HESSI

High Energy Spectroscopic Imager (HESSI)
Spacecraft to Roll Aspect Sensor (RAS)
Interface Control Document (ICD)

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Document Revision Record

Rev.	Date	Description of Change	Approved By
A	1998-May-19	Preliminary Draft	-
B	1998-Sep-18	Add SA Comments	-
C	1998-Oct-15	Add SA Comments	-
D	1998-Oct-16	Fix error in RAS interface temperature limit	-
E	1999-Mar-5	• Update ICD Drawing, Mass & Power spreadsheets • Add RAS heater	
F	1999-Mar-24	Update Drawing and file references	

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1. Introduction

This document shall describe the interface between the HESSI spacecraft bus and the Instrument Roll Angle Sensor (RAS).

1.1. *Roll Angle Sensor (RAS) Description*

The RAS provides precise measurements of the spacecraft rotation (or roll angle). The RAS contains lenses and a CCD that optically sense magnitude 1 and 2 stars using a narrow field of view. Ground processing of this data provides the spacecraft rotation vs time records to arc second precision. The RAS must sense light a million times fainter than the sun, so it is extremely sensitive to stray light.

1.2. *Document Conventions*

In this document, TBD (To Be Determined) means that no data currently exists. A value followed by TBR (To Be Resolved) means that this value is preliminary. In either case, the value is typically followed by UCB (University of California at Berkeley) and / or SA (Spectrum Astro) indicating who is responsible for providing the data, and a unique reference number.

1.3. *Applicable Documents*

The following documents include drawings and HESSI Project policies, and are part of the Interface Requirements. In the event of a conflict between this ICD and the following documents, this ICD takes precedence. All ICD documents and drawings can be found on the Berkeley HESSI FTP site:

ftp://apollo.ssl.berkeley.edu/pub/hessi/released/icd

Pre-released versions of these documents may be found at:

ftp://apollo.ssl.berkeley.edu/pub/hessi/icd

1. HESSI Spacecraft to RAS ICD Drawing, File HSI_SYS_018C
2. HESSI Spacecraft to IDPU-ICD, File HSI_SYS_001G
3. HESSI IDPU Block Diagram, File HSI_IDPU_001D
4. HESSI Instrument Harness Specification, File HSI_SYS_022H
5. HESSI Instruments Power Spreadsheet, File HSI_SYS_006I
6. HESSI Instruments Mass Spreadsheet, File HSI_SYS_010E
7. Spectrum Astro HESSI Product Assurance Plan, Rev-, December 17 1997, Document number 1110-EP-Q09920, File epq09929

2. Mechanical Interface

2.1. *Interface Drawing*

The mechanical configuration of the RAS is shown in the RAS ICD Drawing (reference 1).

2.2. *Mass Properties*

Reference (6) shows the instrument mass properties, including current best estimate and maximum (with margin).

2.3. *Field of View and Alignment*

The RAS field of view is shown on the RAS ICD drawing reference 1. The RAS also has a **No Glint Field of View** shown in the same drawing. No spacecraft objects should be seen in this keep out zone.

The RAS alignment must be stable with respect to the imager to less than one arc minute (1 sigma) in the rotation axis. There is no preferred look direction for this rotation, so long as it is stable. The RAS to Imager alignment will be measured during integration, and can be verified on orbit.

2.4. *Mechanisms*

The RAS has a "one shot" shutter that is closed for launch. This shutter protects the CCD from direct sunlight during early operations, since direct sunlight could destroy the CCD. The shutter is released by a Shape Memory Alloy (SMA) non-explosive device that is activated by the IDPU, on ground command.

3. Thermal Interface

3.1. *Thermal Design*

The thermal design shall address radiative and conductive heat transfer between the RAS, spacecraft, and space. The design shall meet the thermal constraints listed in section 3.3. Thermal dissipation shall be primarily radiative, via radiating surfaces. Thermal conduction from the spacecraft to RAS will be kept low by designing the RAS to produce a thermally isolated interface. Thermal properties of the exposed surfaces of the RAS (both MLI and radiator surfaces) are also shown in the RAS ICD Drawing (Reference 1).

3.1.1. Thermal Design Responsibilities

The RAS thermal design is the responsibility of UCB. The design of the RAS shall allow for very low conduction between the RAS and the spacecraft bus. UCB shall provide sufficient information to Spectrum Astro to allow Spectrum Astro to accurately model the

RAS thermal properties as input to the spacecraft bus thermal model. Spectrum Astro shall verify that the spacecraft bus meets its thermal control system requirements using this information. Spectrum Astro shall deliver the spacecraft bus thermal model to UCB as input to the spacecraft thermal model which is integrated and verified by UCB.

3.2. *RAS Power Dissipation*

The RAS is mostly passive, but does consume some power in the CCD and front end electronics. The details are shown in Reference 5, Table 2. The RAS has an IDPU-controlled 5W heater. This can be used to get the RAS up to its turn-on temperature, and may also be used to stabilize the RAS temperature to avoid variations in CCD performance with temperature (this would only be required if the RAS is significantly warmer that the temperature predicts).

3.3. *RAS Temperature Requirements*

The Non-Op temperature limits apply when the instrument power is off.

Table 3.2-1 Thermal Limits

Range	Imager Temperature, °C	Bus Side Interface Temperature, °C
Non-Op Limits	-40 - +40	-24 - +40
Start-up Limits	-40 - +40	-24 - +40
Operational Limits	-20 - +20	-24 - +40

4. Electrical Interface

The IDPU will be the single-point electrical interface between the spacecraft and the instruments. Details of the operation, power consumption, harnessing are all contained in the IDPU ICD, reference 2.