Interface Control Document (ICD)
CDH-FS

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Interface Control Document (ICD)– CDH-FS

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CHANGE RECORD

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SUMMARY

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LIST OF ABBREVIATIONS AND ACRONYMS

AOCS	Attitude and Orbit Control Subsystem
AOS	Acquisition of Signal
API	Application Program Interface
AR	Acceptance Review
BB	Base Band
BGS	Base Ground Station
BOF	Spacecraft Body Fixed Reference Frame
CAM	Camera
CONOPS	Concept of Operations
COSMOS	Command and Control of Embedded Systems (Ball Aerospace)
COTS	Commercial Off-The-Shelf
DCMC	Data Collection Mission Center
DCPS	Data Collection Planning System
DCS	Data Collection System
DSS	Dynamic Satellite Simulator
ECI	EARTH CENTERED INERTIAL FRAME
EPS	Electrical Power Subsystem
FDIR	Fault Detection Identification and Recovery
FDS	Flight Dynamics System
FM	File Manager
FT	FDIR Tests
FTP	File Transfer Protocol
GED	Geodetic Reference Frame
GSR	Ground Segment Revision
GPS	Global Positioning System Sensor
GRD	Ground
ICRS	International Celestial Reference System

IMC	Image Mission Center
IMPS	Imaging Mission Planning System
IOT	In-Orbit Test
IP	Internet Protocol
ITRS	International Terrestrial Reference System
KSAT	Kongsberg Satellite Services AS
LEO	Low Earth Orbit
LEOP	Launch and Early Orbit Phase
LOS	Loss of Signal
MCC	Mission Control Center
MEC	Mechanical Reference Frame
MTF	Modulation Transfer Function
OBC	On Board Computer
OBDH	On-board Data Handling
OPS	Routine Operation Phase
PCD	Plataforma de Coleta de Dados
PLP	Primary Level Product
REL	Earth Target Relative Frame
RIPS	Raw Image Processing System
RTS	Real Time System
SATCON	Satellite Controller
SBCD	Sistema Brasileiro de Coleta de Dados
S/C	Spacecraft
SCC	Satellite Control Center
SDR	Software Defined Radio
SLA	Service Level Agreement
SMS	Short Message Service
SOE	Sequence Of Events

SOH	Satellite Operation Handbook
SSO	Sun-synchronous orbit
STR	Star Tracker Frame
SW	Software
TC	Telecommand
TCS	Thermal Control Subsystem
TER	Terrestrial Reference Frame
TLE	Two-Line Elements
TM	Telemetry
TMTC	Telemetry and Telecommand Subsystem
TT&C	Telemetry, Tracking and Command
UHF	Ultra-High Frequency
VAL	Validation Phase Tests
VPN	Virtual Private Network
WGS	World Geodetic System
YST	Yaw Steering Reference Frame

CONTEXT

This specification outlines the preliminary interface of the Redundancy & Emergency Managment Unit (CDH-FS) considering the Interface requirements.

The main objective of interface management at the system level is to achieve functional and physical compatibility amongst all interrelated items in the product tree. The purpose of the ICD is to define the design of the interface(s) ensuring compatibility among involved interface ends by documenting form, fit, and function. Its purpose is to guarantee compatibility and seamless interaction with other equipment and subsystems throughout the entire lifecycle, including assembly, integration, testing, launch, and orbital operations.

This ICD covers the interface requirements and specifications for the CDH-FS, including its connections to the satellite's power system, data buses, and other subsystems. The scope includes mechanical mounting, electrical power interfaces, signal interfaces, and data communication protocols. The document also addresses compliance with ECSS standards, interface verification, and testing procedures.

An interface control document (ICD) is a document that describes the interface between different components of a system.

It defines the requirements, characteristics, and specifications of the interface, such as the frequency, modulation, and data format of the signals.

The ICD is important for a satellite project because it ensures that the different parts of the system can communicate and interoperate with each other.

The ICD also helps to manage and control changes to the interface during the design, development, and operation phases of the project.

APPLICABLE AND REFERENCE DOCUMENTS

AD-01	SVHR-VIS-ENG-SPC-0102_A XXX STATEMENT OF WORK – REDUNDANCY & EMERGENCY MANAGEMENT UNIT
AD-02	SVHR-VIS-ENG-SPC-0005B XXX DESIGN AND CONSTRUCTION SPECIFICATION & INTERFACE REQUIREMENTS DOCUMENT
AD-03	SVHR-VIS-ENG-SPC-0056_A Thermal Control Equipment Requirements
AD-04	SVHR-VIS-ENG-SPC-0019B Thermal Control Subsystem Requirements
STD-01	ECSS-E-ST-10-24C Space engineering – Interface management
STD-02	ECSS-E-ST-20C Space Engineering – Electrical and Electronic Standards
STD-03	ECSS-E-ST-10-12C Space Engineering – Design and Interface Requirements
AD-05	SVHR-VIS-ENG-SPC-0028A HIVE TALK Protocol Specification

1 INTRODUCTION

The Interface Control Document (ICD) defines the design, technical characteristics, and constraints of the interfaces between various system components, ensuring compatibility among all involved parties. This document's purpose is to maintain system integrity through a detailed interface definition and control, ensuring consistency throughout the development lifecycle. The ICD serves as a critical tool for coordinating interface designs across multiple disciplines and suppliers, and to track the evolution of these interfaces over time.

1.1. PURPOSE

The purpose of this Interface Control Document (ICD) is to define and describe the interfaces of the OBC for the XXX satellite. The CDH-FS is responsible for controlling and managing relaiable command and data of the satellite, ensuring that all components operate within their designated performance for commnad & data. This document provides detailed information on the physical, electrical, and data interfaces between the CDH-FS and other subsystems of the XXX satellite to ensure proper integration and functionality.

1.2. RESPONSIBILITY

Interfacing Organizations: The primary responsibility for developing the ICD lies with XXX, with contributions from CAVU. Each organization involved is responsible for providing accurate and complete data relevant to their interface ends.

Approval Authority: The document approval, including any changes, is governed by XXX, ensuring all modifications are tracked and validated.

Interface Ends: Specific responsibility for each interface end lies with XXX. These entities must coordinate to ensure the interface definition remains consistent with the overall system design.

1.3. SYSTEM OVERVIEW

1.3.1. SATELLITE OVERVIEW

The XXX satellite is a 3-axis stabilized satellite placed directly into a sun-synchronous circular orbit, with injection dispersions corrected by using an on-board propulsion system. The satellite is equipped with various subsystems, including the CDH-FS which ensures the satellite's command and data handling is within specified limits.

The operational modes for product, such a unit, module, equipment, subassembly, subsystem, satellite, or system includes all combinations of operational configurations that can occur during the service life. Some examples are:

a) Power ON or Power OFF;
b) Solar Panels stowed or deployed;
c) Optical Payload ON or Power OFF;
d) Communication Payload ON or Power OFF;
e) In storage, in test or in-orbit.

The product lifecycle includes incoming inspection, manufacturing, testing, transportation, handling, storage, launch site operations, launch, injection and on-orbit operations.

1.3.2. CDH-FS SUBSYSTEM OVERVIEW

The OBC of the XXX satellite is designed to secure command & data channels required for the proper functioning of the satellite's components. The REMS includes both passive elements and active component. The CDH-FS is central to managing the data and command regulation.

1.3.3. CDH-FS OVERVIEW

The Redundancy & Emergency Management (CDH-FS) is a critical component of the satellite, responsible for secure command & data handling in diferent part of the satellite. The CDH-FS interfaces with various components across the satellite and communicates with the Onboard Computer (OBC) to manage data processing and execute control commands. The CDH-FS also provides telemetry data regarding the general status of the satellite's subsystems.

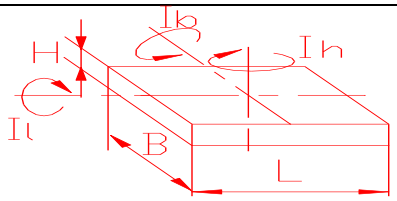
2 MECHANICAL CHARACTERISTICS

Table 1 - Mass Properties (TBC)

Unit mass (kg) : 4.300			Tolerance (kg) 1*: ±0.010			
Dimensions (mm) without screw base	L: 175.0	± 0.1	B: 203.1	± 0.1	H: 87.0	± 0.1
Dimensions (mm) with screw base	L: 205.0	± 0.1	B: 203.1	± 0.1	H: 87.0	± 0.1
Screw center dimensions (mm)	L: 190.0	± 0.1	B: 188.1	± 0.1	H: -	-
CG Locations (mm)	Y_{CG}: 109.31	±:0.1	X_{CG}: 88.38	±:0.1	Z_{CG}: 38.95	±:0.1
Inertia CG (Kg.m^2)	I_{yy}:TBD	±:0.1	I_{xx}: TBD	±:0.1	I_{zz}: TBD	±:0.1

1* General tolerance: ISO 2768 Medium

Table 2 - Base Plate (TBC)

Material Description (symbol):	AL7075-T6
Contact area (mm^2):	36,621
Roughness (µm):	3.2
Flatness (mm / 100mm):	0.1/100
Alignment Requirements (if applicable): The EQUIPMENT shall carry a removable alignment cube according to: The direction of the axes of the optical reference shall be known relative to the direction of the equipment axes to an accuracy better than 0.01 degree. The alignment between the equipment axes and the satellite axes shall be known to an accuracy better than 10'.	
Assembly Directions (if applicable): Z axis direct to geocentric, and X axis direct to the flight direction.	
Remarks: The baffle shall be made of non-metallic material and it shall be made of fiberglass.	
 Figure 1 - Unit Reference	Note: l, b and h are related to the unit reference hole. If the unit has irregular shapes shall be specified on separate sheet

**SVHR-REMSDRIVER-0390, SVHR-TCSDRIVER-0380, SVHR-TCSDRIVER-0400

3 MECHANICAL SKETCH

3.1 ISOMETRIC VIEW

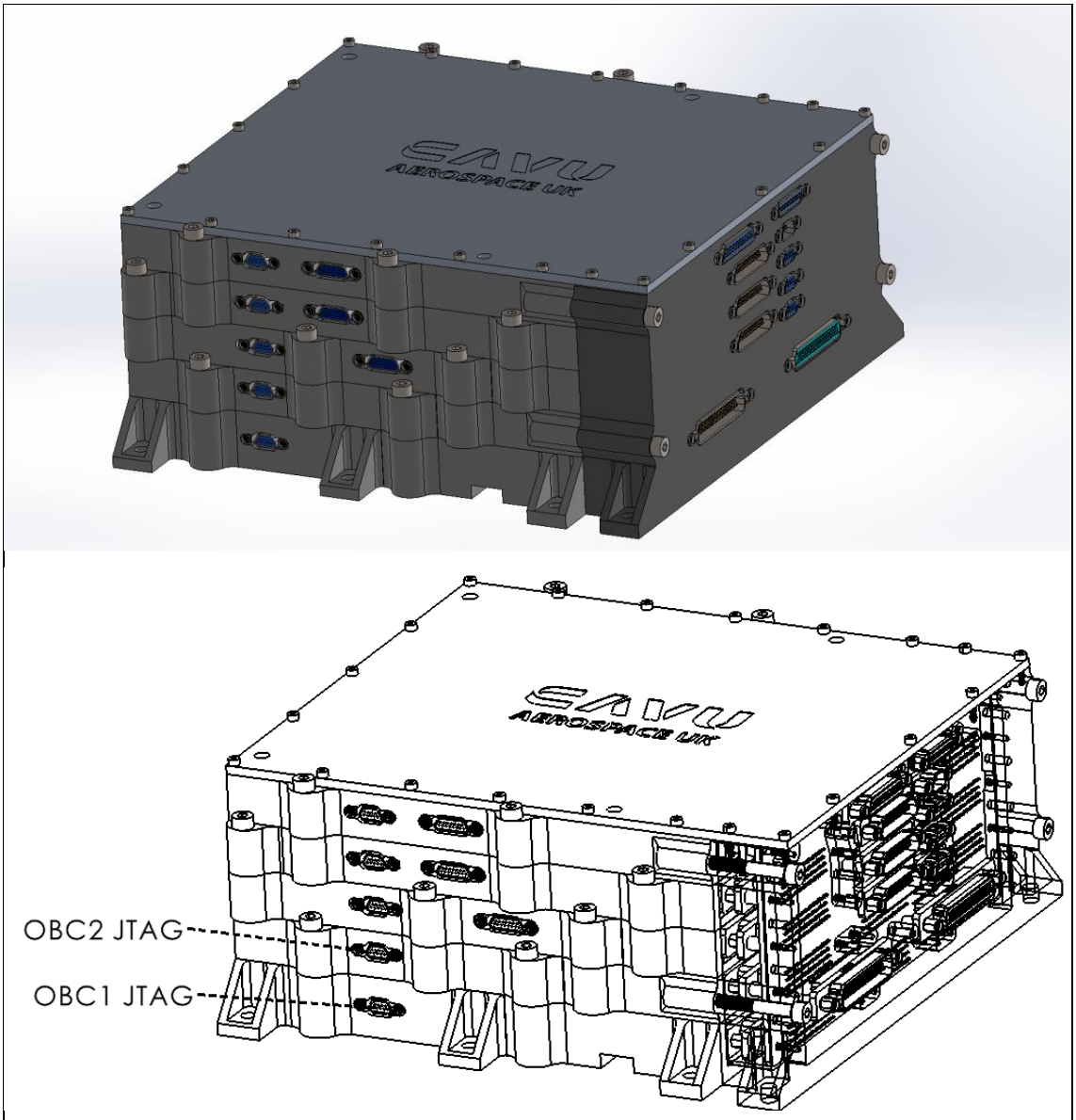


Figure 2 – CDH-FS isometric view

Remarks: On these sketches, shall be identified: - dimensions; - cg location; - inertia axes; foot print; - mounting plane; - mounting points; center to center mounting pointing distance and tolerance; - position tolerance; (guide pins or holes); - location, type, orientation and reference of connectors; necessary access after integration for calibration or tests; bonding strap (location and length); - identification of alignment (if applicable).

Top View

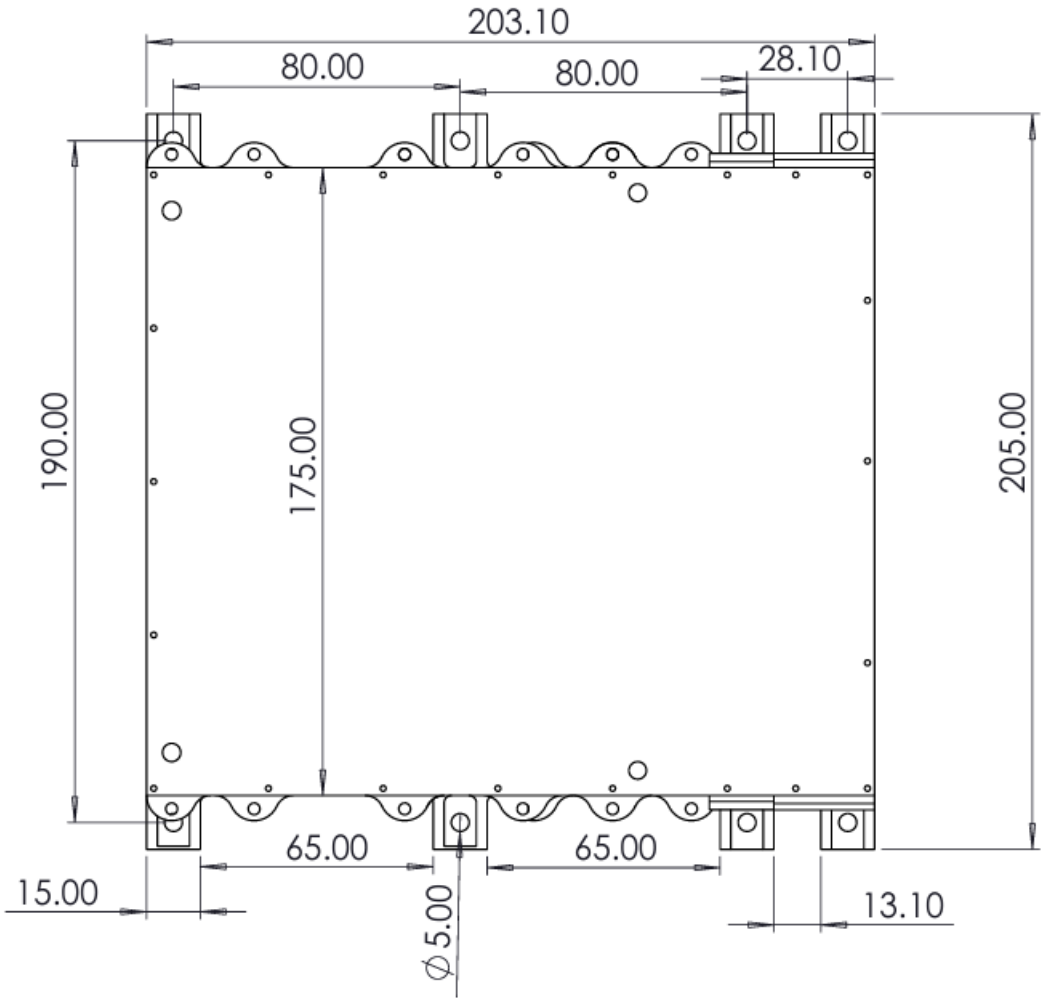


Figure 3 – CDH-FS TOP view

3.2 FRONT AND BACK VIEW

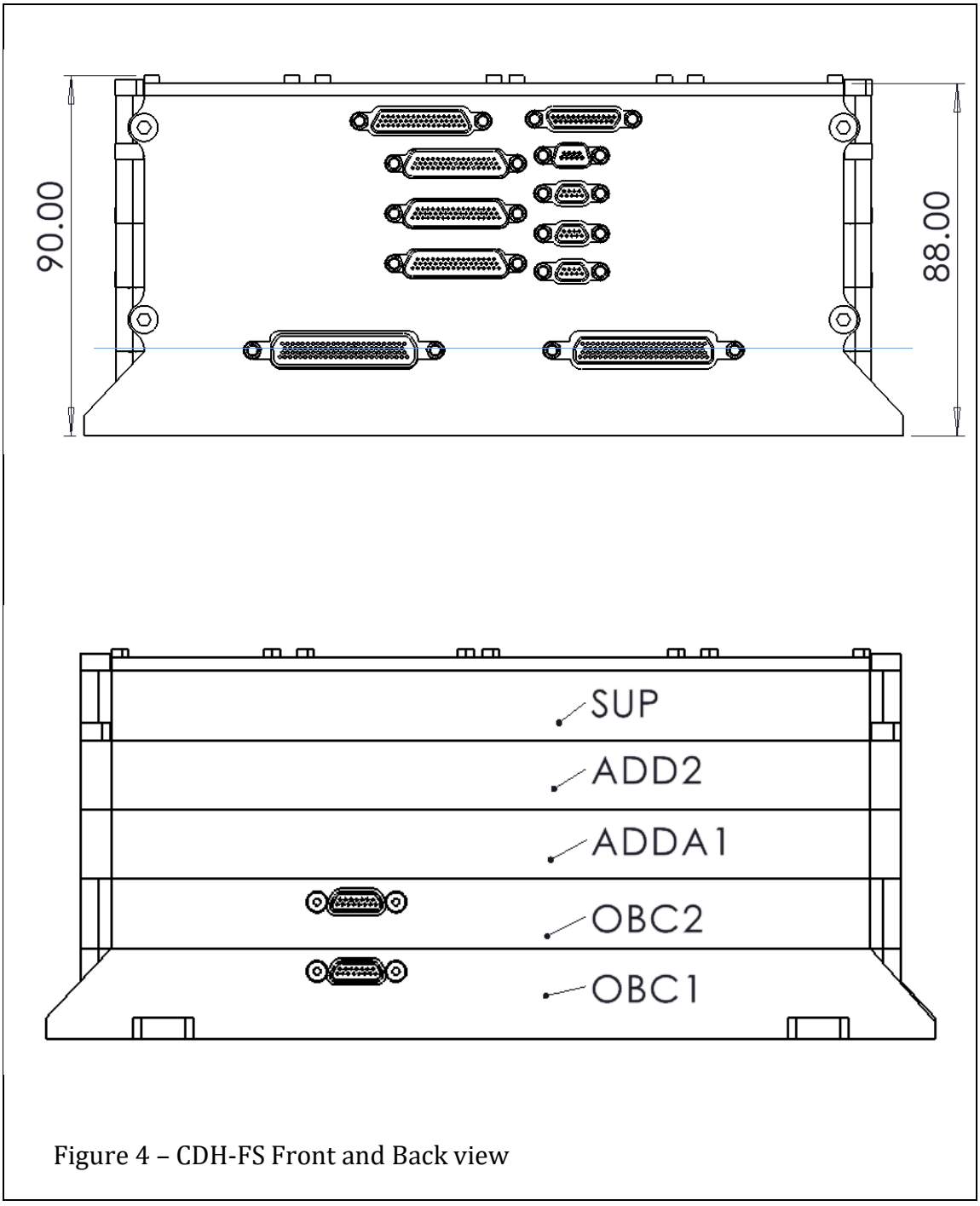


Figure 4 – CDH-FS Front and Back view

3.3 SIDE VIEW

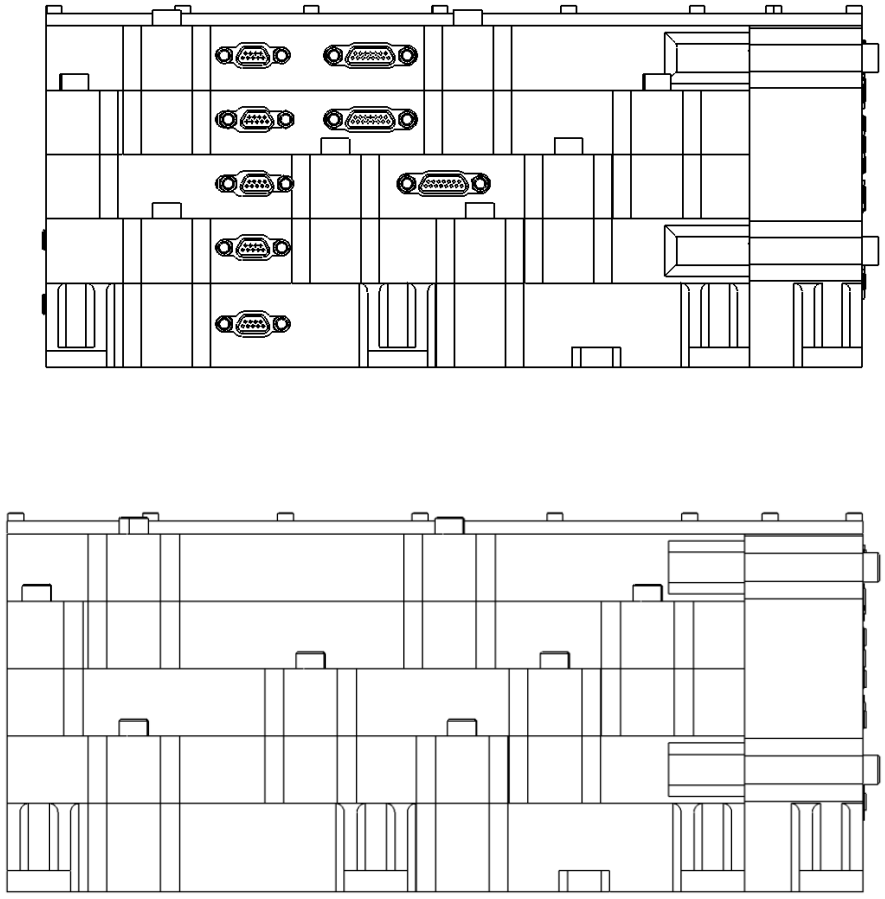


Figure 5 – CDH-FS Side view

3.4 CONNECTOR IDENTIFICATION AND LOCALIZATION

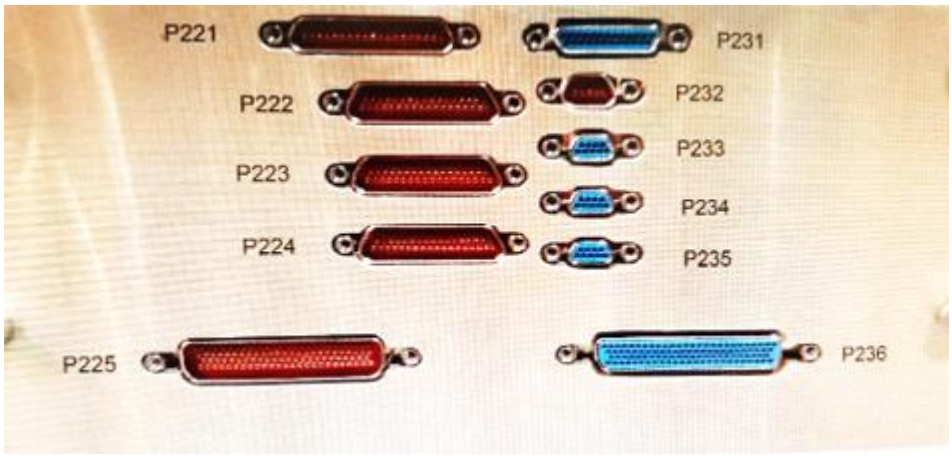


Figure 6 – CDH-FS connector identification and localization

4 THERMAL CHARACTERISTICS

Need the whole Thermal Analysis of the system, so need to Fill out by XXX experts.

Table 3 - Thermo-Optical Properties of the External Coatings

Equipment Faces	Coating Identification	Solar Absorptivity		IR Emissivity
		BOL	EOL	
Top Face (open to space)	Alodyne 1200 yellow (TBC)			
Side Face (inside satellite)	Alodyne 1200 yellow (TBC)			
Bottom Face (inside satellite)	Alodyne 1200 yellow (TBC)			
Radiators				

Table 4 - Temperature Range (oC)

Description	Min. [ºC]	Max. [ºC]
In Orbit Operation		
Operational temperature (SVHR-TCSDRIVER-0180)	-30	+60
In Orbit No Operation		
Survival temperature (SVHR-TCSDRIVER- 0180)	-50	+90
Ground Storage	+5	+30

Table 5 - Heat Dissipation (W)

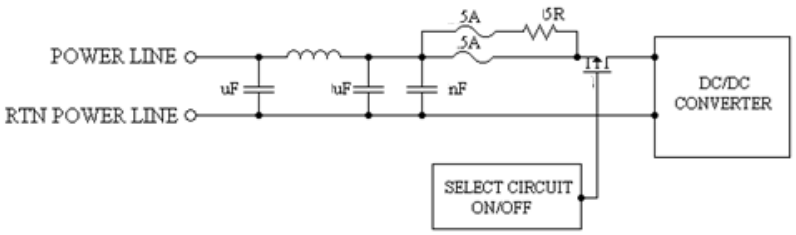
ON = (see profile)	<10 W
Stand-by = (see profile)	<4 W

5 ELECTRICAL POWER

Table 6 - Power parameters (TBC)

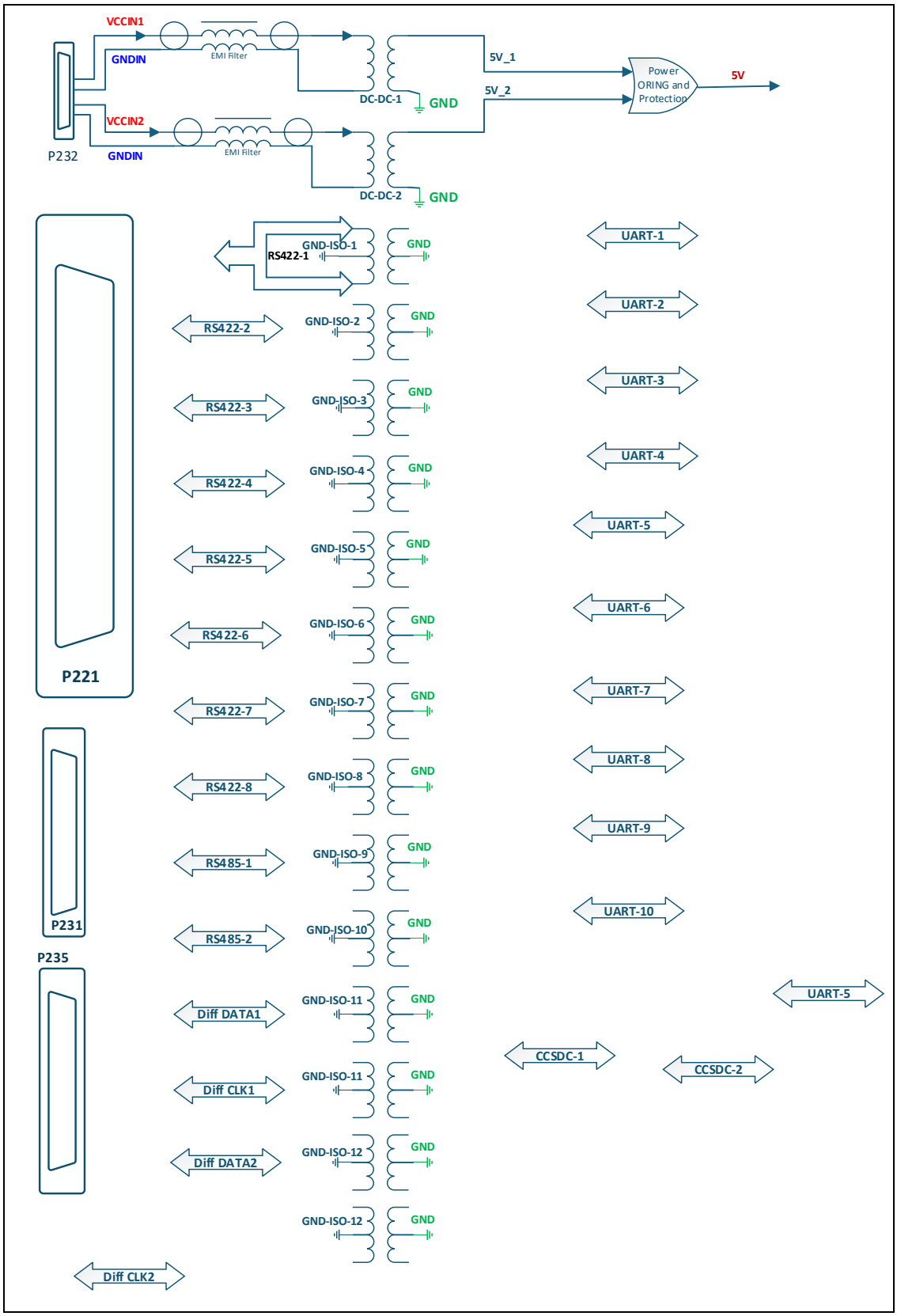
Operating Mode	Voltage (V)	Power (W)	Regulation (+/- %)	Ripple (V_{pp})	Remarks
STAND-BY	28 V +/- 4	3	Line Regulation ±0.2%	Maximum Ripple and Noise (20 MHz bandwidth): <100 mVpp	
NORMAL LOAD	28 V +/- 4	6-10	Load Regulation ±1.0%	Maximum Ripple and Noise (20 MHz bandwidth): <100 mVpp	

6 ELECTRICAL INTERFACE CHARACTERISTICS

Signal Name	**POWER INPUT LINES**
Signal Characteristic	**POWER SUPPLY (+28V)**
Interface Circuit Drawing	
	
Remarks:	

7 GROUNDING DIAGRAM

Line	Ref.	Note
VCCIN-1	GND_IN	GND_IN and GND-ISO-[1..12] are all electrically isolated
VCCIN2		
RS422-1	GND-ISO-1	
RS422-2	GND-ISO-2	
RS422-3	GND-ISO-3	
RS422-4	GND-ISO-4	
RS422-5	GND-ISO-5	
RS422-6	GND-ISO-6	
RS422-7	GND-ISO-7	
RS422-8	GND-ISO-8	
RS485-1	GND-ISO-9	
RS485-2	GND-ISO-10	
ClockData-1	GND-ISO-11	
ClockData-2	GND-ISO-12	
AN_[1..128]	AGND	GND and AGND are Electrically Connected
Input_[1..100]	GND	
OUT_[1..100]		
SPI_X		
I2C_X		
CAN_X		


VCCIN1
GNDIN
EMI Filter
DC-DC-1
GND
5V_1
5V_2
Power ORING and Protection
5V
VCCIN2
P232
GNDIN
EMI Filter
DC-DC-2
GND
P221
GND-ISO-1
RS422-1
GND
UART-1
RS422-2
GND-ISO-2
GND
UART-2
RS422-3
GND-ISO-3
GND
UART-3
RS422-4
GND-ISO-4
GND
UART-4
RS422-5
GND-ISO-5
GND
UART-5
RS422-6
GND-ISO-6
GND
UART-6
RS422-7
GND-ISO-7
GND
UART-7
RS422-8
GND-ISO-8
GND
UART-8
RS485-1
GND-ISO-9
GND
UART-9
RS485-2
GND-ISO-10
GND
UART-10
P231
P235
Diff DATA1
GND-ISO-11
GND
UART-5
Diff CLK1
GND-ISO-11
GND
CCSDC-1
CCSDC-2
Diff DATA2
GND-ISO-12
GND
GND-ISO-12
GND
Diff CLK2

8 LIST OF CONNECTORS

Table 7 - List of Connectors

Connector Code	Connector Name	Male Female	Connector Type	Function
P222	P222	Male	Micro-D 51 pins	Analog IN
P223	P223	Male	Micro-D 51 pins	ANALOG IN
P224	P224	Male	Micro-D 51 pins	Analog IN
P225	P225	Male	Micro-D 100 pins	Digital In
P236	P236	Female	Micro-D 100 pins	Digital Out
P221	P221	Female	Micro-D 51 pins	RS422 / Serial
P231	P231	Female	Micro-D 25 pins	RS422
P232	P232	Male	Micro-D 9 pins	Power_IN
P233	P233	Female	Micro-D 9 pins	Serial1
P234	P234	Female	Micro-D 9 pins	Serial2
P235	P235	Female	Micro-D 9 pins	Serial3

9 PIN ASSIGNMENT

Annex: CDH-FS Pin Map