

IDS 1: Performance Index

XXX		File Number	TYS-ADCS-N1-IDS		Page 1 of 17		
		Sub-System Name	Attitude and Orbit Control				
		Device Name	ADCS		Stage Mark		
		Device Code	PnP ADCS-N1				FM
Equipment	Quantity	Performance					
ADCS Module	/	System Pointing Accuracy: Better than 0.02°					
		System Position Accuracy: Better than 10m					
		Total Dimensions: (96±1)mm×(100±1)mm×(101±1)mm					
		Total Weight: 1.43±0.2kg					
Components	Quantity	Performance					
Star Tracker	2	Accuracy: 5" (3σ, Pointing); 50" (3σ, Roll)					
		Data Update Rate: 10Hz					
		Dynamic Performance: 2°/s					
		Exclusion Angle: Sun: better than 35°; Earth: better than 30°					
Sun Sensor	1	Accuracy: 0.1° (3σ)					
		Field of View: 85°×85°					
		Data Update Rate: 10Hz					
Gyroscope	2	Bias Instability: 0.5°/h					
		Angle Random Walk: $0.03^{\circ}/\sqrt{h}$					
		Angle Measurement Range: ±60°/s					
Magnetometer	1	Magnetic Field Measurement Range: ±1Gauss					
		Linear Error: ±5.0% FS					
		Measurement Noise: 100nT(1σ)					
Reaction Wheel	4	Maximum Output Angular Momentum: 20mNms					
		Maximum Output Torque: 2.5mNm					
		Rotational Speed Control Accuracy: Better than 1rpm(@±100~±4000rpm)					
Magnetic Torquer	3	Maximum Output Magnetic Moment: 0.8A·m² @12V; 0.3A·m² @5V					
		Residual Magnetic Moment: ≤10 mAm²					
		Linearity: Better than 10%					
GNSS	1	Position Accuracy: ≤10m					
		Velocity Accuracy: ≤0.1m/s					
		Timing Accuracy: 100ns					
		Data Update Rate: 1Hz					
Edited (Date):							
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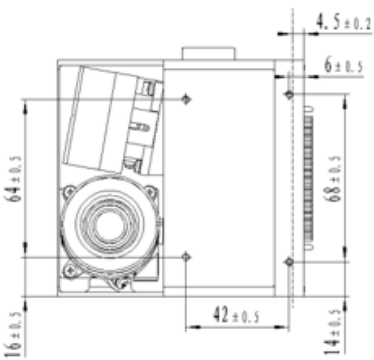
IDS 2: Mechanical Characteristics

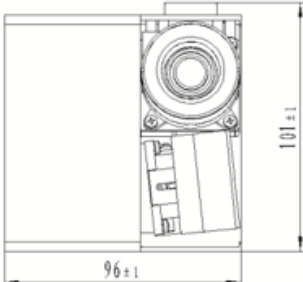
XXX		File Number		TYS-ADCS-N1-IDS		Page 2 of 17	
		Sub-System Name		Attitude and Orbit Control			
		Device Name		ADCS		Stage Mark	
		Device Code		PnP ADCS-N1			FM
Device Weight: 1.43±0.2 kg		Device Count: 1					√
Mechanical Characteristics	Dimensions (mm)	L: 96±1	W: 100±1	H: 101±1		√	
	CM Position (mm)	X: -2.16±0.5	Y: -0.62±0.5	Z: -0.92±0.5		√	
	Inertia at CM (kg.mm ²)	P _X = 1964.82±0.5	P _Y = 2143.74±0.5	P _Z = 2048.29±0.5		√	
					MEAS	CALC	EST
Mounting Characteristics	Mounting Hole Count: 8	Mounting Hole Dimensions (Tolerance) (mm): M3±0.1 (Depth 3mm)		Material: Aluminum Alloy 7075	Determination Method (√)		
	Mounting Contact Area (mm ²): 14996.7						
	Mounting Surface Flatness: 0.1mm/(100mm×100mm)						
	Mounting Surface Roughness Ra (μm): 3.2						
	Mounting Surface Treatment: Conductive Chemical Oxidation						
Schematic Diagram: 1) The coordinate system shown in the figure is the ADCS body coordinate system, and the position of the CM is the coordinate value relative to this body coordinate system. 2) The ADCS antenna is an external antenna. The user shall provide the required length of the RF cable.							
Edited (Date):							
Signed (Date):		Mark		Signature, Date			

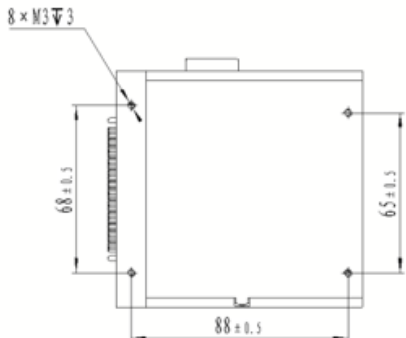
IDS 3: Instrument Diagram

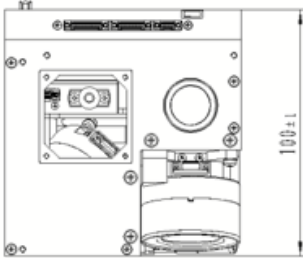
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	Sub-System Name	Attitude and Orbit Control			
	Device Name	ADCS		Stage Mark	
	Device Code	PnP ADCS-N1			FM

Starting Point for
Plate Spacing









Note: The ADCS is electrically connected to other units via plate spacing connectors. The plate spacing shall be calculated from the starting point of plate spacing.

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Signed (Date):	Mark		Signature, Date

IDS 4: Thermal Characteristics

XXX		File Number		TYS-ADCS-N1-IDS		Page 4 of 17																			
		Sub-System Name		Attitude and Orbit Control																					
		Device Name		ADCS		Stage Mark																			
		Device Code		PnP ADCS-N1				FM																	
Surface (Excluding Mounting Surface)	Material: Aluminum Alloy 7075																								
	Outside Surface Treatment: Conductive Chemical Oxidation																								
	Outer Surface Emissivity: $\varepsilon_H \geq 0.8$																								
Start Temperature °C: -30~+40			Mounting Contact Area (mm ²): 14996.7		Heat Capacity J/K: 1235.5																				
Operating Temperature Range °C: -40~+40			Operating Relative Humidity Range: ≤60%																						
Storage Temperature Range °C: -40~+40			Storage Relative Humidity Range: ≤60%																						
Power Consumption @Operating State W: ≤11.5W (Per Device)																									
<i>Note:</i> <table border="1" style="width: 100%; border-collapse: collapse; margin-top: 10px;"> <thead> <tr> <th style="text-align: center;"><i>Mode</i></th> <th style="text-align: center;"><i>Description</i></th> <th style="text-align: center;"><i>Power Consumption</i></th> </tr> </thead> <tbody> <tr> <td>Minimum-System Mode</td> <td>Activated upon severely insufficient satellite power supply</td> <td style="text-align: center;">< 1.5 W</td> </tr> <tr> <td>Safe Mode</td> <td>Activated upon satellite fault occurrence</td> <td style="text-align: center;">< 5 W</td> </tr> <tr> <td>Standby Mode</td> <td>Satellite on-orbit standby mode</td> <td style="text-align: center;">< 6.5 W</td> </tr> <tr> <td>Normal Operation Mode</td> <td>Normal working mode for satellite on-orbit operation</td> <td style="text-align: center;">< 10.0 W</td> </tr> <tr> <td>Maneuver Mode</td> <td>All unit functions enabled for executing on-orbit missions</td> <td style="text-align: center;">< 11.5 W</td> </tr> </tbody> </table>								<i>Mode</i>	<i>Description</i>	<i>Power Consumption</i>	Minimum-System Mode	Activated upon severely insufficient satellite power supply	< 1.5 W	Safe Mode	Activated upon satellite fault occurrence	< 5 W	Standby Mode	Satellite on-orbit standby mode	< 6.5 W	Normal Operation Mode	Normal working mode for satellite on-orbit operation	< 10.0 W	Maneuver Mode	All unit functions enabled for executing on-orbit missions	< 11.5 W
<i>Mode</i>	<i>Description</i>	<i>Power Consumption</i>																							
Minimum-System Mode	Activated upon severely insufficient satellite power supply	< 1.5 W																							
Safe Mode	Activated upon satellite fault occurrence	< 5 W																							
Standby Mode	Satellite on-orbit standby mode	< 6.5 W																							
Normal Operation Mode	Normal working mode for satellite on-orbit operation	< 10.0 W																							
Maneuver Mode	All unit functions enabled for executing on-orbit missions	< 11.5 W																							
Edited (Date):																									
Signed (Date):			Mark		Signature, Date																				

IDS 5: Power

XXX		File Number		TYS-ADCS-N1-IDS		Page 5 of 15		
		Sub-System Name		Attitude and Orbit Control				
		Device Name		ADCS		Stage Mark		
		Device Code		PnP ADCS-N1				FM
Operating Mode (Long Term/Short Term / Other)		Long Term				Device Count		1
Voltage	Voltage Stability	Ripple Voltage	Inrush Current (Peak / Duration)			Power Consumption		
5V	5%	200mV (p-p)	≤3A/20ms			≤5.5 W		
11~16.8V	5%	200mV (p-p)	≤3A/20ms			≤12.0 W		
Edited (Date):								
Signed (Date):		Mark			Signature, Date			

IDS 6: Electrical Connector

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	Sub-System Name	Attitude and Orbit Control				
	Device Name	ADCS	Stage Mark			
	Device Code	PnP ADCS-N1			FM	
Electrical Connector Code	Name (By Function)	Pin / Hole	Electrical Connector P/N			
X1	Download Interface	Hole	J70A-2F2-031-431-TH			
X2	Ground Test Interface	Hole	J70A-2F2-037-431-TH			
X3	External Magnetometer Interface	Hole	J70A-2F2-015-431-TH			
X4	Stacked Input/Output Interface	Hole	HRM-3B2-080-001-0256-L07			
Notes						
Edited (Date):						
Signed (Date):		Mark		Signature, Date		

IDS 7: Electrical Connector Contact Assignment – X1

XXX	File Number	TYS-ADCS-N1-IDS		Page 7 of 17	
	Sub-System Name	Attitude and Orbit Control			
	Device Name	ADCS		Stage Mark	
	Device Code	PnP ADCS-N1			
Name (by Function): Download Interface		Electrical Connector: X1		Pin / Hole: Pin	
Electrical Connector P/N: J70A-2F2-031-431-TH					
Contact Number	Signal (Function) Description	Voltage/ V	Current/ A	Polarity	Remarks (Shielded/Twisted)
18	SWDIO_CPU1	3.3	<0.01		
17	SWCLK_CPU1	3.3	<0.01		
20	SWDIO_CPU2	3.3	<0.01		
19	SWCLK_CPU2	3.3	<0.01		
22	TEST_AON	OC	<0.2	CPU1 Power -on	
23	TEST_AOFF	OC	<0.2	CPU1 Power-off	
24	TEST_BON	OC	<0.2	CPU2 Power-on	
21	TEST_BOFF	OC	<0.2	CPU2 Power-off	
15,16	ADCS_5V	5	<1.1	+	
5,6,7,8,9,10, 11,31	ADCS_A_GND	0	<1.1	-	
28	TEST_TX+	RS422 Standard	RS422 Standard	+	
27	TEST_TX-			-	
26	TEST_RX+	RS422 Standard	RS422 Standard	+	
25	TEST_RX-			-	
30	LDC_ON	OC	<0.2	Minimum-System Mode Enable	
29	LDC_OFF	OC	<0.2	Minimum-System Mode Disable	
2	WIFI_TX+	RS422 Standard	RS422 Standard	+	
1	WIFI_TX-			-	
4	WIFI_RX+	RS422 Standard	RS422 Standard	+	
3	WIFI_RX-			-	
Notes					
Edited (Date):					
Signed (Date):		Mark		Signature, Date	

IDS 8: Electrical Connector Contact Assignment – X2

XXX	File Number		TYS-ADCS-N1-IDS		Page 8 of 17	
	Sub-System Name		Attitude and Orbit Control			
	Device Name		ADCS		Stage Mark	
	Device Code		PnP ADCS-N1			
Name (By Function): Ground Test Interface			Electrical Connector: X2		Pin / Hole: Pin	
Electrical Connector P/N: J70A-2F2-037-431-TH						
Contact Number	Signal (Function) Description	Voltage/V	Current/A	Polarity	Remarks (Shielded / Twisted)	
22,23	CAN2_H	CAN2.0B Standard	CAN2.0B Standard	+		
20,21	CAN2_L			-		
24,25	OUT_TX+	RS422 Standard	RS422 Standard	+		
26,27	OUT_TX-			-		
28,29	OUT_RX+	RS422 Standard	RS422 Standard	+		
30,31	OUT_RX-			-		
32,33,34, 35	ADCS_5V	5	<1.1	+		
10,11,16, 17,18,19	ADCS_A_GND	0	<1.1	-		
36,37	OC_Z	OC	<0.2	Primary-Backup Switch - Primary		
4,5	OC_B	OC	<0.2	Primary-Backup Switch - Backup		
2,3	ADCS_CB_V	16.8	<1	External Power Supply for MTQ & RW		
6,7	LDC_ON	OC	<0.2	Minimum-System Mode Enable		
8,9	LDC_OFF	OC	<0.2	Minimum-System Mode Disable		
12,13	PPS+	RS422 Standard	RS422 Standard	+		
14,15	PPS-			-		
Notes						
Edited (Date):						
Signed (Date):		Mark		Signature, Date		

IDS 9: Electrical Connector Contact Assignment – X3

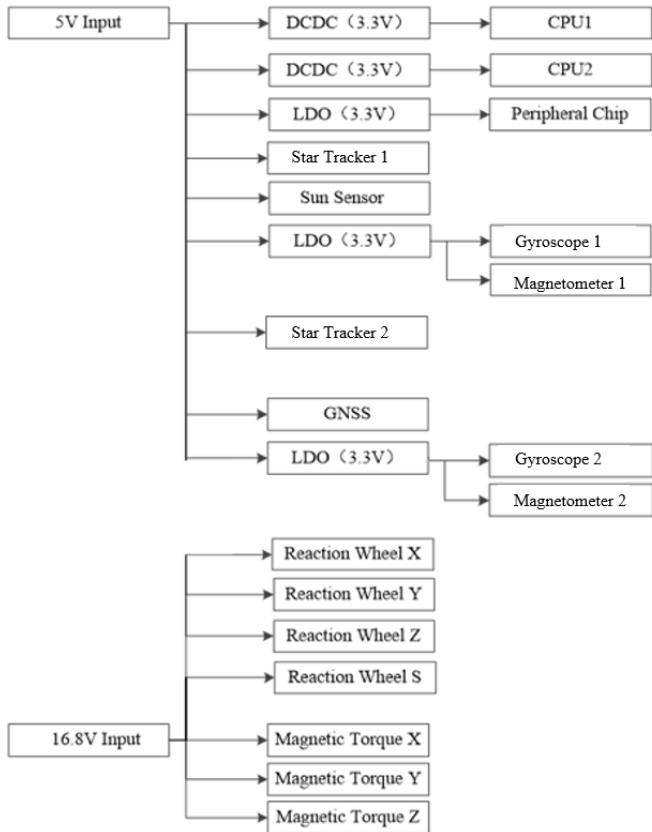
XXX	File Number	TYS-ADCS-N1-IDS		Page 9 of 17	
	Sub-System Name	Attitude and Orbit Control			
	Device Name	ADCS		Stage Mark	
	Device Code	PnP ADCS-N1			FM
Name (By Function): External Magnetometer Interface		Electrical Connector: X3		Pin / Hole: Pin	
Electrical Connector P/N: J70A-2F2-015-431-TH					
Contact Number	Signal (Function) Description	Voltage/V	Current/A	Polarity	Remarks (Shielded / Twisted)
13,14,15	MAGS_5V	5	<0.2	Magnetometer Power Supply	
6,7,8	GND	0	<0.2	Magnetometer Power Return Line	
3,4	MAGS_TX+	RS422	RS422		
11,12	MAGS_TX-	Standard	Standard		
1,2	MAGS_RX+	RS422	RS422		
9,10	MAGS_RX-	Standard	Standard		
Notes					
Edited (Date):					
Signed (Date):		Mark		Signature, Date	

IDS 10: Electrical Connector Contact Assignment – X4

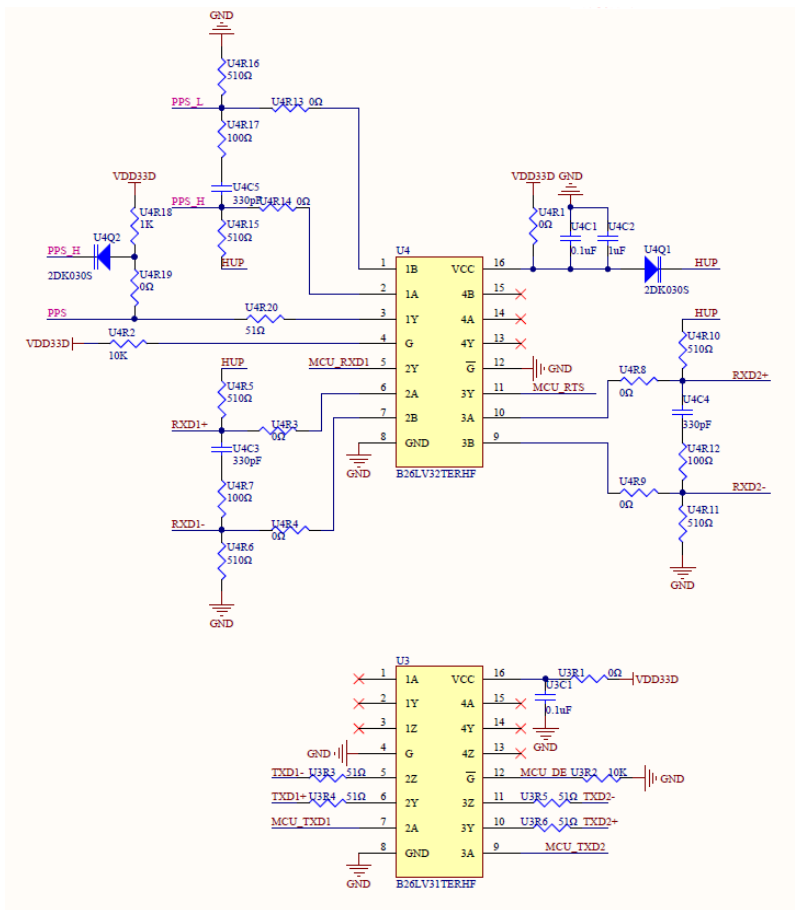
XXX	File Number		TYS-ADCS-N1-IDS		Page 10 of 17	
	Sub-System Name		Attitude and Orbit Control			
	Device Name		ADCS		Stage Mark	
	Device Code		PnP ADCS-N1			FM
Name (By Function): Stacked Input/Output Interface			Electrical Connector: X4		Pin / Hole: Pin	
Electrical Connector P/N: HRM-3B2-080-001-0256-L07						
Contact Number	Signal (Function) Description		Voltage/V	Current/A	Polarity	Remarks (Shielded / Twisted)
9	OC_Z		OC	<0.2	Primary-Backup Switch - Primary	
36	OC_B		OC	<0.2	Primary-Backup Switch - Backup	
37	OC_MS_ON		OC	<0.2	Minimum-System Mode Enable	
38	OC_MS_OFF		OC	<0.2	Minimum-System Mode Disable	
12	PPS+		RS422	RS422		
13	PPS-		Standard	Standard		
52	CAN1_H		CAN2.0B	CAN2.0B		
79	CAN1_L		Standard	Standard		
53	CAN2_H		CAN2.0B	CAN2.0B		
80	CAN2_L		Standard	Standard		
43	S_RX+		RS422	RS422		
44	S_RX-		Standard	Standard		
45	S_TX+		RS422	RS422		
46	S_TX-		Standard	Standard		
40,67	ADCS_POW_5		5	<1.1	5V Power Input+	
39,66	ADCS_GND		0	<1.1	5V Power Return Line	
76,72	FW_CB_GND		0	<1	RW & MTQ GND	
77,65	FW_CB_V		16.8	<1	RW & MTQ Primary Power +	
78	MPPT_B_OFF		OC	<0.2		
22	P_BAT_ON		OC	<0.2		
23	P_BAT_OFF		OC	<0.2		
8	MPPT_A_ON		OC	<0.2		
10	MPPT_A_OFF		OC	<0.2		

14	FB_D_ON	OC	<0.2		
49	IIC3_OUT_SCL	3.3	<0.01	IIC Communication Bus	
75	IIC3_OUT_SDA	3.3	<0.01	IIC Communication Bus	
48	IIC4_OUT_SCL	3.3	<0.01	IIC Communication Bus	
74	IIC4_OUT_SDA	3.3	<0.01	IIC Communication Bus	
68	V_FW1	16.8	<0.5	Internal Use	NC
69	V_FW2	16.8	<0.5	Internal Use	NC
70	V_FW3	16.8	<0.5	Internal Use	NC
71	V_FW4	16.8	<0.5	Internal Use	NC
18	FB_D_OFF	OC	<0.2		
51	MPPT_B_ON	OC	<0.2		
Notes					
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IDS 11: Electrical Interface Characteristics - Power

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	Sub-System Name	Attitude and Orbit Control				
	Device Name	ADCS	Stage Mark			
	Device Code	PnP ADCS-N1			FM	
Interface Signal	Power supply					
Signal Characteristics	5V, 16.8V power and the ground are two-point two-wire.					
Interface Circuit	 <pre> graph LR 5V[5V Input] --> DCDC1[DCDC 3.3V] --> CPU1[CPU1] 5V --> DCDC2[DCDC 3.3V] --> CPU2[CPU2] 5V --> LDO1[LDO 3.3V] --> PC[Peripheral Chip] 5V --> ST1[Star Tracker 1] 5V --> SS[Sun Sensor] 5V --> LDO2[LDO 3.3V] --> Gyro1[Gyroscope 1] 5V --> LDO2 --> Mag1[Magnetometer 1] 5V --> ST2[Star Tracker 2] 5V --> GNSS[GNSS] 5V --> LDO3[LDO 3.3V] --> Gyro2[Gyroscope 2] 5V --> LDO3 --> Mag2[Magnetometer 2] 16.8V[16.8V Input] --> RWX[Reaction Wheel X] 16.8V --> RWY[Reaction Wheel Y] 16.8V --> RWZ[Reaction Wheel Z] 16.8V --> RWS[Reaction Wheel S] 16.8V --> MTX[Magnetic Torque X] 16.8V --> MTY[Magnetic Torque Y] 16.8V --> MTZ[Magnetic Torque Z] </pre>					
Notes	The 16.8 V input voltage can be adaptively adjusted according to user requirements, with a minimum adjustable value of 11 V.					
Edited (Date):						
Signed (Date):		Mark		Signature, Date		

IDS 12: Electrical Interface Characteristics - RS422

XXX	File Number	TYS-ADCS-N1-IDS		Page 12 of 17			
	Sub-System Name	Attitude and Orbit Control					
	Device Name	ADCS		Stage Mark			
	Device Code	PnP ADCS-N1				FM	
Interface Signal	Digital Signal: RS422						
Signal Characteristics	RS422 communication baud rate: 115200bps; Two-point two-wire						
Interface Circuit							
Notes							
Edited (Date):							
Signed (Date):		Mark				Signature, Date	

IDS 13: Electrical Interface Characteristics – CAN

		File Number	TYS-ADCS-N1-IDS		Page 13 of 17		
		Sub-System Name	Attitude and Orbit Control				
		Device Name	ADCS		Stage Mark		
		Device Code	PnP ADCS-N1				FM
Interface Signal	CAN Bus						
Signal Characteristics	CAN Bus communication baud rate: 500kbps; Two-point two-wire						
Interface Circuit	</						

IDS 14: Electrical Interface Characteristics – PPS

		File Number	TYS-ADCS-N1-IDS		Page 14 of 17		
		Sub-System Name	Attitude and Orbit Control				
		Device Name	ADCS		Stage Mark		
		Device Code	PnP ADCS-N1				FM
Interface Signal	Pulse per second (PPS)						
Signal Characteristics	Second pulse signal: single-ended input; Falling edge aligned to integer seconds; Negative pulse width 1ms.						
Interface Circuit	The diagram illustrates the interface circuit for the ADCS-N1 device. It features a PPS (Pulse Per Second) input signal that is conditioned through a series of resistors (R26, R27, R31, R33, R37, R38, R43) and a capacitor (C27) to the SN65C116PWR CAN transceiver. The transceiver is connected to the MCU's RXD and TXD pins. The circuit also includes a VDD33D supply, a 2DK030S diode (Q1), and a 2DK030S diode (Q2) for signal protection. The CAN bus is terminated with 120Ω resistors (R48, R54) and includes a 100pF capacitor (C80) for signal integrity. The MCU's TXD pin is connected to the TXD+ pin of the transceiver through a 51Ω resistor (R39).						
Notes							
Edited (Date):							
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IDS 15: Circuit and Interface Schematics

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	Sub-System Name	Attitude and Orbit Control				
	Device Name	ADCS	Stage Mark			
	Device Code	PnP ADCS-N1			FM	

Schematic Diagram:

Gyroscope 1

Magnetometer 1

Gyroscope 2

Magnetometer 2

Magnetic Torque X/Y/Z

Sun Sensor

Star Tracker 1/2

SPI2

SPI2

SPI3

SPI3

PWM*6

Onboard Computer

CPU1

Primary/Backup Switch

CPU2

CAN1,CAN2,422, OC,PPS, Power Supply

Ground Test Interface

Download Interface

External Interface

AD

HRM-3B2-080-001-0256-L07

J70A-2F2-037-431-TH

J70A-2F2-031-431-TH

J70A-2F2-015-431-TH

Voltage, Current, Temperature

Antenna

Reaction Wheel X/Y/Z/S

CAN1

GNSS

±PPS

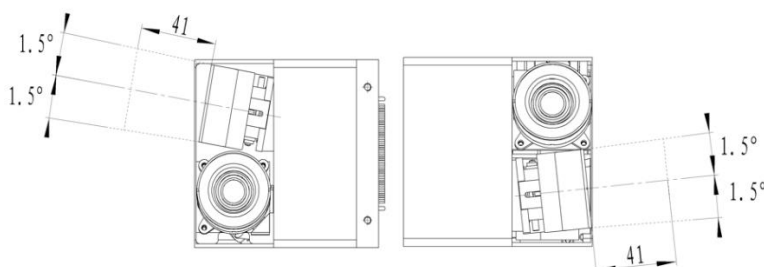
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Signed (Date):	Mark		Signature, Date

IDS 16: Mounting Requirements

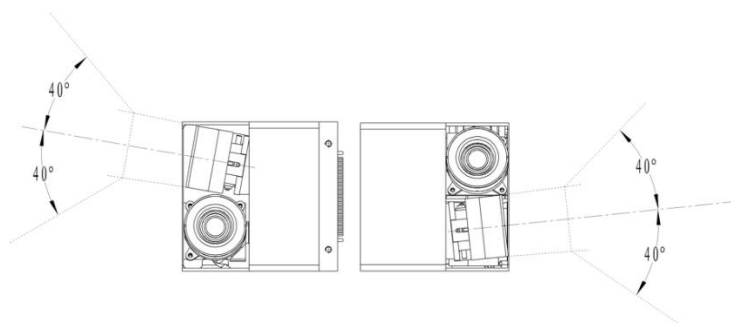
XXX	File Number	TYS-ADCS-N1-IDS	Page 16 of 17			
	Sub-System Name	Attitude and Orbit Control				
	Device Name	ADCS	Stage Mark			
	Device Code	PnP ADCS-N1			FM	

Mounting requirements:

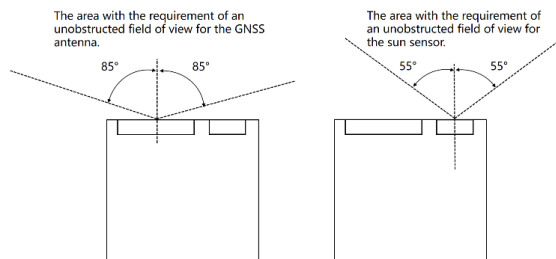
- (1) Keep away from strong magnetic sources.
- (2) The star tracker, sun sensor, and GNSS antenna should have sufficient unobstructed areas within their fields of view.
- (3) The dynamic envelope range of the star tracker's baffle should be free of obstructions.
- (4) During satellite integration, the GNSS antenna shall be mounted on the outer cabin panel. The flat mounting area shall be no less than 80 mm × 80 mm (no protrusions, other equipment or other interferences within this plane).



The unfolding dynamic envelope range of the star tracker baffle



The area with the requirement of unobstructed field of view for the star tracker



The area with the requirement of unobstructed field of view for the GNSS antenna and the sun sensor

Edited (Date):			
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IDS 17: Device Description

XXX	File Number	TYS-ADCS-N1-IDS	Page 17 of 17			
	Sub-System Name	Attitude and Orbit Control				
	Device Name	ADCS	Stage Mark			
	Device Code	PnP ADCS-N1			FM	
None.						
Edited (Date):						
Signed (Date):		Mark		Signature, Date		