File Number	Piece Number

File Number	TYS-HST-A1-IDS
Stage Mark	FM
Page	18

HST-A1 Star Tracker IDS

Prepared by:	Fu Shuxin
Proofread by:	Cao Baolei
Reviewed by:	Wang Haijun
Standardization Checked by:	Dong Pengfei
Approved by:	Xiao Mingguo

Signature

TY-Space Technology (Beijing) Ltd.

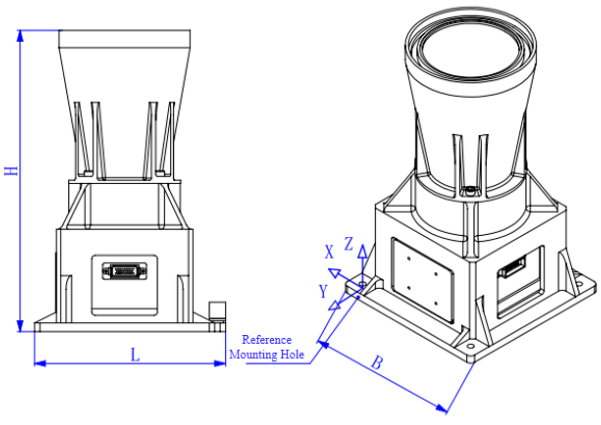
IDS 1: Performance Index

	File Number	TYS-HST-A1-IDS	Page 1 of 18			
	Sub-System Name	Attitude and Orbit Control				
	Device Name	HST-A1 Star Tracker	Stage Mark			
	Device Code				FM	

Parameters	**Specifications**
Attitude Accuracy	Pointing: 0.08″ (3σ) Roll: 2″ (3σ)
Dynamic Performance	@0.1°/s: 0.08″ (Pointing, 3σ); 2″ (Roll, 3σ); @0.5°/s: 0.3″ (Pointing, 3σ); 5″ (Roll, 3σ); @1.0°/s: 1″ (Pointing, 3σ); 10″ (Roll, 3σ); @1.5°/s: Trackable
Field of View	≥5.5°×5.5°
Update Rate	≥10Hz
Acquisition Rate	Max. ≤2s
Start-up Time	Better than 5s
Exclusion Angle	Sun: better than 30°; Earth: better than 30°
Time Scale Accuracy	Better than 40us @ synchronization pulse (SYNC pulse)
Communication	RS422
Quaternions Continuity	The scalar of quaternion: non-negative
Life Time	7 years
Reliability	≥0.98 @ the end of 7-year running

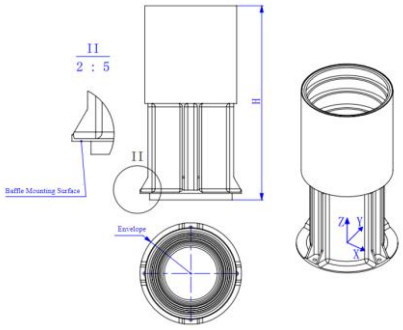
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Signed (Date):	Mark		Signature, Date

IDS 2: Mechanical Characteristics-Body

<table>
<tr><td colspan="2" rowspan="4"></td><td>File Number</td><td colspan="2">TYS-HST-A1-IDS</td><td colspan="4">Page 2 of 18</td></tr>
<tr><td>Sub-System Name</td><td colspan="2">Attitude and Orbit Control</td><td colspan="4"></td></tr>
<tr><td>Device Name</td><td colspan="2">HST-A1 Star Tracker</td><td colspan="4">Stage Mark</td></tr>
<tr><td>Device Code</td><td colspan="2"></td><td></td><td></td><td>FM</td><td></td></tr>
<tr><td colspan="2">Device Weight: 5.5±0.3kg</td><td colspan="3">Device Count: 1</td><td></td><td>√</td><td></td></tr>
<tr><td rowspan="4">Mechanical Characteristics</td><td>Envelope Size (mm)</td><td colspan="2">Envelope: 175±1×165±1</td><td>H: 276.5±3</td><td></td><td>√</td><td></td></tr>
<tr><td>CM Position (mm)</td><td>X: -70±2</td><td>Y: -67±2</td><td>Z: 122.8±2</td><td></td><td>√</td><td></td></tr>
<tr><td rowspan="2">Inertia at CM (kg.mm^2)</td><td rowspan="2">P_X = 48999±10</td><td rowspan="2">P_Y = 47958±10</td><td rowspan="2">P_Z = 14487±10</td><td></td><td>√</td><td></td></tr>
<tr><td>MEAS</td><td>CALC</td><td>EST</td></tr>
<tr><td rowspan="5">Mounting Characteristics</td><td>Mounting Hole Count: 4</td><td colspan="2">Mounting Hole Dimensions (Tolerance) (mm): Φ6.5±0.1</td><td>Material: Aluminum Silicon Carbide</td><td colspan="3">Determination Method (√)</td></tr>
<tr><td colspan="3">Mounting Contact Area (mm^2): 13589</td><td colspan="4" rowspan="4">Note:</td></tr>
<tr><td colspan="3">Mounting Surface Flatness: 0.1mm/(100mm×100mm)</td></tr>
<tr><td colspan="3">Mounting Surface Roughness Ra (μm): 3.2</td></tr>
<tr><td colspan="3">Mounting Surface Treatment: Conductive Treatment</td></tr>
<tr><td colspan="7">Parameter relationship diagram (should indicate coordinate system relative orientation, CM position, device body dimensions, mounting surface location, etc.):


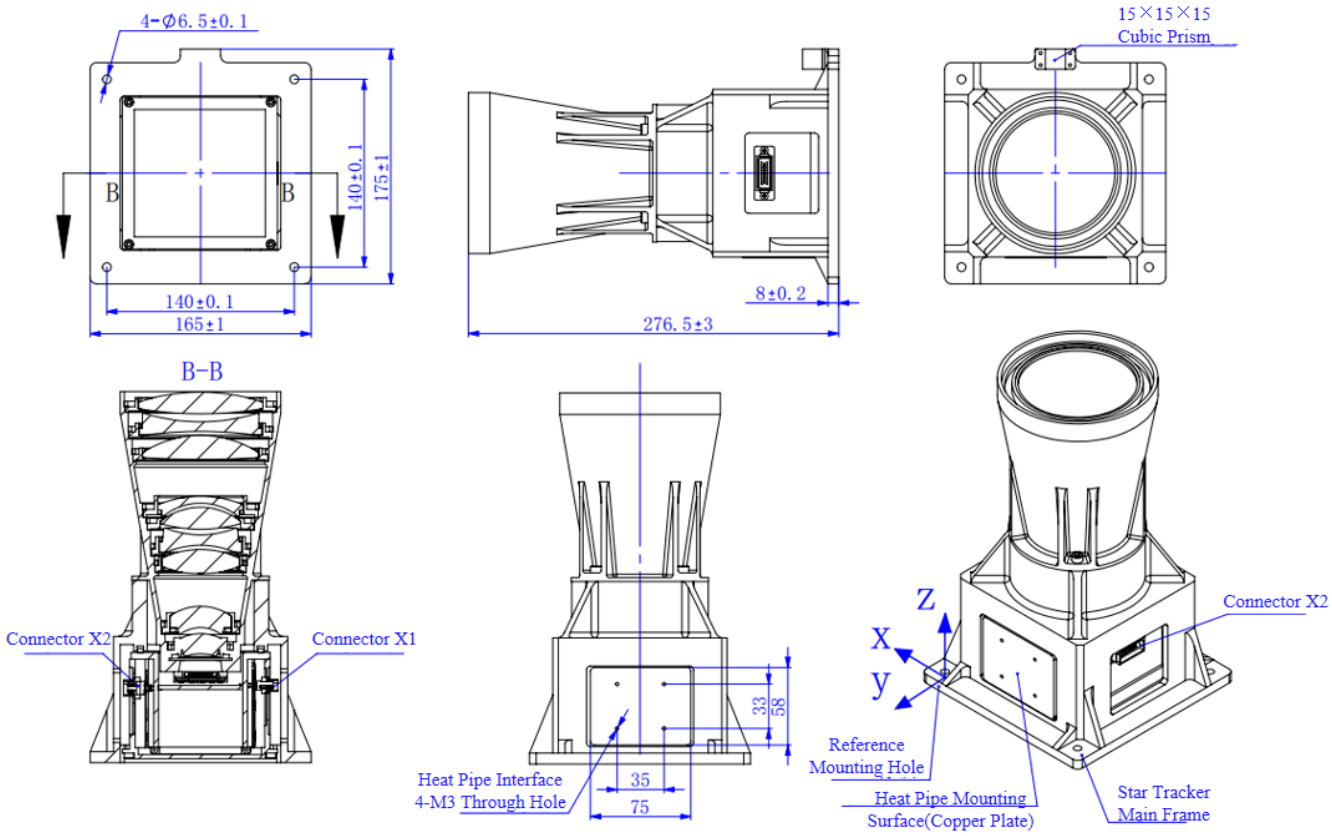
Note: The coordinate origin is located at the center of the reference mounting hole on the mounting surface (see IDS 3: Instrument Diagram).</td></tr>
<tr><td colspan="2">Edited (Date):</td><td></td><td colspan="2"></td><td colspan="2"></td></tr>
<tr><td colspan="2">Signed (Date):</td><td>Mark</td><td colspan="2"></td><td colspan="2">Signature, Date</td></tr>
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IDS 3: Mechanical Characteristics-Baffle

<table>
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<tr><td>Sub-System Name</td><td colspan="2">Attitude and Orbit Control</td><td colspan="4"></td></tr>
<tr><td>Device Name</td><td colspan="2">HST-A1 Star Tracker</td><td colspan="4">Stage Mark</td></tr>
<tr><td>Device Code</td><td colspan="2"></td><td></td><td></td><td>FM</td><td></td></tr>
<tr><td colspan="3">Device Weight: 0.73±0.05kg</td><td colspan="3">Device Count: 1</td><td></td><td>√</td><td></td></tr>
<tr><td rowspan="4">Mechanical Characteristics</td><td>Envelope Size (mm)</td><td colspan="2">155±2</td><td colspan="2">Height: 297±5</td><td></td><td>√</td><td></td></tr>
<tr><td>CM Position (mm)</td><td>X: 0</td><td>Y: 0</td><td>Z: 112.184</td><td></td><td>√</td><td></td></tr>
<tr><td rowspan="2">Inertia at CM (kg.mm^2)</td><td rowspan="2">P_X = 6635.851</td><td rowspan="2">P_Y = 6635.851</td><td rowspan="2">P_Z = 2837.181</td><td></td><td>√</td><td></td></tr>
<tr><td>MEAS</td><td>CALC</td><td>EST</td></tr>
<tr><td rowspan="5">Mounting Characteristics</td><td>Mounting Hole Count: 4</td><td colspan="2">Mounting Hole Dimensions (Tolerance) (mm): Φ5.4±0.1</td><td>Material: 2A12-T4</td><td colspan="3">Determination Method (√)</td></tr>
<tr><td colspan="3">Mounting Contact Area (mm^2): 6300</td><td colspan="4" rowspan="4">Note:</td></tr>
<tr><td colspan="3">Mounting Surface Flatness: 0.1mm/(100mm×100mm)</td></tr>
<tr><td colspan="3">Mounting Surface Roughness Ra (μm): 3.2</td></tr>
<tr><td colspan="3">Mounting Surface Treatment: Conductive Treatment</td></tr>
<tr><td colspan="8">Parameter relationship diagram (should indicate coordinate system relative orientation, CM position, device body dimensions, mounting surface location, etc.):

Note: The coordinate origin is located at the center of the reference mounting hole on the mounting surface (see IDS 3: Instrument Diagram).</td></tr>
<tr><td colspan="2">Edited (Date):</td><td></td><td colspan="2"></td><td colspan="3"></td></tr>
<tr><td colspan="2">Signed (Date):</td><td>Mark</td><td colspan="2"></td><td colspan="3">Signature, Date</td></tr>
</table>

IDS 4: Instrument Diagram-Body

	File Number	TYS-HST-A1-IDS	Page 4 of 18			
	Sub-System Name	Attitude and Orbit Control				
	Device Name	HST-A1 Star Tracker	Stage Mark			
	Device Code				FM	

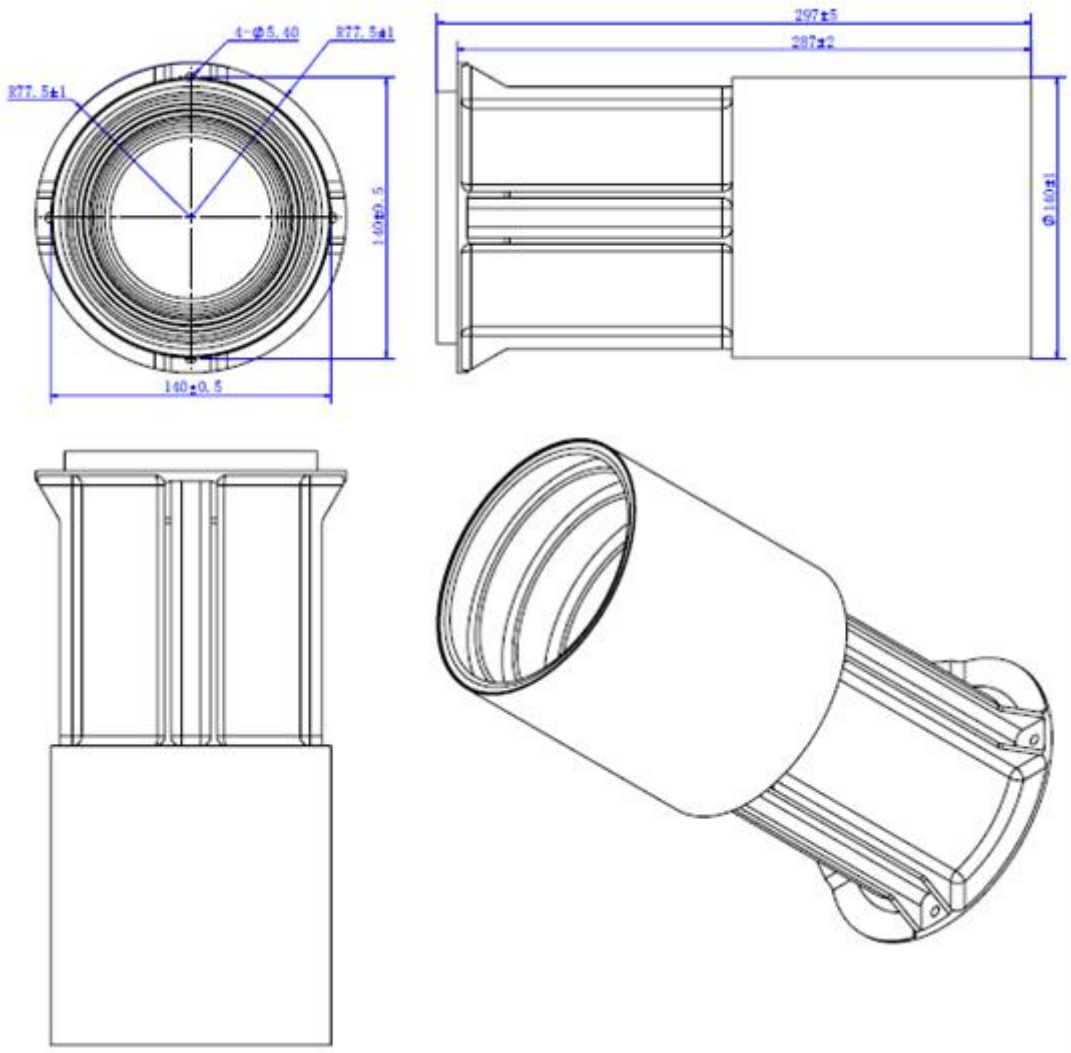


Note: This schematic diagram should include overall dimensions, mounting dimensions, mounting surface, mounting points (hole diameters and their tolerances, center-to-center distance and their tolerances), positional tolerances of guide pins and holes, orientation, position, type and designation of electrical connectors, operation holes required for calibration and testing, bonding jumpers/straps (position and length), and registration measurement datum.

Edited (Date):			
Signed (Date):	Mark		Signature, Date

IDS 5: Instrument Diagram-Baffle

	File Number	TYS-HST-A1-IDS	Page 5 of 18			
	Sub-System Name	Attitude and Orbit Control				
	Device Name	HST-A1 Star Tracker	Stage Mark			
	Device Code				FM	

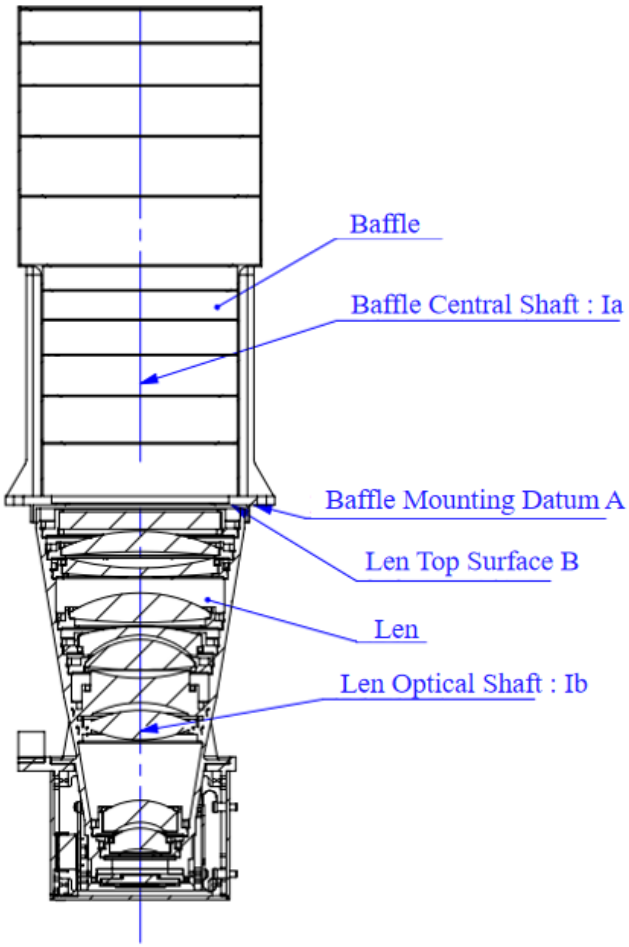


Note: This schematic diagram should include overall dimensions, mounting dimensions, mounting surface, mounting points (hole diameters and their tolerances, center-to-center distance and their tolerances), positional tolerances of guide pins and holes, orientation, position, type and designation of electrical connectors, operation holes required for calibration and testing, bonding jumpers/straps (position and length), and registration measurement datum.

Edited (Date):			
Signed (Date):	Mark		Signature, Date

IDS 6: Instrument Diagram

	File Number	TYS-HST-A1-IDS	Page 6 of 18			
	Sub-System Name	Attitude and Orbit Control				
	Device Name	HST-A1 Star Tracker	Stage Mark			
	Device Code				FM	



Note:

1. The central axis I_a of the baffle shall be coaxially mounted with the optical axis I_b of the lens; the angular deviation between the two axes shall be within ±0.5°.

2. The mounting reference plane A of the baffle and the upper end face B of the lens shall be mounted in parallel, with a gap of 2 mm between the two reference planes.

3. The bracket for the star tracker body and the baffle shall be designed by the satellite prime contractor/integrator.

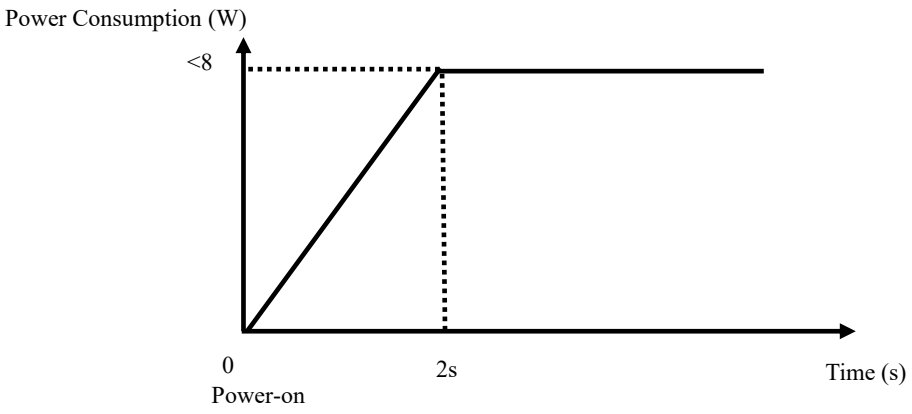
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Signed (Date):	Mark		Signature, Date

IDS 7 Thermal Characteristics

	File Number	TYS-HST-A1-IDS	Page 7of 18				
	Sub-System Name	Attitude and Orbit Control					
	Device Name	HST-A1 Star Tracker	Stage Mark				
	Device Code				FM		

Surface (Excluding Mounting Surface)	Material: Aluminum Silicon Carbide, Aluminum Alloy	**Note**: The inner surface of the baffle is ultra black coating, $\varepsilon_H \geq 0.85$, $\alpha_S \geq 0.96$.
	Outer Surface Treatment: Aluminum Nature Color	
Start Temperature ℃: -30～+40		Heat Capacity J/K: 4950 (Star Tracker), 730 (Baffle)
Operating Temperature Range ℃: -30～+40		Operating Relative Humidity Range: ≤60%
Best Operating Temperature Range ℃: 20±5		Storage Relative Humidity Range: ≤70%
Storage Temperature Range ℃: -30～+40		Power Consumption @Operating State W: <8(Per Device) Power Consumption @Preparing State W: 0 (Per Device)

Description:

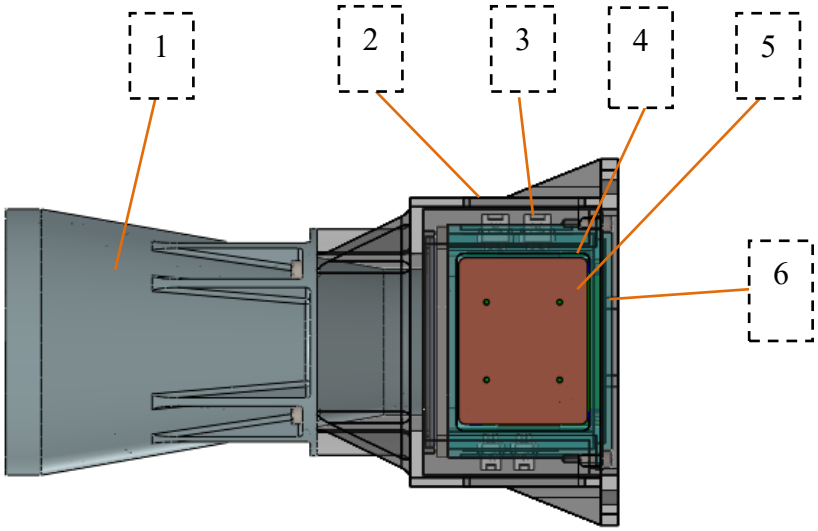


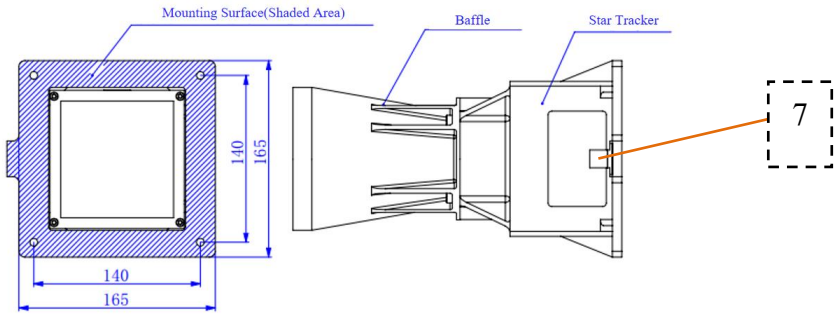
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Signed (Date):	Mark		Signature, Date

IDS 8: Thermal Diagram

	File Number	TYS-HST-A1-IDS	Page 8 of 18			
	Sub-System Name	Attitude and Orbit Control				
	Device Name	HST-A1 Star Tracker	Stage Mark			
	Device Code				FM	

Diagram:





1—Lens 2—Main Fram

3—Connector 4—Image Processing Circuit

5—Heat Pipe Mounting Board 6—Mounting Lug 7—Prism

Note: The shell of star tracker requires heat pipes to dissipate heat.

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IDS 9: Power

		File Number	TYS-HST-A1-IDS	Page 9 of 18			
		Sub-System Name	Attitude and Orbit Control				
		Device Name	HST-A1 Star Tracker	Stage Mark			
		Device Code				FM	
Operating Mode (Long Term/Short Term / Other)		Long Term		Device Count			2
Voltage	Voltage Stability	Ripple Voltage	Inrush Current (Peak / Duration)	Power Consumption			
28V	24~33.6V	≤500mV (p-p)	2A/25ms	<8			
Edited (Date):							
Signed (Date):		Mark		Signature, Date			

IDS 10: Electrical Connector

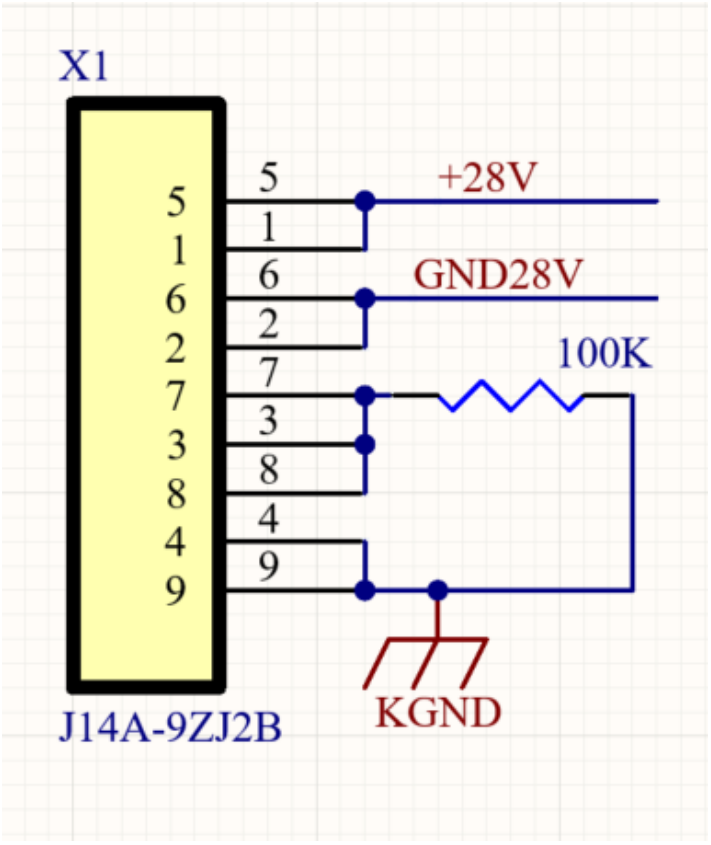
		File Number		TYS-HST-A1-IDS	Page 10 of 18
		Sub-System Name		Attitude and Orbit Control	
		Device Name		HST-A1 Star Tracker	Stage Mark
		Device Code			FM
Name (by Function)	Pin / Hole	Pin / Hole Number	Description	Model	Remarks
X1	Pin	9	Power Interface	J14A-9ZJ2B	
X2	Pin	26	Communication Interface	J14A-26ZJ2B	

Edited (Date):			
Signed (Date):	Mark		Signature, Date

IDS 11: Electrical Connector Contact Assignment – X1

	File Number	TYS-HST-A1-IDS		Page 11 of 18	
	Sub-System Name	Attitude and Orbit Control			
	Device Name	HST-A1 Star Tracker		Stage Mark	
	Device Code				FM
Name (by Function): X1	Electrical Connector P/N: J14A-9ZJ2B			Pin / Hole: Pin	

Contact Number	Signal (Function) Description	Voltage/V	Current/A	Polarity	Remarks (Shielded / Twisted)
1,5	+28V Power+ (Primary Power)	28V		+	1,2 Twisted, 5,6 Twisted
2,6	GND28V Power- (Primary Power)	0		-	
3,7,8	NC	/	/		
4,9	KGND	/	/	Case Ground	

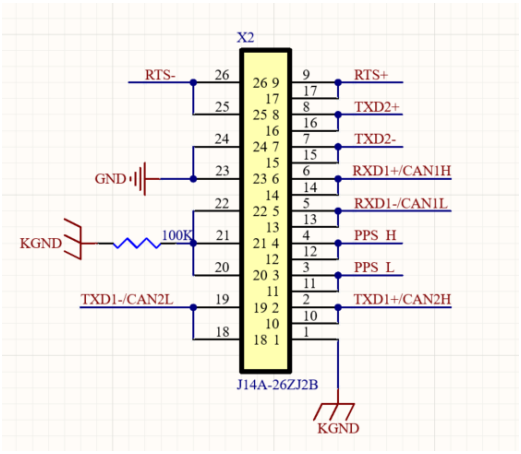


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Signed (Date):	Mark		Signature, Date

IDS 12: Electrical Connector Contact Assignment – X2

	File Number	TYS-HST-A1-IDS	Page 12 of 18		
	Sub-System Name	Attitude and Orbit Control			
	Device Name	HST-A1 Star Tracker	Stage Mark		
	Device Code				FM
Name (by Function): X2	Electrical Connector P/N: J14A-26ZJ2B		Pin / Hole: Pin		

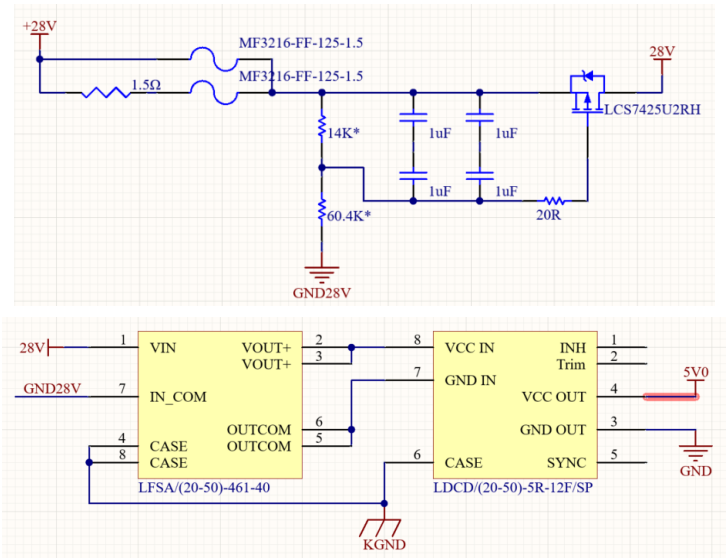
Contact Number	Signal (Function) Description	Voltage/V	Current/A	Polarity	Remarks (Shielded / Twisted)
9,17	RTS+	RS422 Standard	RS422 Standard	RTS Receive+	9,26 Twisted, 17,25 Twisted
25,26	RTS-			RTS Receive-	
8,16	TXD2+	RS422 Standard	RS422 Standard	422 Transmit+	7,8 Twisted, 15,16 Twisted
7,15	TXD2-			422 Transmit-	
6,14	RXD1+	RS422 Standard	RS422 Standard	422 Receive+	5,6 Twisted; 13,14 Twisted
5,13	RXD1-			422 Receive-	
4,12	PPS_H	RS422 Standard	RS422 Standard	PPS Differential+	3,4 Twisted; 11,12Twisted
3,11	PPS_L			PPS Differential-	
2,10	TXD1+	RS422 Standard	RS422 Standard	422 Transmit+	2,18 Twisted; 10,19 Twisted
18,19	TXD1-			422 Transmit-	
23,24	GND	0	0	Secondary Ground	/
20,21,22	NC	/	/		
1	KGND	/	/	Case Ground	/



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IDS 13: Electrical Interface Features - Power

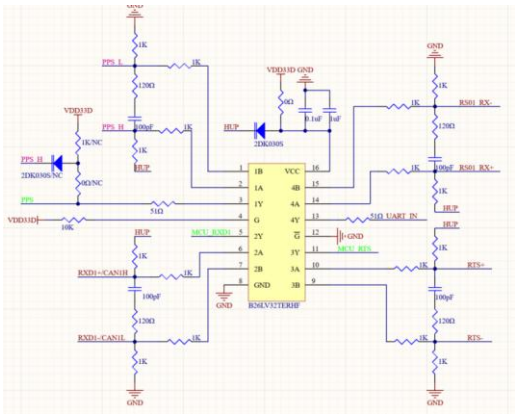
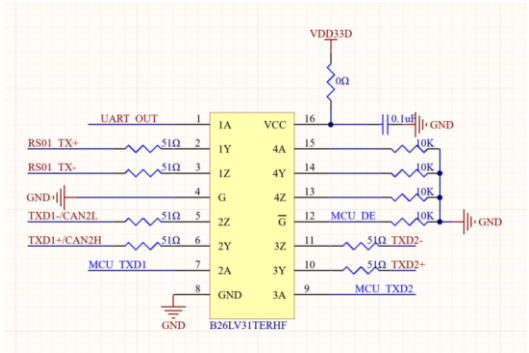
	File Number	TYS-HST-A1-IDS	Page 13 of 18
	Sub-System Name	Attitude and Orbit Control	
	Device Name	HST-A1 Star Tracker	Stage Mark
	Device Code		FM

Interface Signal	Power Supply Two-point two-wire
Signal Characteristics	Voltage Stability: 24~33.6V Ripple Voltage: ≤500mV (p-p)
Interface Circuit	
Notes	Fuse: MF3216-FF-125-1.5. Unbalanced design, rated current1.5A, internal resistance 77mΩ, blowing time 120ms @ 250% rated current (25°C), series resistor 1.5Ω, rated power 0.25W. PMOS: LCS7425U2RH EMI Filter: LFSA/ (20-50)-461-40 DC-DC Converter: LDCD/ (20-50)-5R-12F/SP

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Signed (Date):	Mark		Signature, Date

IDS 14: Electrical Interface Features - RS422

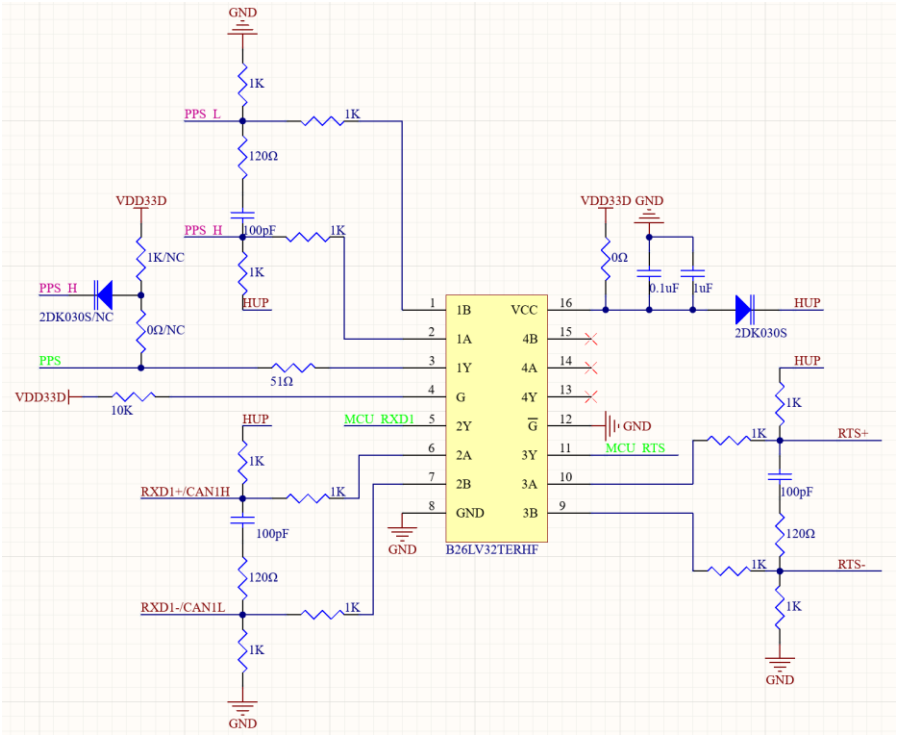
	File Number	TYS-HST-A1-IDS	Page 14 of 18			
	Sub-System Name	Attitude and Orbit Control				
	Device Name	HST-A1 Star Tracker	Stage Mark			
	Device Code				FM	

Interface Signal	Digital Signal: RS422
Signal Characteristics	RS422 Communication Baud Rate: 115200bps; 1 start bit, 8 data bits (LSB first), 1 stop bit, odd parity; Communication Method: Two-point Two-wire
Interface Circuit	 
Notes	RS422 Receiver: B26LV32TERHF. RS422 Transceiver: B26LV31TERHF. RXD1 and TXD1 are telemetry ports.

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Signed (Date):	Mark		Signature, Date

IDS 15: Electrical Interface Features - Differential PPS

	File Number	TYS-HST-A1-IDS	Page 15 of 18			
	Sub-System Name	Attitude and Orbit Control				
	Device Name	HST-A1 Star Tracker	Stage Mark			
	Device Code				FM	

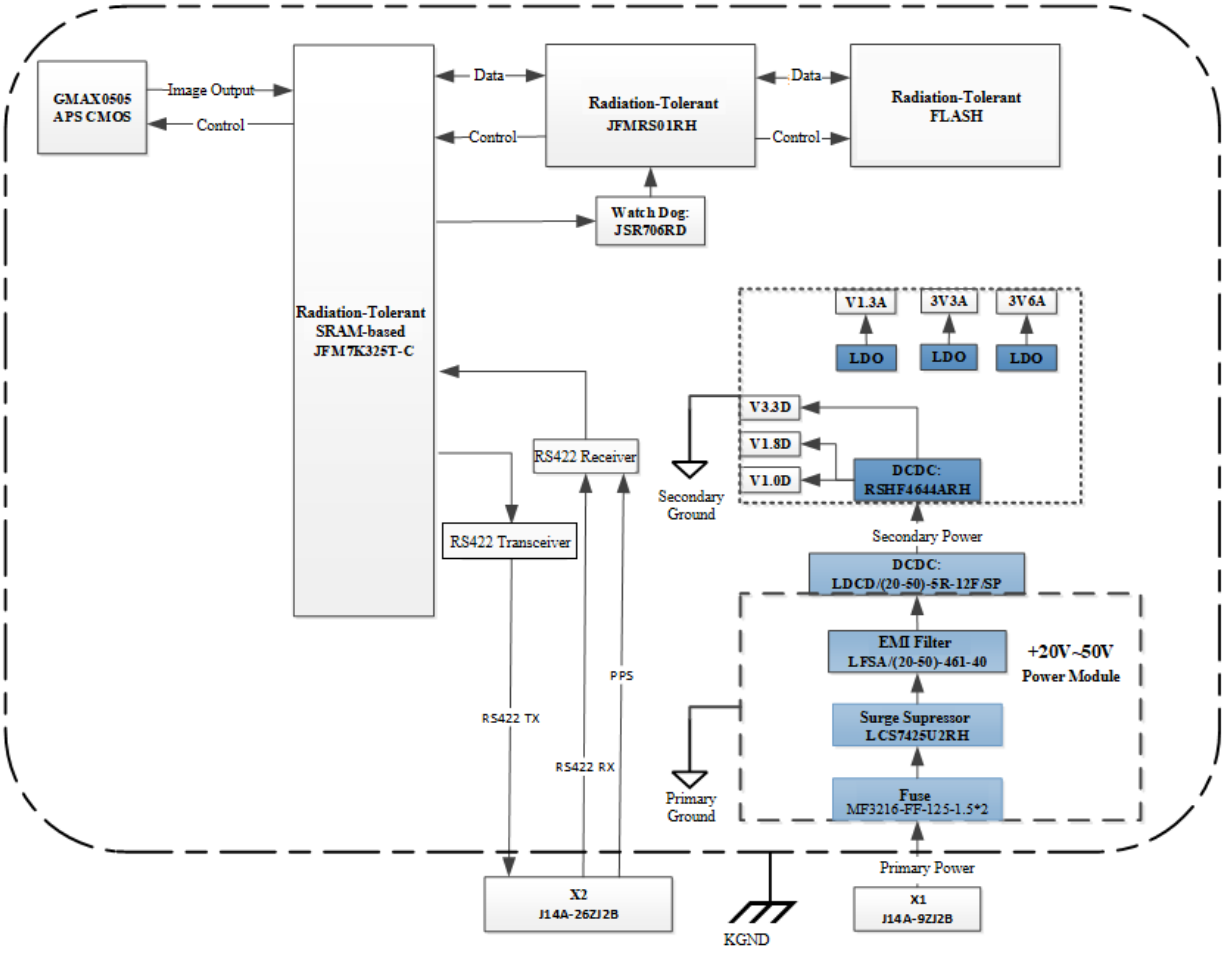
Interface Signal	Pulse Per Second (PPS)
Signal Characteristics	Second Pulse Signal: Differential Input; Falling Edge Aligned to Integer Seconds; Negative Pulse Width 1ms.
Interface Circuit	PPS circuit 
Notes	1K/NC, 2DK030S/NC, 0Ω/NC: not soldered @Differential PPS

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IDS 16: Circuit and Interface Schematics

	File Number	TYS-HST-A1-IDS	Page 16 of 18			
	Sub-System Name	Attitude and Orbit Control				
	Device Name	HST-A1 Star Tracker	Stage Mark			
	Device Code				FM	

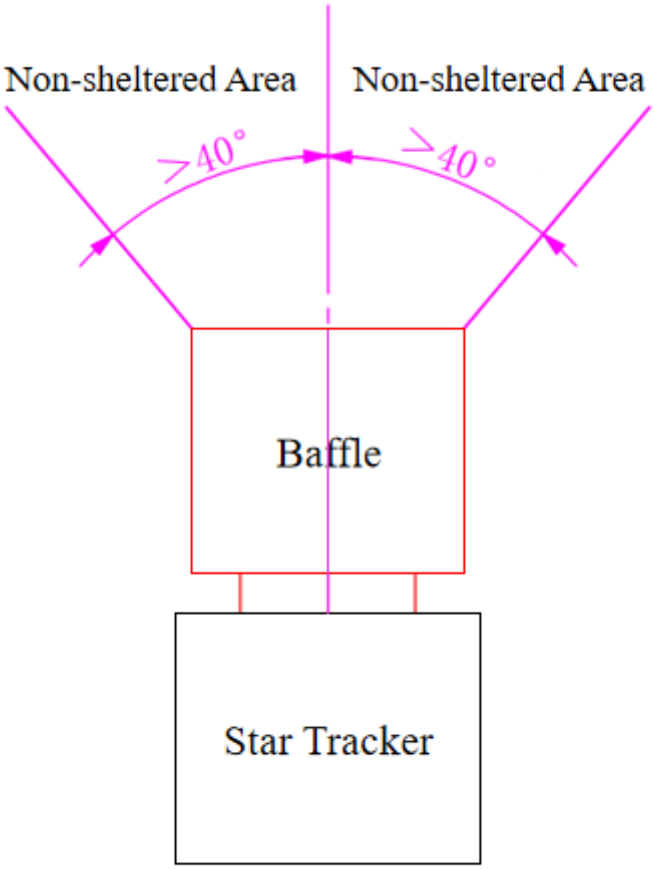
Schematic Diagram:



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Signed (Date):	Mark		Signature, Date

IDS 17: Mounting Requirements

	File Number	TYS-HST-A1-IDS	Page 17 of 18			
	Sub-System Name	Attitude and Orbit Control				
	Device Name	HST-A1 Star Tracker	Stage Mark			
	Device Code				FM	



Mounting Requirements: Ensure that nothing sheltered in the field of view (no obstructions within the 80° cone from the top of the baffle).

Edited (Date):			
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IDS 18: Device Description

	File Number	TYS-HST-A1-IDS	Page 18 of 18			
	Sub-System Name	Attitude and Orbit Control				
	Device Name	HST-A1 Star Tracker	Stage Mark			
	Device Code				FM	

None.

Edited (Date):			
Signed (Date):	Mark		Signature, Date