RX	Input	UART3 Receiver
3	UART3_TX	Output	UART3 Transmitter
4	DIO	Input/Output	Configurable function based on firmware
5	GND	Supply	Ground
6	RS485B	Input	RS485_B
7	RS485A	Input	RS485_A
8	CAN_L	Input	CAN bus low voltage line
9	CAN_H	Input	CAN bus high voltage line
10	GND	Supply	Ground

Table 3.1.1 Pin Function Descriptions

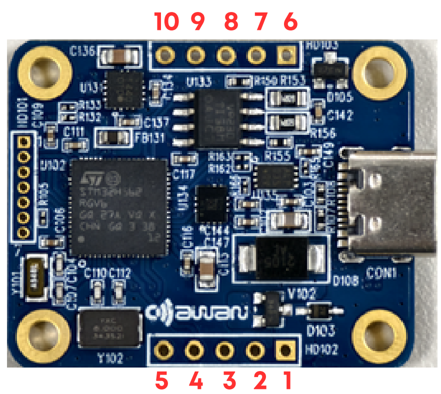

Figure 3.1.2 Acgyma Series Non-Waterproof Connector Pin Configuration(Type-C)

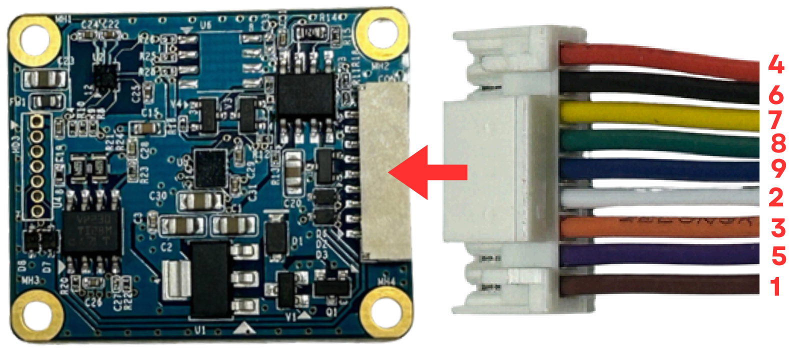

Figure 3.1.3 Acgyma Series Non-Waterproof Connector Pin Configuration (GH)

3.2 Type-C Connector Description

The Acgyma Type-C interface uses only the following lines for connection:

Signal	Description
Vbus	Power Supply
GND	Ground
D+	Differential Data Line Positive, used for data transmission
D-	Differential Data Line Negative, used for data transmission

Table 3.2 Type C Pin Descriptions

In addition to the lines mentioned above, all other lines in the product's Type-C interface (e.g., CC1, CC2, SBU1, SBU2, Vconn, etc.) are not connected or utilized.

3.3 SPI and I2C Pinout Description

The pinout details for Acgyma's SPI and I2C connectors are as follows:

Pin	Description	Pin	Description
1	GND	7	SCL(SPI)
2	5V	8	MOSI(SPI)
3	RX	9	MISO(SPI)
4	TX	10	CS(SPI)
5	CAN_H	11	SCL(I2C)
6	CAN_L	12	SDA(I2C)

Table 3.3 12-Pin Circular Connector Pin Descriptions

4. TRANSMISSION PROTOCOL (DATA PROTOCOL)

4.1 Product Data Communication Protocol

The product communication format is divided into six parts: Header, Device, Length, Payload Label, Payload, and Checksum. The number of bytes allocated for each section is shown in Table 4.1. Data is transmitted using the Big-endian format.

Packet Content	Header	Device	Length	Payload Label	Payload	Checksum
	1 Byte	1 Byte	1 Byte	1 Byte	6~41 Bytes	1 Byte

TABLE 4.1 BYTE ALLOCATION FOR EACH SECTION OF THE DATA FRAME

4.2 Header

This byte is fixed at 0xAA, and the system uses this header to identify the start of a valid data frame.

4.3 Device

The product Device is composed of various product types and models, with the corresponding tables.

Category	AHRS				
Device ID	AGM-210	AGM-510	AGM-610	AGM-720	AGM-810
	0x21	0x51	0x61	0x72	0x81

Table 4.3 Device ID for different models

4.4 Length

The value of the Length byte is the total number of bytes in the Payload Label plus the Payload.

4.5 Payload Label

The Payload Label field is used to define the meaning of the data content represented by the subsequent Payload bytes.

Payload Label	Data Length (including Label byte)	Definition
0xFF	1	Default (All Data Included)
0xA0	7	3-axis Accelerometer Data
0xB0	7	3-axis Gyroscope Data
0xC0	7	3-axis Magnetometer Data
0xD0	7	3-axis Euler Angles Output
0xD1	9	3-axis Quaternion Output
0xE0	3	Temperature (Celsius)

TABLE 4.5.1 DEFINITION OF FUNCTIONAL FIELDS (APPLICABLE TO AGM-210/510/610/720)

Payload Label	Data Length (including Label byte)	Definition
0xFF	1	Default (All Data Included)
0xA0	7	3-axis Accelerometer Data
0xB0	7	3-axis Gyroscope Data
0xC0	7	3-axis Magnetometer Data
0xD0	7	3-axis Euler Angles Output
0xD1	9	3-axis Quaternion Output
0xE0	3	Temperature (Celsius)
0xE1	5	Barometric Data (hPa)
0xF0	17	GPS Data (Position, Velocity, Status)

TABLE 4.5.2 DEFINITION OF FUNCTIONAL FIELDS (APPLICABLE TO AGM-810)

4.6 Data Bits (Payload)

This product defines the forward direction as +X, left as +Y, and upward as +Z, Rx represents the angular velocity around the +X axis, therefore, the angular velocities [Rx Ry Rz] correspond to the attitude angles [Roll Pitch Yaw]. The direction of rotation follows the right-hand rule to determine whether it is clockwise or counterclockwise. Note: Data is transmitted in big-endian format (high byte first, then low byte).

Data	Accelerometer(Accel)			
	Label 0xA0	Ax	Ay	Az
Byte	1	2	2	2

TABLE 4.6.1 0xA0 payload Format and Byte Count

Data	Angular Rate(Rate)			
	Label 0xB0	Rx	Ry	Rz
Byte	1	2	2	2

TABLE 4.6.2 0xB0 payload Format and Byte Count

Data	Magnetic Field Strength (Mag)			
	Label 0xC0	Mx	My	Mz
Byte	1	2	2	2

TABLE 4.6.3 0xC0 payload Format and Byte Count

Data	Euler Attitude Angles			
	Label 0xD0	Roll	Pitch	Yaw
Byte	1	2	2	2

TABLE 4.6.4 0xD0 payload Format and Byte Count

Data	Quaternion Attitude Angles				
	Label 0xD1	i	j	k	w
Byte	1	2	2	2	2

TABLE 4.6.5 0xD1 payload Format and Byte Count

Data	temperature(Temp)	
	Label 0xE0	Celsius Temperature
Byte	1	2

TABLE 4.6.6 0xE0 payload Format and Byte Count

Data	Default	Accel		Rate		Mag		Euler Attitude Angles		Quaternion Attitude Angles		Temp	
	Label 0xFF	Label 0xA0	Data	Label 0XB0	Data	Label 0xC0	Data	Label 0xD0	Data	Label 0xD1	Data	Label 0xE0	Data
Byte	1	1	6	1	6	1	6	1	6	1	8	1	2

Table 4.6.7 0xFF Payload Format and Byte Count (Applicable to AGM-210/510/610/720)

Data	Default	Accel		Rate		Mag		Euler Attitude Angles		Quaternion Attitude Angles		Temp		Barometric Pressure		GPS	
	Label 0xFF	Label 0xA0	Data	Label0XB0	Data	Label 0xC0	Data	Label 0xD0	Data	Label 0xD1	Data	Label 0xE0	Data	Label 0xE1	Data	Label 0xF0	Data
Byte	1	1	6	1	6	1	6	1	6	1	8	1	2	1	4	1	16

Table 4.6.8 0xFF Payload Format and Byte Count (Applicable to AGM-810)

Data	Barometric Pressure	
	Label 0xE1	Barometric(hPa)
Byte	1	4

Table 4.6.9 Barometric (Applicable to AGM-810)

Data	GPS						
	Label 0xF0	Latitude	Longitude	Altitude	Speed	Fix Status	Satellite Count
Byte	1	4	4	4	2	1	1

Table 4.6.10 GPS (Applicable to AGM-810)

4.7 Checksum

The checksum is calculated as the sum of all bytes except for the checksum byte itself. Only the lower 8 bits of the resulting sum are used.

```
uint8_t get_Checksum(uint8_t *payload, uint8_t payload_length)
{
  register unsigned int sum = 0;
  uint8_t CheckSum;

      // Only sum up to the second-to-last byte, excluding
"checksum" itself.
  for (uint8_t index = 0; index < payload_length - 1; index++)
  {
    sum += (uint8_t)payload[index];
  }

  CheckSum = (uint8_t)(sum & 0xff);
  return CheckSum;
}
```

Figure 4.7 Checksum Calculation Code

4.8 Example Explanation

Communication Interface: RS485 / CAN / UART / Type-C /SPI /I2C Serial Transmission.
Baud Rate: Default: 921600 (Options from 9600 to 921600).
Data Output Frequency: Defaults to the minimum frequency of each model.
– AGM-210/510/610/720: 50 to 200 Hz configurable.
– AGM-810: 25 to 100 Hz configurable.
Byte Order: Big-Endian – For all values > 1 byte, the most significant byte (MSB) is transmitted first.

Byte Offset	Field Name	Content / Tag	Data Type	Byte Length	Description / Receiver Action
0	Start Byte	0xAA	uint8_t	1	Start of Data Frame Marker
1	Device ID	(ex: 0x61)	uint8_t	1	Sender Device ID
2	Data Length	L	uint8_t	1	Number of Valid Data Bytes (from the next byte up to the checksum)
--- Start of Valid Data (Payload, Length = L) ---					
3	Reserved	0xFF	uint8_t	1	The current version is fixed at 0xFF. The receiver should read and ignore this byte. It is reserved for future protocol extension.
4	Accelerometer Tag	0xA0	uint8_t	1	
5	Acceleration X		int16_t	2	* ACCEL_SCALE_FACTOR_DIV (unit: m/s²)
7	Acceleration Y		int16_t	2	* ACCEL_SCALE_FACTOR_DIV (unit: m/s²)
9	Acceleration Z		int16_t	2	* ACCEL_SCALE_FACTOR_DIV (unit: m/s²)
11	Gyroscope Tag	0xB0	uint8_t	1	
12	Gyroscope X		int16_t	2	* GYRO_SCALE_FACTOR_DIV (unit: °/s)
14	Gyroscope Y		int16_t	2	* GYRO_SCALE_FACTOR_DIV (unit: °/s)
16	Gyroscope Z		int16_t	2	* GYRO_SCALE_FACTOR_DIV (unit: °/s)
18	Magnetometer Tag	0xC0	uint8_t	1	
19	Magnetometer X		int16_t	2	* MAG_SCALE_FACTOR_DIV (unit: μT)
21	Magnetometer Y		int16_t	2	* MAG_SCALE_FACTOR_DIV (unit: μT)
23	Magnetometer Z		int16_t	2	* MAG_SCALE_FACTOR_DIV (unit: μT)
25	Euler Angles Tag	0xD0	uint8_t	1	
26	Roll		int16_t	2	* EULER_SCALE_FACTOR_DIV (unit: °)
28	Pitch		int16_t	2	* EULER_SCALE_FACTOR_DIV (unit: °)
30	Yaw		int16_t	2	* EULER_SCALE_FACTOR_DIV (unit: °)
32	Quaternion Tag	0xD1	uint8_t	1	
33	Quaternion qx		int16_t	2	* QUAT_SCALE_FACTOR_DIV
35	Quaternion qy		int16_t	2	* QUAT_SCALE_FACTOR_DIV
37	Quaternion qz		int16_t	2	* QUAT_SCALE_FACTOR_DIV
39	Quaternion qw		int16_t	2	* QUAT_SCALE_FACTOR_DIV
41	Temperature Tag	0xE0	uint8_t	1	
42	Temperature		int16_t	2	* TEMP_SCALE_FACTOR_DIV (unit:°C)
--- End of Valid Data (Payload) ---					
44 (i.e., 3 + L)	Checksum		uint8_t	1	Checksum: Sum of all bytes from 0xAA to the last data byte.

Table 4.8.1 Data Reference (Applicable to AGM-210/510/610/720)

Byte Offset	Field Name	Content / Tag	Data Type	Byte Length	Description / Receiver Action
0	Start Byte	0xAA	uint8_t	1	Start of Data Frame Marker
1	Device ID	(ex: 0x81)	uint8_t	1	Sender Device ID
2	Data Length	L	uint8_t	1	Number of Valid Data Bytes (from the next byte up to the checksum)
	--- Start of Valid Data (Payload, Length = L) ---				
3	Reserved	0xFF	uint8_t	1	The current version is fixed at 0xFF. The receiver should read and ignore this byte. It is reserved for future protocol extension.
4	Accelerometer Tag	0xA0	uint8_t	1	
5	Accelerometer X		int16_t	2	*ACCEL_SCALE_FACTOR_DIV (unit: m/s^2)
7	Accelerometer Y		int16_t	2	*ACCEL_SCALE_FACTOR_DIV (unit: m/s^2)
9	Accelerometer Z		int16_t	2	*ACCEL_SCALE_FACTOR_DIV (unit: m/s^2)
11	Gyroscope Tag	0xB0	uint8_t	1	
12	Gyroscope X		int16_t	2	*GYRO_SCALE_FACTOR_DIV (unit : °/s)
14	Gyroscope Y		int16_t	2	*GYRO_SCALE_FACTOR_DIV (unit : °/s)
16	Gyroscope Z		int16_t	2	*GYRO_SCALE_FACTOR_DIV (unit : °/s)
18	Magnetometer Tag	0xC0	uint8_t	1	
19	Magnetometer X		int16_t	2	*MAG_SCALE_FACTOR_DIV (unit: μT)
21	Magnetometer Y		int16_t	2	*MAG_SCALE_FACTOR_DIV (unit: μT)
23	Magnetometer Z		int16_t	2	*MAG_SCALE_FACTOR_DIV (unit: μT)
25	Euler Angles Tag	0xD0	uint8_t	1	
26	Roll		int16_t	2	*EULER_SCALE_FACTOR_DIV (unit: °)
28	Pitch		int16_t	2	*EULER_SCALE_FACTOR_DIV (unit: °)
30	Yaw		int16_t	2	*EULER_SCALE_FACTOR_DIV (unit: °)
32	Quaternion Tag	0xD1	uint8_t	1	
33	Quaternion qx		int16_t	2	*QUAT_SCALE_FACTOR_DIV
35	Quaternion qy		int16_t	2	*QUAT_SCALE_FACTOR_DIV
37	Quaternion qz		int16_t	2	*QUAT_SCALE_FACTOR_DIV
39	Quaternion qw		int16_t	2	*QUAT_SCALE_FACTOR_DIV
41	Temperature Tag	0xE0	uint8_t	1	
42	Temperature		int16_t	2	*TEMP_SCALE_FACTOR_DIV (unit:°C)
44	Barometer Tag	0xE1	uint8_t	1	
45	Barometric Pressure		int32_t	4	*BARO_PRESS_SCALE_FACTOR_DIV (unit:hPa)
49	GPS Tag	0xF0	uint8_t	1	
50	Latitude		int32_t	4	*GPS_LAT_LON_SCALE_FACTOR_DIV (unit: °)
54	Longitude		int32_t	4	*GPS_LAT_LON_SCALE_FACTOR_DIV (unit: °)
58	Altitude		int32_t	4	*GPS_ALT_SCALE_FACTOR_DIV (unit: m)

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Byte Offset	Field Name	Content / Tag	Data Type	Byte Length	Description / Receiver Action
62	Speed		int16_t	2	*GPS_SPEED_SCALE_FACTOR_DIV (unit:m/s)
64	Speed_x		int16_t	2	*GPS_SPEED_SCALE_FACTOR_DIV (unit:m/s)
66	Speed_y		int16_t	2	*GPS_SPEED_SCALE_FACTOR_DIV (unit:m/s)
68	Speed_z		int16_t	2	*GPS_SPEED_SCALE_FACTOR_DIV (unit:m/s)
69	Fix Status		uint8_t	1	0=Invalid, 1=GPS, 2=DGPS, 4=RTK Fixed...
70	Satellite Count		uint8_t	1	Number of Satellites Used for Positioning
--- End of Valid Data (Payload) ---					
71(i.e., 3 + L)	Checksum		uint8_t	1	Checksum: Sum of all bytes from 0xAA to the last data byte.

Table 4.8.2 Data Reference (Applicable to AGM-810)

Output Data Units:

Type	Quaternion Attitude	Euler Attitude Angles	Angular Rate	Acceleration	Magnetic Field Strength	Temperature
Unit	(None)	Degrees	Degrees per second (deg/s)	Meters per second squared (m/s^2)	Microtesla (μT)	Celsius (°C)
Resolution	0.00006	0.0055	0.0153	0.00488	0.1	0.01

Table 4.8.3 Data Unit Reference Table

Type	GPS Latitude and Longitude	GPS Altitude	GPS Speed	Barometric Pressure
Resolution	1e-7	0.01	0.01	0.01

Table 4.8.4 Data Unit Reference Table (Applicable to AGM-810)

5. CONTROL COMMANDS

Host sends command strings to the module. Each command must be appended with a termination character (\r, \n, or k). The commands are as follows:

Category	Command	Description
UART	UART1 ~ UART8	Set UART as the output interface. Available baud rates: 9600, 19200, 38400, 57600, 115200, 230400, 460800, 921600.
CAN	CAN9 ~ CAN16	Set CAN as the output interface. Available baud rates: 10k, 20k, 50k, 125k, 250k, 500k, 800k, 1M bps.
RS485	RS-1 ~ RS-8	Set RS485 as the output interface. Available baud rates: 9600, 19200, 38400, 57600, 115200, 230400, 460800, 921600.
Output Data Rate (ODR)	ODR2~ODR4	Set output frequency to 50Hz, 100Hz, 200Hz
Sensor Fusion Control	FUSEON	Enable magnetometer fusion (applicable to 9-axis models).
	FUSEOFF	Disable magnetometer fusion (applicable to 9-axis models).
System Operation	RESET	System Reboot.
	UPFM	Enter Firmware Update Mode.
	CONFIG	Query Configuration: Returns firmware version, communication interface, Baud Rate, and magnetometer fusion status.

Table 5.1 Control Command Descriptions

6. GLOSSARY OF TERMS

Glossary of Terms	
Hz	Hertz
AHRS	Attitude and Heading Reference System
LSB	Least Significant Byte
MEMS	Micro Electro Mechanical Systems
mg	Milligravity = (10^{-3} g)
SPI	Serial Peripheral Interface
I2C	Inter-Integrated Circuit
dps	Degrees Per Second
uT	Magnetic Field Strength Unit

Table 6.1 Glossary

7.MODEL COMPREHENSIVE COMPARISON

Icon					
Model	AGM-510	AGM-210	AGM-610	AGM-720	AGM-810
Size	49X42X13 mm	20X20X6 mm	49X42X13 mm	49X42X13 mm	64X64X30 mm
Weight	20 g	4 g	20 g	20 g	65 g
Operating Temp	-40 °C to 85 °C				
Gyroscope	Standard Full Scale Range : ±2000 dps, Resolution : 70 mdps/LSB, Noise Density : 5 mdps/√Hz Bias Instability : 3 deg/h, Temperature Drift : ±0.005 dps/°C, Angle Random Walk (ARW) : 0.21 deg/√h				
Accelerometer	Standard Full Scale Range : ±16 g, Resolution : 0.488 mg/LSB Noise Density : 60 μg/√Hz, Temperature Drift : ±0.10 mg/°C				
Magnetometer	X	Dynamic Range : ±4915.2 μT, Resolution : 0.15 μT/LSB, Noise Density : 0.06 μT√Hz, Temperature Drift : ±0.3 mG/°C			
Attitude Angle	Roll/Pitch Accuracy: <0.5° Heading Accuracy: <2.0° Output Rate: 50–200 Hz	Roll/Pitch Accuracy : <0.6° Heading Accuracy : <3.0° Output Rate： 50-200Hz	Roll/Pitch Accuracy :<0.5° Heading Accuracy : <1.0° Output Rate : 50-200Hz	Roll/Pitch Accuracy :<0.4° Heading Accuracy : <0.8° Output Rate : 50-200Hz	Roll/Pitch Accuracy : <0.4° Heading Accuracy : <0.8° Output Rate : 25-100Hz
Voltage	4.75 to 5.4 VDC	4.75 to 5.4 VDC	4.75 to 5.4 VDC	4.75 to 5.4 VDC	4.75 to 5.4 VDC
Power Consumption	<0.5W	<0.5W	<0.5W	<0.5W	<1.0W
Product Description	6-axis, with magnetic interference immunity. Supports UART/CAN/RS485, and features a USB Type-C interface.	9-axis, mini type. Supports UART/I2C interfaces, with a physical interface utilizing an FPC connector.	9-axis, standard AHRS model. Supports UART/CAN/RS485, and features a USB Type-C interface.	9-axis, with array noise reduction. Supports UART/CAN/RS485, and features a USB Type-C interface.	9-axis, with integrated GPS. Fusion position (CEP) 1 m Supports UART/CAN/SPI/I2C interfaces.
Applicable Fields	Industrial environment applications with strong magnetic interference from sources such as motors, metallic structures, or high currents.	Embedded applications with extremely stringent size and weight requirements, integrating into limited product spaces.	Convenient integration for unmanned vehicles and general industrial and automation applications.	For advanced moving systems that need to aim precisely and stay perfectly steady.	Inertial Navigation System, providing precise positioning and navigation for outdoor mobile vehicles.

*All specifications are typical, measured under specific laboratory conditions. Actual performance may vary depending on the operating environment and application.