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Quad-Copter Application Protocol

Product No.	AHRS Application Protocol
Function	Protocol Description

File Information		
Name	AHRSProtocol.pdf	
Project	Sensor Fusion Applications	
Function	Protocol Description	
Purpose		
Author	TZU-LAN SHEN	
Revision History		
Revision	Date	Comments
1.0	14/8/5	Original Plan
1.1	15/3/23	Complete Definition

Release Note:

Revision 1.0	(1 st Draft Version)
Revision 1.1	Add report sensor calibrated data

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1 Hook Command

Host Send	@h00	-
BYTES	4	-
Description	Host send hook command to confirm the target device	

Device Reply	@HOOK00	-
BYTES	4	-
Description	Device get host hook command and reply the hook token to confirm device to host	

2 Calibration Commands

MAG Calibration

Host Send	@cm	-
BYTES	3	-
Description	Command device to do magnetometer calibration	

Device Reply	d	[Calibration Quality]
BYTES	1	1
Description	<p>Calibration is done, device reply 'd' with an additional calibration quality factor which has number from 0 ~ 255.</p> <p>0: Best</p> <p>1~10: fair</p>	

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	>10 :Bad and may need to redo calibration
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ACC Calibration

Host Send	@ca	[Face Number]
BYTES	3	1
Description	<p>Calibrate Accelerometer by [Face Number], there are total 6 faces need to be calibrated by ACC.</p> <p>Face Number: 0 ~ 5 (+x,-x,+y,-y,+z,-z)</p> <p>[#] No calibration sequence of faces.</p> <p>[#] User can do a fast Z calibration by put device flat on a horizontal plane and calibrate "Face Number 0" only.</p> <p>[#] A complete ACC calibration need user to sample all 6 faces.</p>	

Device Reply	[Face Number]	-
BYTES	1	-
Description	<p>Raw data collection of selected face is done, device reply the [Face Number] to host</p> <p>Face Number:</p> <p>0 ~ 5 – Raw data collection done</p> <p>d – All data collection done and calibration complete</p>	

GYRO Calibration

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Host Send	@cg	[Axis Number]
BYTES	3	1
Description	Calibrate Gyroscope of [Axis Number], there are total 3 axis need to be calibrated by Gyroscope. Axis Number: x, y and z	

Device Reply	d	-
BYTES	1	-
Description	Raw data collection of selected axis is done and calibration is complete. Device reply the 'd' to host d – All data collection done and calibration complete [#] No calibration sequence of axis.	

3 Control Commands

Report Attitude by Euler

Host Send	@me	-
BYTES	3	-
Description	Host need device to report attitude by Euler angle and altitude information @me: mode 'e'uler	

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Device Reply	ROLL	PITCH	YAW	ALT
BYTES	4	4	4	4
Format	Float	Float	Float	Float
Description	Device reply the attitude information by Euler angle (degree) and additional one altitude information			

Report Attitude by Quaternion

Host Send	@mq	-
BYTES	3	-
Description	Host need device to report attitude by Quaternion @mq: mode `q`uaternion	

Device Reply	Q0	Q1	Q2	Q3
BYTES	4	4	4	4
format	Float	Float	Float	Float
Description	Device reply the attitude information by Quaternion representation			

Report Sensor Raw Data

Host Send	@mr	-
BYTES	3	-
Description	Host need device to report sensor raw data. @mr: mode `r`aw	

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Device Reply	Raw ACC	Raw GYRO	Raw MAG	RAW BARO
BYTES	6	6	6	4
Format	Integer	Integer	Integer	Integer
Description	Device replies the raw data of ACC, GYRO, MAG and BARO. RAW ACC: X – 2 bytes, Y – 2 bytes, Z – 2 bytes RAW GYRO: X – 2 bytes, Y – 2 bytes, Z – 2 bytes RAW MAG: X – 2 bytes, Y – 2 bytes, Z – 2 bytes RAW BARO: Temperature – 2 bytes, Pressure – 2 bytes			

Report Sensor Calibrated Data

Host Send	@mc	-
BYTES	3	-
Description	Host need device to report sensor calibrated data. A calibrated data is raw data has been process by calibration sequence but not doing AHRS fusion sequence yet. @mc: mode `c'alibrated data	

Device Reply	Raw ACC	Raw GYRO	Raw MAG
BYTES	12	12	12
Format	Float	Float	Float
Description	Device replies the calibrated data of ACC, GYRO and MAG.		

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	RAW ACC: X – 4 bytes, Y – 4 bytes, Z – 4 bytes
	RAW GYRO: X – 4 bytes, Y – 4 bytes, Z – 4 bytes
	RAW MAG: X – 4 bytes, Y – 4 bytes, Z – 4 bytes

Report Format Binary

Host Send	@fb	-
BYTES	3	-
Description	Host need device to report data in binary format. [#] Binary format is used between device and host communication	

Device Reply	-
BYTES	-
Format	-
Description	Device does not need to confirm this command but switch output from text mode to binary mode. Do nothing, if device is in binary mode already.

Report Format Text

Host Send	@ft	-
BYTES	3	-
Description	Host need device to report data in text format.	

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	[#] Text format is useful when user need console to output debug messages.
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Device Reply	-
BYTES	-
Format	-
Description	Device does not need to confirm this command but switch output from binary mode to text mode. Do nothing, if device is in text mode already.

Stream Start Switch

Host Send	@ss	-
BYTES	3	-
Description	Host need device start to output designated information(binary or text)	

Device Reply	-
BYTES	-
Format	-
Description	Device does not need to confirm this command but starting output the sensor information

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Stream Stop Switch

Host Send	@sp	-
BYTES	3	-
Description	Host need device stop to output any information.	

Device Reply	-
BYTES	-
Format	-
Description	Device does not need to confirm this command but stop output any information to host.

Stream Toggle Switch

Host Send	@st	-
BYTES	3	-
Description	Host need device to toggle it report action from stop to start or from start to stop	

Device Reply	-
BYTES	-
Format	-
Description	Device does not need to confirm this command. If device is currently reporting sensor information than it should stop output information to

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	host. If device is currently stop report information than it should start to output information to host.
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