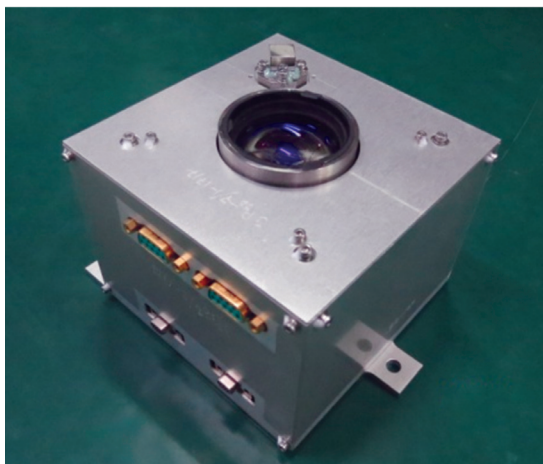


ANTRIX CORPORATION LTD.
A "Mini Ratna" Company



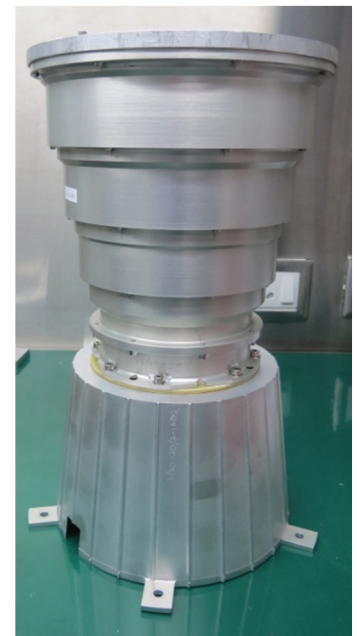
Optical Imaging Unit

The Laboratory for Electro-Optics Systems (LEOS) of Indian Space Research Organisation (ISRO) is responsible for design, development and production of electro-optic sensors and optics for spacecraft use. LEOS made Mark3 Star Sensor has flight heritage in ISROs GSAT series of satellites.

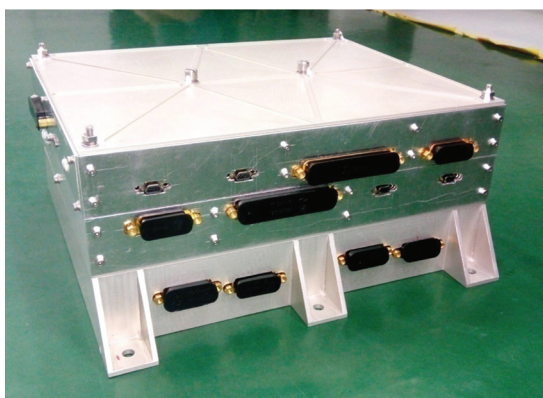
Star Sensor system (SS) provides attitude information to Attitude and Orbit Control System (AOCS) for spacecraft pointing and control. Star Sensor hardware consists of optics, detector,

embedded processor based processing electronics, memory, power circuitry. A baffle is used to eliminate unwanted stray-light entering optics.

- Star tracker provides 3-axis attitude information with high accuracy.
- Autonomous mode of operation in star tracker provides accurate attitude even when the spacecraft is in Lost in Space condition.
- As there are no moving mechanical elements, star tracker provides higher reliability.



Baffle



Attitude Processing Unit

Mark-3 Star Sensor (M3SS) is designed with multiple optical heads, termed as Optical Imaging Unit (OIU) and centralized Attitude processing unit (APU). Star Sensor operating in dual head mode provides improved bore-sight accuracy equivalent to cross-axis accuracy (10 arc seconds). In single-head mode of operation, bore-sight accuracy is around 40 arc seconds.



SYSTEM CONFIGURATION

M3SS is based on CMOS Active Pixel Sensor (APS) detector with 1024x1024 elements array size. APU is a single unit comprising of main and redundant units. APU can be configured to interface with 4 OIUs. At any given time only 2 OIUs data will be processed.

OIU: Captures Star Image in

- Acquisition mode (Full Frame)
- Track Mode (Window frames)
- Transmits captured image to APU via Space Wire Link

APU: Processes star data received from OIU and provides attitude data, as given below:

ACQUISITION MODE

- Star Capture, rate estimation.
- Star identification, acquisition of S/C attitude, rate & acceleration.

TRACK MODE

- Acquisition of individual OIU Star measurements.
- Fusion of Star data and attitude quaternion computation.
- Transmission of final fused attitude quaternion to AOCE.

HERITAGE

GEO and LEO missions

LIFE TIME

15 Yrs

SPECIFICATIONS

OPTICAL IMAGING UNIT

HAS2 Detector
7 element Optics with Rad Hard glass
Stray Light Baffle
Power and SpaceWire interface with APU
Thermo Electric Cooler

ATTITUDE PROCESSING UNIT

Main and Redundant in single unit
Includes DC-DC converters
4 SpceWire links cross strapped with 4 OIUs
MIL-STD-1553 I/F with AOCS.
Power interface with OIUs
32 bit processor based system.
Includes embedded software and star catalogue in EEPROM.

PERFORMANCE

Attitude Accuracy: Single Head <math><10^{\circ}</math> Cross axis, 40" Boresight
Dual Head <math><10^{\circ}</math> all 3 axis (for minimum of 60° of separation angle)

@ rate <math><0.2^{\circ}/s</math>
accl <math><0.1^{\circ}/s^2</math>

Lost in space acquisition time: <math><6</math> secs

Attitude update rate: 8 Hz

Tracking 15 windows per OIU

Angular rate: up to 2°/s in track mode
up to 1°/s in acquisition mode

Acceptance temperature: -10°C to +50°C

Vibration load: OIU: 13.9grms
APU: 11.7 grms

Shock: 1000g

MECHANICAL INTERFACE

OIU: 2.0 kg, ϕ 235 x 335 (mm)

APU: 4.25 kg 260 x 270 x 120 (mm)

ELECTRICAL INTERFACE

Raw Bus: two options 28-42V or 70V

APU + 1 OIU: 14W without cooler, 24W with cooler
(when OIU detector temp >35°C)