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:	Fan Wei
Reviewed by:	Wang Hongqiang
Standardization Checked by:	Li Yanan
Approved by:	Wang Haijun

Signature

TY-Space Technology (Beijing) Ltd.

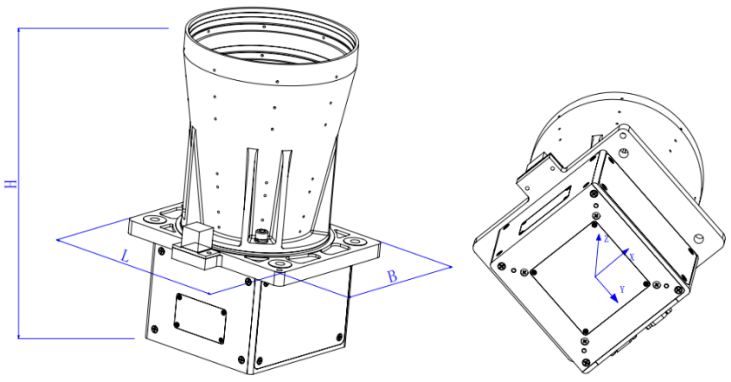
IDS 1: Performance Index

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

Parameters	**Specifications**
Attitude Accuracy	Pointing: 0.3″ (3σ) Roll: 3″ (3σ)
Dynamic Performance	@0.1°/s: 0.3″ (Pointing, 3σ); 3″ (Roll, 3σ); @0.5°/s: 1″ (Pointing, 3σ); 15″ (Roll, 3σ); @1.0°/s: 1.5″ (Pointing, 3σ); 20″ (Roll, 3σ); @1.5°/s: Trackable
Field of View	≥5.5°×5.5°
Update Rate	≥10Hz
Start-up Time	Better than 5s
Exclusion Angle	Sun: better than 30°; Earth: better than 30°
Time Scale Accuracy	Better than 0.1μs@ synchronization pulse (SYNC pulse)
Communication	Dual CAN2.0B/RS422
Quaternions Continuity	The scalar of quaternion: non-negative
Life Time	7 years @LEO Orbit
Reliability	≥0.98 @ the end of 7-year running

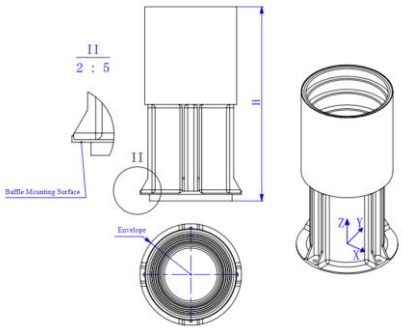
Edited (Date):			
Signed (Date):	Mark		Signature, Date

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"></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: 4.2±0.3kg</td><td colspan="2">Device Count: 1</td><td colspan="2"></td><td>√</td><td></td></tr>
<tr><td rowspan="4">Mechanical Characteristics</td><td>Envelope Size (mm)</td><td colspan="2">140±1×130±1</td><td>Height: 223±5</td><td colspan="2"></td><td>√</td><td></td></tr>
<tr><td>CM Position (mm)</td><td>X: -0.33±1</td><td>Y: -0.46±1</td><td>Z: 120.3±1</td><td colspan="2"></td><td>√</td><td></td></tr>
<tr><td rowspan="2">Inertia at CM (kg.mm^2)</td><td rowspan="2">P_X = 22658±5</td><td rowspan="2">P_Y = 22822±5</td><td rowspan="2">P_Z = 7587±5</td><td colspan="2"></td><td>√</td><td></td></tr>
<tr><td colspan="2">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: Titanium Alloy (TC4)</td><td colspan="4">Determination Method (√)</td></tr>
<tr><td colspan="3">Mounting Contact Area (mm^2): 5680</td><td colspan="4" rowspan="4">Note: The determination method refers to the way to determine the mechanical characteristics of the device.
MEAS: Measurement
CALC: Calculation
EST: Estimation</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.):
 

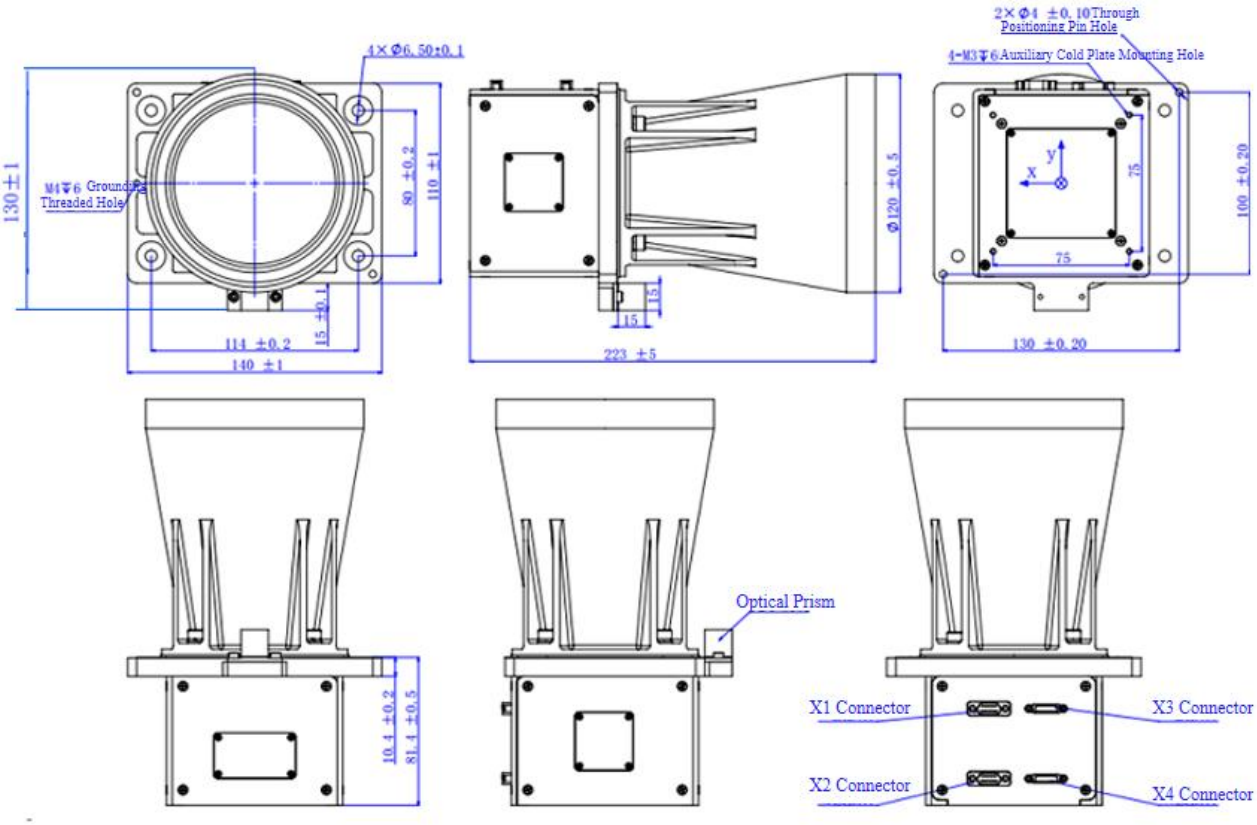
Note: The coordinate origin is located at the center of the reference mounting hole on the mounting surface (see IDS 3: Instrument Diagram).</td></tr>
<tr><td colspan="2">Edited (Date):</td><td></td><td colspan="2"></td><td colspan="3"></td></tr>
<tr><td colspan="2">Signed (Date):</td><td>Mark</td><td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

IDS 3: Mechanical Characteristics-Baffle

<table>
<tr><td colspan="3" rowspan="4"></td><td>File Number</td><td colspan="2">TYS-HST-A1-IDS</td><td colspan="4">Page 3 of 18</td></tr>
<tr><td>Sub-System Name</td><td colspan="2"></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="3" rowspan="4">Note: The determination method refers to the way to determine the mechanical characteristics of the device.
MEAS: Measurement
CALC: Calculation
EST: Estimation</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:
Mounting Lug: Conductive Treatment
Remain Area: Bright Anodized Aluminum (Natural Color)</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>Edited (Date):</td><td></td><td></td><td colspan="4"></td></tr>
<tr><td>Signed (Date):</td><td>Mark</td><td></td><td colspan="4">Signature, Date</td></tr>
</table>

IDS 4: Instrument Diagram-Body

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

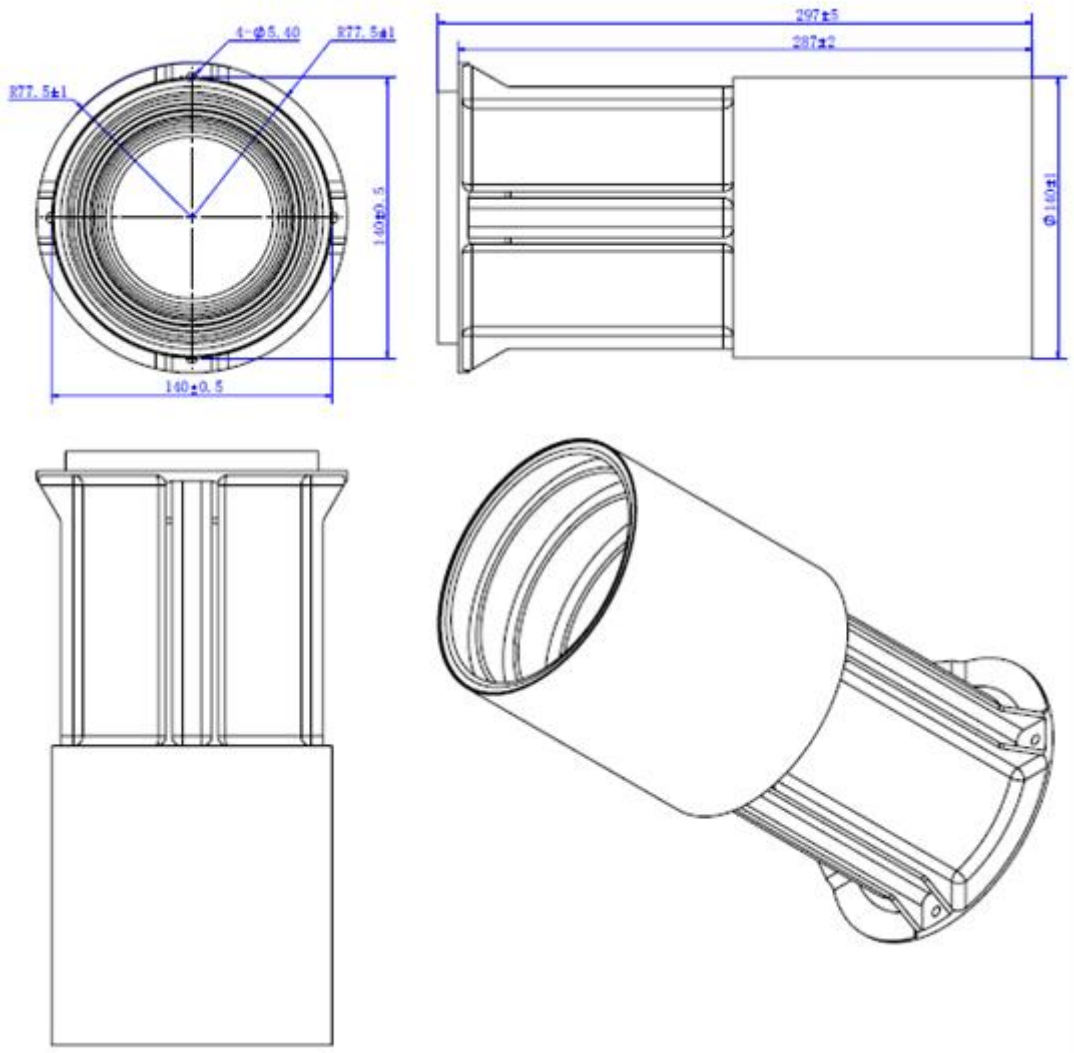


Note: This schematic diagram should include overall dimensions, mounting dimensions, mounting surface, mounting points (hole diameters and their tolerances, center-to-center distance and their tolerances), positional tolerances of guide pins and holes, orientation, position, type and designation of electrical 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					
	Device Name	HST-A1 Star Tracker	Stage Mark			
	Device Code				FM	

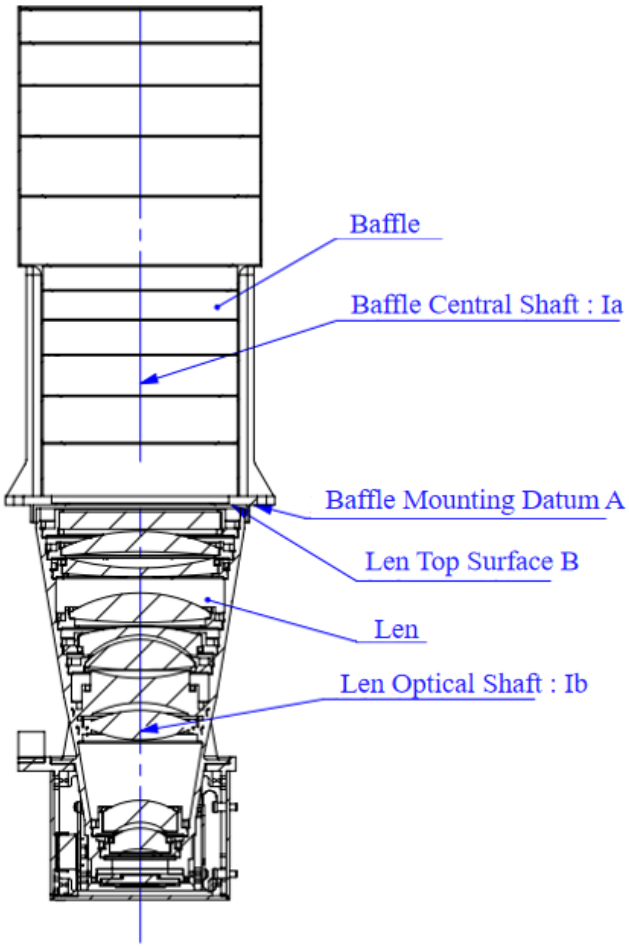


Note: This schematic diagram should include overall dimensions, mounting dimensions, mounting surface, mounting points (hole diameters and their tolerances, center-to-center distance and their tolerances), positional tolerances of guide pins and holes, orientation, position, type and designation of electrical 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					
	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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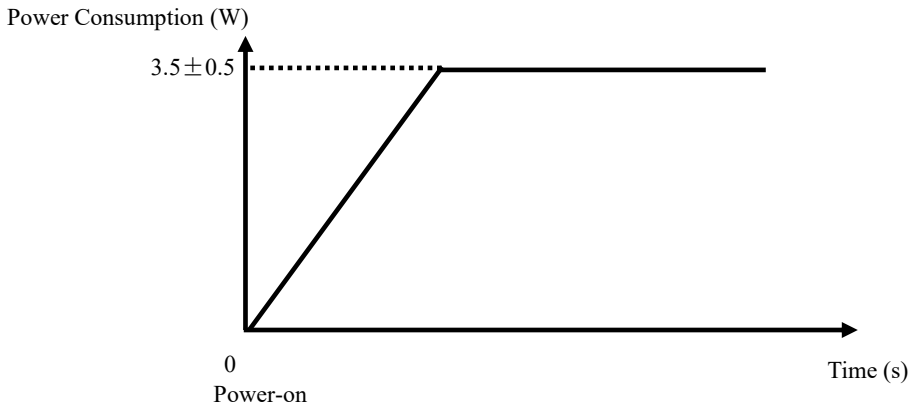
IDS 7: Thermal Characteristics

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

Surface (Excluding Mounting Surface)	Material: Titanium Alloy (TC4) Aluminum Alloy (2A12-T4) Outer Surface Treatment: Bright Anodized Aluminum Outer Surface Emissivity: ε_H ≥0.6	Note: The inner surface of the baffle is ultra black coating. ε_H≥0.85,α_S ≥0.96
Start Temperature ℃: -30～+40		Heat Capacity J/K: 4200 (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 ℃: -10～30		Power Consumption @Preparing State W: 0 (Per Device) Power Consumption @Operating State W: 3.5±0.5 (Per Device)

Description:

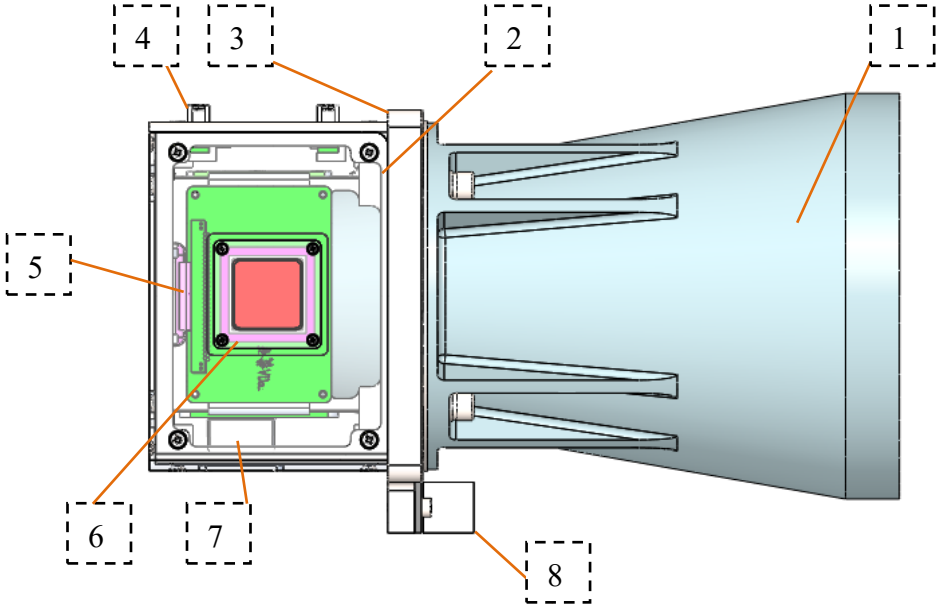


Edited (Date):			
Signed (Date):	Mark		Signature, Date

IDS 8: Thermal Diagram

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

Diagram:



1—Lens Baffle 2—Upper Cover

3—Mounting Lug 4—Connector

5—Power Supply & Image Processing Circuit Board

6—Image Sensor Circuit Board

7—Circuit Box 8—Optical Prism

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IDS 9: Power

		File Number	TYS-HST-A1-IDS	Page 9 of 18			
		Sub-System Name					
		Device Name	HST-A1 Star Tracker	Stage Mark			
		Device Code				FM	
Operating Mode (Long Term/Short Term / Other)		Long Term		Device Count			1
Voltage	Voltage Stability	Ripple Voltage	Inrush Current (Peak / Duration)	Power Consumption			
28V	5%	300mV (p-p)	2A/5ms	3.5±0.5W			

Edited (Date):			
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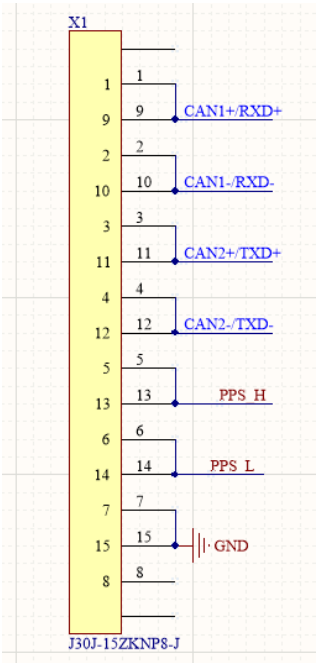
IDS 10: Electrical Connector Contact Assignment – X1

	File Number		TYS-HST-A1-IDS	Page 10 of 18	
	Sub-System Name				
	Device Name		HST-A1 Star Tracker	Stage Mark	
	Device Code				FM
Name (by Function): X1	Electrical Connector P/N: J30J-15ZKNP8-J			Pin / Hole: Hole	

Contact Number	Signal (Function) Description	Voltage/V	Current/A	Polarity	Remarks (Shielded / Twisted)
1,9	CAN1+/RXD+	CAN2.0 B /RS422 Standard	CAN2.0 B /RS422 Standard	CAN1 Tx/Rx + / Async Rx +	1,2 Twisted, 9,10 Twisted
2,10	CAN1-/RXD-			CAN1 Tx/Rx - / Async Rx -	
3,11	CAN2+/TXD+	CAN2.0 B /RS422 Standard	CAN2.0 B /RS422 Standard	CAN2 Tx/Rx + / Async Rx +	3,4 Twisted, 11,12 Twisted
4,12	CAN2-/TXD-			CAN2 Tx/Rx - / Async Rx -	
5,13	PPS_H	RS422 Standard	RS422 Standard	PSS Receive-	5,6 Twisted, 13,14 Twisted
6,14	PPS_L			PSS Receive-	
7,15	GND	0V			Two-Point Two-Wire
8	NC				

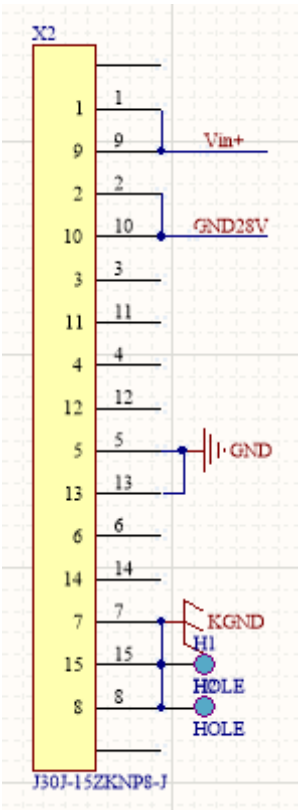


Edited (Date):			
Signed (Date):	Mark		Signature, Date

IDS 11: Electrical Connector Contact Assignment – X2

	File Number	TYS-HST-A1-IDS	Page 11 of 18		
	Sub-System Name				
	Device Name	HST-A1 Star Tracker	Stage Mark		
	Device Code				FM
Name (by Function): X2	Electrical Connector P/N: J30J-15ZKNP8-J		Pin / Hole: Hole		

Contact Number	Signal (Function) Description	Voltage/V	Current/A	Polarity	Remarks (Shielded / Twisted)
1,9	Vin+ Power+	26~32V	≤0.23A	+	1,2 Twisted, 9,10 Twisted
2,10	GND 28V Power-	0	0	-	
5,13	Secondary GND	0	0	-	Two-Point Two-Wire
7,8,15	KGND	0	0	-	Three-Point Three-Wire
3,4,6,11,12,14	NC			-	

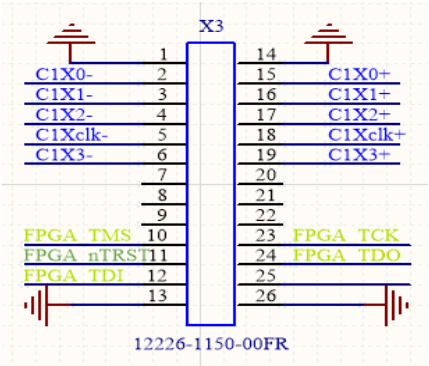


Edited (Date):			
Signed (Date):	Mark		Signature, Date

IDS 12: Electrical Connector Contact Assignment – X3

	File Number		TYS-HST-A1-IDS	Page 12 of 18	
	Sub-System Name				
	Device Name		HST-A1 Star Tracker	Stage Mark	
	Device Code				FM
Name (by Function): X3	Electrical Connector P/N: 12226-1150-00FR			Pin / Hole: Hole	

Contact Number	Signal (Function) Description	Voltage/V	Current/A	Polarity	Remarks (Shielded / Twisted)
5	C1Xclk-	LVDS Standard	LVDS Standard	Camera-Link1 Xclk-	Shielded, Twisted
18	C1Xclk+			Camera-Link1 Xclk+	
2	C1X0-	LVDS Standard	LVDS Standard	Camera-Link1 X0-	Shielded, Twisted
15	C1X0+			Camera-Link1 X0+	
3	C1X1-	LVDS Standard	LVDS Standard	Camera-Link1 X1-	Shielded, Twisted
16	C1X1+			Camera-Link1 X1+	
4	C1X2-	LVDS Standard	LVDS Standard	Camera-Link1 X2-	Shielded, Twisted
17	C1X2+			Camera-Link1 X2+	
6	C1X3-	LVDS Standard	LVDS Standard	Camera-Link1 X3-	Shielded, Twisted
19	C1X3+			Camera-Link1 X3+	
10,11,12,23,24					Internal Use
1,13,14,26	GND	0	0		Secondary GND
7,8,9,20,21,22	NC				



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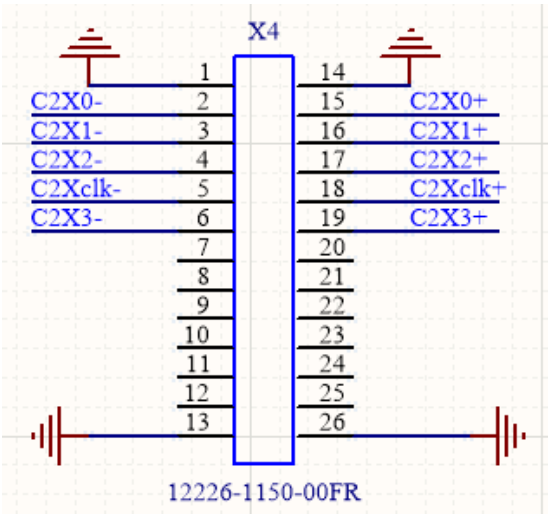
Signed (Date):	Mark		Signature, Date

IDS 13: Electrical Connector Contact Assignment – X4

	File Number		TYS-HST-A1-IDS	Page 13 of 18	
	Sub-System Name				
	Device Name		HST-A1 Star Tracker	Stage Mark	
	Device Code				FM
Name (by Function): X4	Electrical Connector P/N: 12226-1150-00FR			Pin / Hole: Hole	

Contact Number	Signal (Function) Description	Voltage/V	Current/A	Polarity	Remarks (Shielded / Twisted)
5	C2Xclk-	LVDS Standard	LVDS Standard	Camera-Link2 Xclk-	Shielded, Twisted
18	C2Xclk+			Camera-Link2 Xclk+	
2	C2X0-	LVDS Standard	LVDS Standard	Camera-Link2 X0-	Shielded, Twisted
15	C2X0+			Camera-Link2 X0+	
3	C2X1-	LVDS Standard	LVDS Standard	Camera-Link2 X1-	Shielded, Twisted
16	C2X1+			Camera-Link2 X1+	
4	C2X2-	LVDS Standard	LVDS Standard	Camera-Link2 X2-	Shielded, Twisted
17	C2X2+			Camera-Link2 X2+	
6	C2X3-	LVDS Standard	LVDS Standard	Camera-Link2 X3-	Shielded, Twisted
19	C2X3+			Camera-Link2 X3+	
1,13,14,26	GND	0	0		Secondary GND
7,8,9,10,11,12, 20,21,22,23,24, 25	NC				Internal Use



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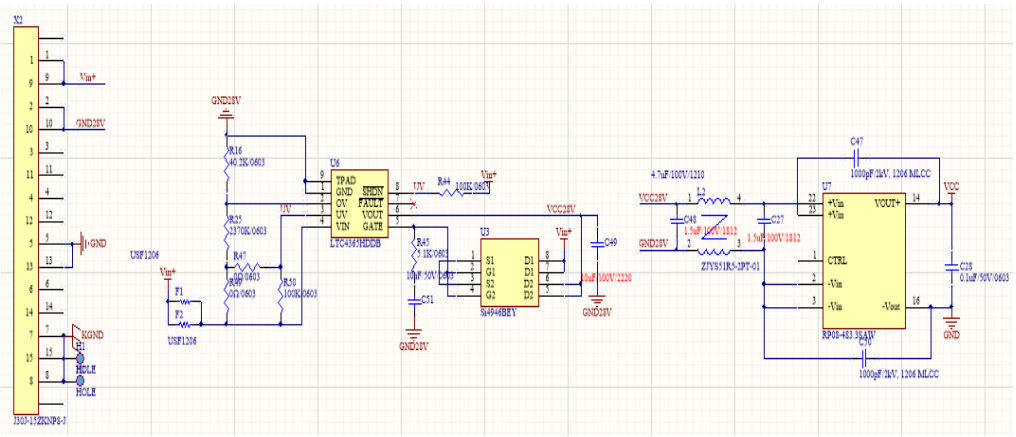
Signed (Date):	Mark		Signature, Date

IDS 14: Electrical Interface Features - Power

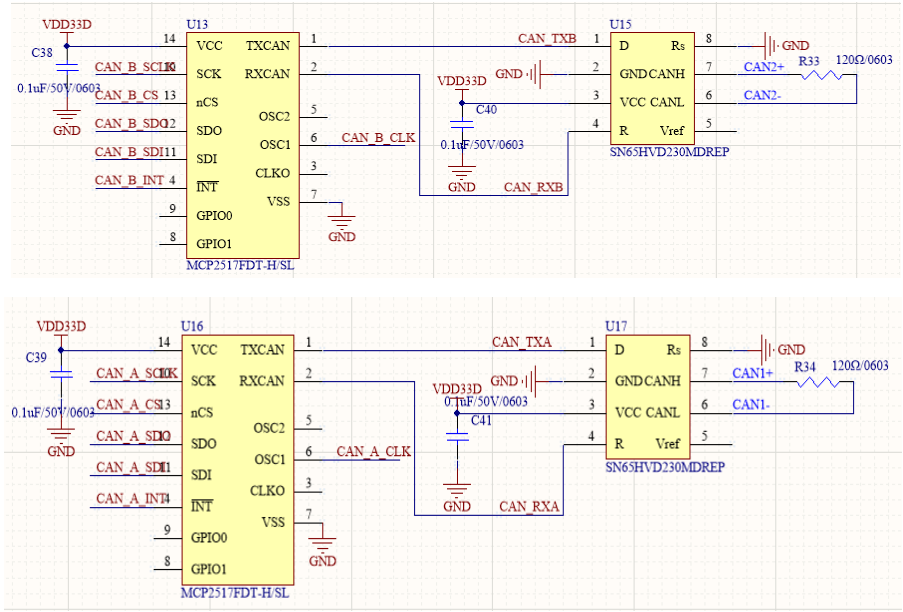
	File Number	TYS-HST-A1-IDS	Page 14 of 18			
	Sub-System Name					
	Device Name	HST-A1 Star Tracker	Stage Mark			
	Device Code				FM	

Interface Signal	Power Supply
Signal Characteristics	28V power and the ground are two-point two-wire.
Interface Circuit	
Notes	

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

IDS 15: Electrical Interface Features - CAN

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

Interface Signal	Digital Signal: CAN
Signal Characteristics	CAN Bus Rate: 500kbps; Communication Method: Two-point Two-wire.
Interface Circuit	
Notes	Soldering of R33 and R34 is determined by the overall requirements of the satellite side.

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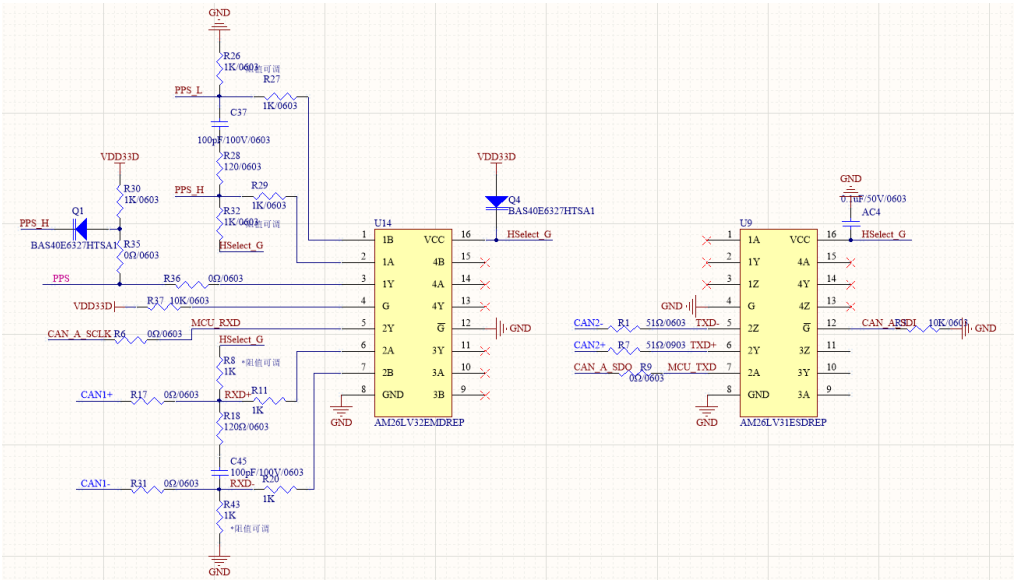
Signed (Date):	Mark		Signature, Date

IDS 15: Electrical Interface Features - RS422

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

Interface Signal	Digital Signal: RS422
Signal Characteristics	RS422 Communication Baud Rate: 115200bps; Communication Method: Two-point Two-wire.
Interface Circuit	
Notes	

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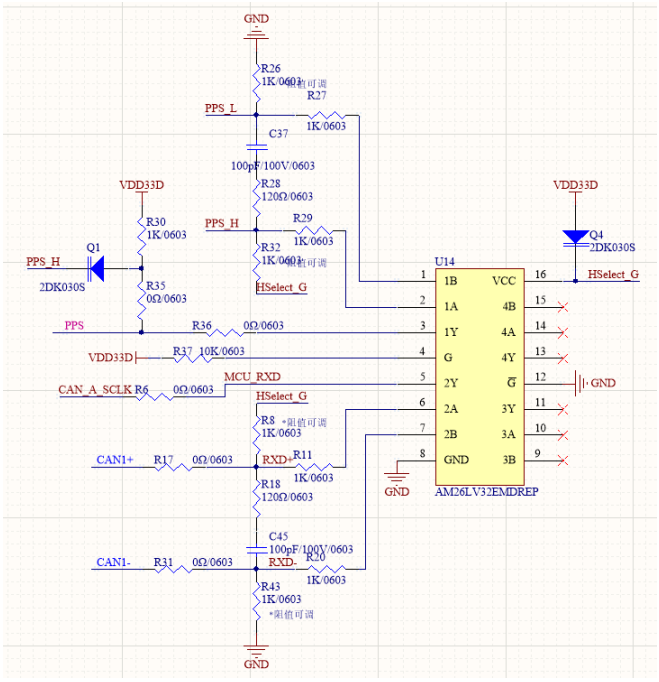
Signed (Date):	Mark		Signature, Date

IDS 16: Electrical Interface Features - Single-Ended PPS

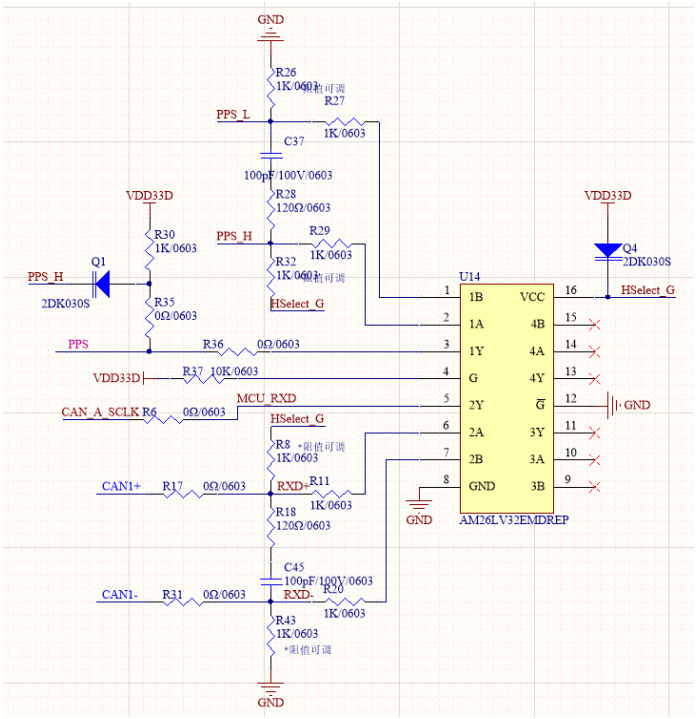
	File Number	TYS-HST-A1-IDS	Page 16 of 18			
	Sub-System Name					
	Device Name	HST-A1 Star Tracker	Stage Mark			
	Device Code				FM	

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	PPS circuit 
Notes	R26, R27, C37, R28, R29, R32, R36: not soldered @Single-Ended PPS.

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

IDS 16: Electrical Interface Features - Differential PPS

	File Number	TYS-HST-A1-IDS	Page 16 of 18			
	Sub-System Name					
	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	R30, R35, Q1: not soldered @Differential PPS.

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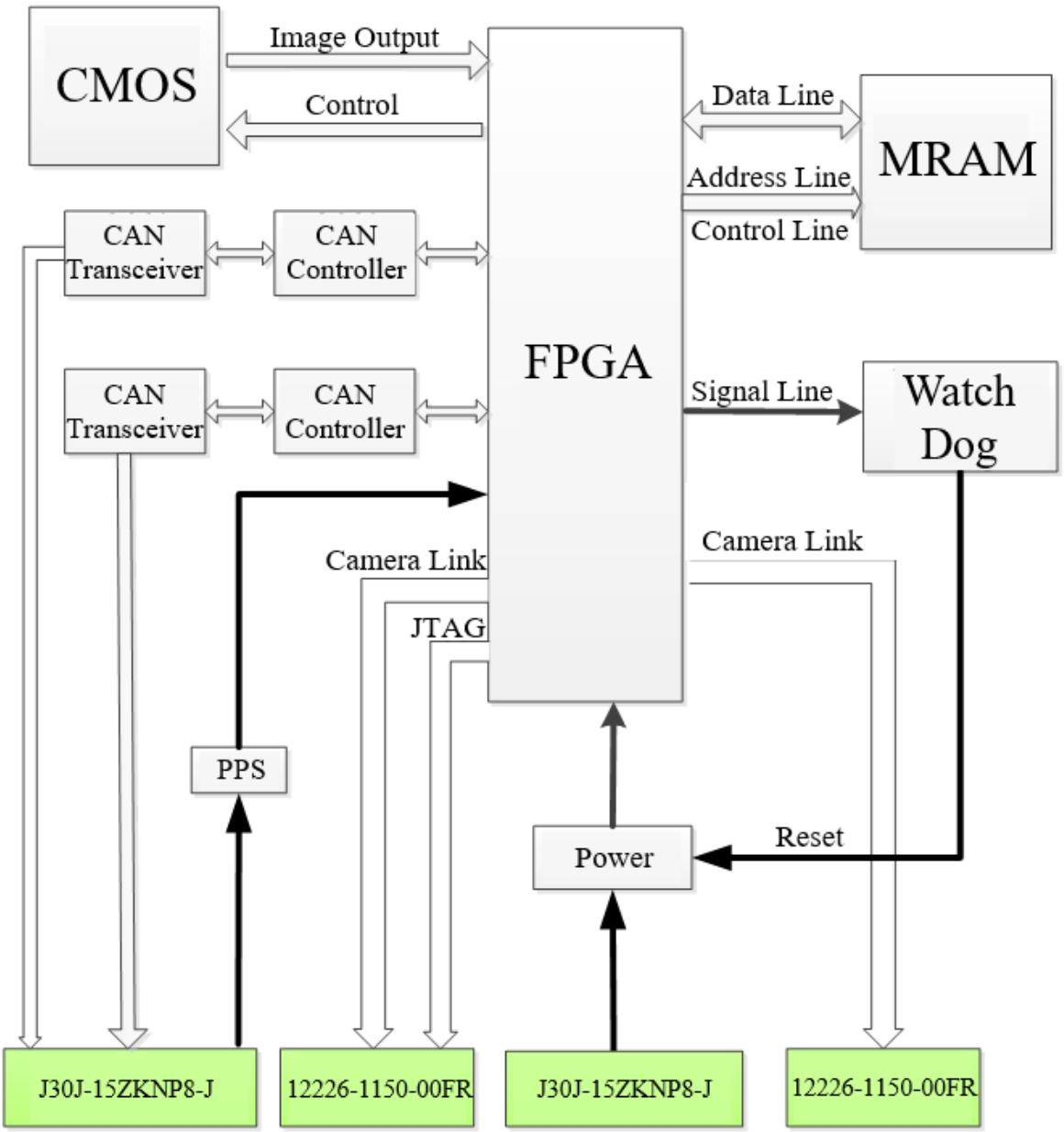
IDS 17: Circuit and Interface Schematics

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

Schematic Diagram:



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IDS 18: Device Description

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

None.

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