Bartington Instruments

UAS-Mag Magnetometer DroneCAN Protocol

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Change History

ISSUE	DATE	AUTHOR	DESCRIPTION
1	06/05/2025	Alan MacAree	First release using VcCom Ltd document format, named DroneCanProtocolV1.docx
2	13/05/2025	Alan MacAree	Reformatted & renamed to adhere to Bartington Instruments documentation standards.
3	12/08/2025	Alan MacAree	Updated document to match the DroneCAN protocol that UAS-Mag will support.
4	28/08/2025	Alan MacAree	Typos corrected, unnecessary protocol removed, additional parameters added, and the SAVE protocol command documented.
5	30/09/2025	Alan MacAree	Removed Debug and added Bartington's float32 DroneCAN message.
6	30/09/2025	Alan MacAree	Minor format & typo corrections + removal of ADCs frequency settings.
7	02/10/2025	Alan MacAree/Dmitrijs Grivskis	Removed Node Address collision facility. Name updated to UAS-Mag.
8	12/11/2025	Alan MacAree/Dmitrijs Grivskis	GetNodeInfo Messages name changed to "Magnetometer Compass V1.4". SEND_AVERAGED_VALUES description updated with warning against disabling Averaging.
9	19/01/2026	Alan MacAree	Removed com.mag.equipment.ahrs.MagneticFieldStrengthF32 And name changed to "Magnetometer Compass V1.8".
10	07/09/2026	Alan MacAree/Dmitrijs Grivskis	Added com.mag.equipment.ahrs.MagneticFieldStrengthF32, name changed to "Magnetometer Compass V1.9, corrected Sensor ID resetting all values to default issue. Note saying that MagneticFieldStrengthF32 must be used only with the Drones, which support current format

Introduction

Bartington Instruments UAS-Mag provides a DroneCAN protocol v1 interface for use with DroneCAN-supported devices (e.g., Pixhawk). Additionally, UAS-Mag can also offer a float32 format for magnetometer data messages.

The DroneCAN protocol v1 is based on the UAVCAN v0 protocol.

This document details the supported DroneCAN protocol.

Details of each message can be found here:
https://legacy.uavcan.org/Specification/7._List_of_standard_data_types/

Audience

This document is intended for anyone who wishes to learn the details of the UAS-Mag DroneCAN-supported protocol.

Introduction

UAS-Mag is a magnetometer that can be used as a compass on devices that support the DroneCAN v1 protocol. Any device that uses the DroneCAN protocol is referred to as a DroneCAN node.

DroneCAN nodes must support a minimum set of DroneCAN protocol messages for them to be used on a DroneCAN bus. This document covers these messages and the additional magnetometer data messages that the UAS-Mag generate.

DroneCAN Supported Messages

Summary of UAS-Mag DroneCAN protocol supported messages.

uavcan Name	Common Name	Description
uavcan.protocol.dynamic_node_id.Allocation	DNA Support	Requests and handles Dynamic Node Address Allocation requests.
uavcan.protocol.NodeStatus	Node Status (heartbeat)	Provides an "alive" heartbeat message along with minimum Node health information.
uavcan_protocol_GetNodeInfo	Node Information	Handles and provides Node Information requests to a controller, including version, health, and hardware information.
uavcan.protocol.param.GetSet	Parameter Support	Provides Node Parameter information that flight controllers can change.
uavcan.equipment.ahrs.MagneticFieldStrength2	Magnetometer X, Y and Z-axis information.	Data is provided in Gauss and constitutes the primary dataset obtained from magnetometers.
uavcan.equipment.ahrs.MagneticFieldStrength	Magnetometer X, Y and Z-axis information.	Data is provided in Gauss and constitutes the primary dataset obtained from magnetometers.
com.mag.equipment.ahrs.MagneticFieldStrengthF32	Magnetometer X, Y and Z-axis information.	float32 implementation of MagneticFieldStrength2. **Note: Not currently an official DroneCAN message.**
uavcan.protocol.param.ExecuteOpcode	Node reset	Resets the node to its default Parameter values.
uavcan.protocol.RestartNode	Restart	Restarts the Node.

DroneCan NDA Requests (uavcan.protocol.dynamic_node_id.Allocation)

Upon startup, the UAS-Mag sends NDA requests (Node ID Address Allocation requests, uavcan.protocol.dynamic_node_id.Allocation) at regular intervals until it receives a uavcan.protocol.dynamic_node_id.Allocation response.

Details:

Message Parameter	**Value**
node_id	Zero or the last allocated Node Address
first_part_of_unique_id	True
unique_id	The unique ID of the UAS-Mag
priority	6 (low)

- Sent as an Anon message (anonymous message)
- Broadcast frequency = randomly between ~1Hz and ~1.67 Hz.

NDA Requests will cease once UAS-Mag receives a uavcan.protocol.dynamic_node_id.Allocation in response to its uavcan.protocol.dynamic_node_id.Allocation request.

Notes:

1. UAS-Mag will ignore all other DroneCAN messages until a Node ID has been allocated via the DroneCAN NDA request process.
2. Magnetometer data messages (MagneticFieldStrength) will not be generated until the UAS-Mag is allocated a Node ID Address via the DroneCAN NDA Request.

Node Status Messages (uavcan.protocol.NodeStatus)

Once the UAS-Mag has been allocated a node address via an NDA request, it will periodically send Node Status messages (also referred to as a heartbeat message). These Node Status Messages indicate the status of the UAS-Mag, controllers often use these as a heartbeat to determine if the UAS-Mag is still operating.

Details:

Message Parameter	**Value**
uptime_sec	The amount of time in seconds that the UAS-Mag has been powered.
health	Zero (okay).
mode	Always zero (operational).
sub_mode	Always zero.
vendor_specific_status_code	always zero.
priority	6 (Low)

- Broadcast frequency = 1Hz

GetNodeInfo Messages (uavcan_protocol_GetNodeInfo)

A uavcan_protocol_GetNodeInfo message is a request for information about the UAS-Mag and allows the UAS-Mag to inform controllers of additional Node information. A GetNodeInfo is sent in reply to this message,

Details:

Message Parameter	**Value**
Status Information: uptime_sec	The amount of time in seconds that the UAS-Mag has been powered.
Status Information: health	Always zero (zero = okay).
Status Information: mode	Always zero (operational).
Status Information: sub_mode	Always zero.
Software Version: major	1 (may change depending on the release version).
Software Version: minor	0 (may change depending on the release version).
Software Version: optional_field_flags	Always zero.
Software Version: vcs_commit	Always zero.
Software Version: image_crc	Always zero.
Hardware Version: major	1 (may change depending on the release version).
Hardware Version: minor	0 (may change depending on the release version).
Hardware Version: unique_id	The unique ID of the UAS-Mag.
Hardware Version: certificate_of_authenticity	Not set.
name	Magnetometer Compass V1.9
priority	Set to the same value as the request for the GetNodeInfo.

Get Set Parameter Messages

The uavcan.protocol.param.GetSet messages are how the controllers identify the parameters of the DroneCAN Node, retrieve their values, and set them accordingly.

The following parameters are published via this protocol:

Name	Type	Default	Min	Max
SEND_AVERAGED_VALUES	Boolean	True	N/A	N/A
MAG_DATA_FORMAT	Integer	1	0	2
MAG_DATA_FREQ_(Hz)	Integer	50	1	200
MAG_X_OFFSET	Real	0	-1	1
MAG_Y_OFFSET	Real	0	-1	1
MAG_Z_OFFSET	Real	0	-1	1
MAG_ENABLED	Boolean	True	N/A	N/A
MAG_PRIORITY	Integer	6 (low)	0	7
MAG_SENSOR_ID	Integer	0	0	255

Meaning:

Name	Meaning
SEND_AVERAGED_VALUES	If true, outputs the x, y and z values that are an average of all of the values that have been acquired since the last average values were output. If false, then the last acquired x, y and z value is output. **Note: Deactivating Averaging is not recommended and may introduce aliasing.**
MAG_DATA_FORMAT	Specifies the format that the magnetic data will be output in: 0 = uavcan.equipment.ahrs.MagneticFieldStrength 1 = uavcan.equipment.ahrs.MagneticFieldStrength2 2 = com.mag.equipment.ahrs.MagneticFieldStrengthF32
MAG_DATA_FREQ_(Hz)	The frequency at which the data is output.
MAG_X_OFFSET	X-axis offset to be applied before sending the x data out.
MAG_Y_OFFSET	Y-axis offset to be applied before sending the y data out.
MAG_Z_OFFSET	Z-axis offset to be applied before sending the z data out.
MAG_ENABLED	If true, the mag is enabled and will send out magnetometer data; otherwise, it will not send out magnetometer data.
MAG_PRIORITY	This is the priority at which magnetometer messages are sent over DroneCAN. Note that the lower this value is, the higher the DroneCAN priority.
MAG_SENSOR_ID	The sensor_id (when available within MagneticFieldStrength messages) value will be replaced with this value

Magnetometer Data

UAS-Mag supports three MagneticFieldStrength data formats:

- uavcan.equipment.ahrs.MagneticFieldStrength2 (default)
- uavcan.equipment.ahrs.MagneticFieldStrength
- com.mag.equipment.ahrs.MagneticFieldStrengthF32

NOTE: Only switch to MagneticFieldStrengthF32 when it is supported by the Drone. If it is not supported by the Drone, UAS-Mag data output would not be recognized and potentially it would not be possible to switch to other Data Types (unless the firmware is re-flashed).

This depends on the value of the “MAG_DATA_FORMAT” parameter.

Notes:

- The MAG_ENABLED parameter must be enabled; otherwise, this message is not sent.
- Any Offsets are applied before the X, Y and Z-axis data is sent.
- Data is sent out at a frequency specified in the MAG_DATA_FREQ_(Hz).

Details (uavcan.equipment.ahrs.MagneticFieldStrength)

Message Parameter	**Value**
priority	Parameter MAG_PRIORITY.
float16 magnetic_field_ga[0]	x-axis value in Gauss.
float16 magnetic_field_ga[1]	y-axis value in Gauss.
float16 magnetic_field_ga[2]	z-axis value in Gauss.
float16 magnetic_field_covariance	Unused.

Details (uavcan.equipment.ahrs.MagneticFieldStrength2)

Message Parameter	**Value**
priority	Parameter MAG_PRIORITY.
sensor_id	Parameter MAG_SENSOR_ID.
float16 magnetic_field_ga[0]	x-axis value in Gauss.
float16 magnetic_field_ga[1]	y-axis value in Gauss.
float16 magnetic_field_ga[2]	z-axis value in Gauss.
float16 magnetic_field_covariance	Unused.

Details (Bartington's float 32 DroneCAN Mag message, based on uavcan.equipment.ahrs.MagneticFieldStrength2

Message Parameter	Value
priority	Parameter MAG_PRIORITY.
sensor_id	Parameter MAG_SENSOR_ID.
float32 magnetic_field_ga[0]	x-axis value in Gauss.
float32 magnetic_field_ga[1]	y-axis value in Gauss.
float32 magnetic_field_ga[2]	z-axis value in Gauss.
float32 magnetic_field_covariance	Unused.

Request Parameters Erase, Reset and Save
(uavcan.protocol.param.ExecuteOpcode)

Requests that the UAS-Mag reset its parameters to the defaults and save or save the current parameter settings.

Request Restart Node (uavcan.protocol.RestartNode)

Forces a restart of the UAS-Mag.