



Vehicle Electronics (VEH) System Architecture

ES00003

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1 General Setting

In the OA-II VEH system, each payload module is specialize for a special function. In each module, it have three type of units.

Basic unit The basic unit is indecate this unit finish the most foundmental function of this module. It is a stand alone unit that build the foundation for the the unit. It will be the first unit in the module.

Feature Unit The feature unit is adding more features to the module. It usually need the basic unit to function and receive commend from the the basic unit.

For a functioning OA-II VEH, it only require the basic unit in COM and PAM. For more feature, more unit in each module is needed. In the most basic OA-II VEH system, it only contain two unit, the basic unit for COM and PAM.

2 Payload Frame (PF)

2.1 Discription

In the Payload Frame, most of the signal and power will run through it and arrive to the target unit. The payload frame will have different sector for different module. In general, it will at least provide three power line, more than one command line, and four high speed data lane.

2.2 Product Code

OA2-PF-XXX-YY-Z

XXX indicate how much unit it can fit for each module. The first number is for COM, then TAM and PAM.

YY Designer name.

Z Revision number. If it is greek numerals, it mean this unit is a test branch.

example: OA2-PF-333-[JC-1]

First generation payload frame design by Jinzhi Cai which can contain three COM,TAM,PAM units.

example: OA2-PF-111-[JC-IV]

Fourth generation payload frame test branch design by Jinzhi Cai which can contain one COM,TAM,PAM units.

3 Payload Modules (PM)

3.1 Discription

Payload Modules are specialized circuits which slot into the Payload Frame. They can be divided into three primary types: Computing and Operation Module (COM), Telecommuni-
cation and Acquisition Module (TAM), and Power and Actuator Module (PAM).

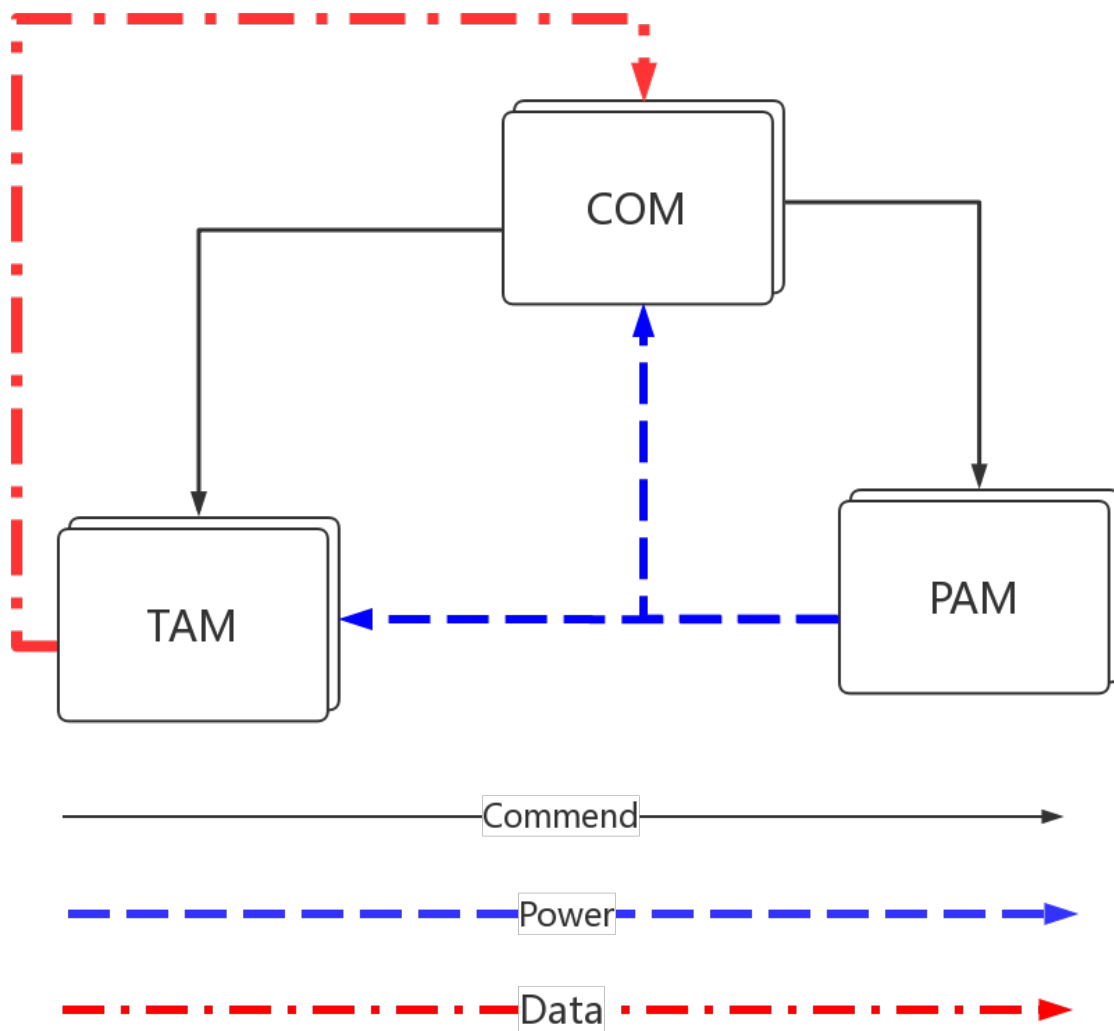


Figure 1: System Diagram

3.2 Payload Catalog

Critical Payload All the critical payload will be in the assigning unit.

- 4 low temp sensors for electronics **In each unit**
- 4 low temp sensors for batteries **In power manager unit**
- 4 current sensors for pyros **In actuator power unit**
- 4 current sensors for batteries **In power manager unit**
- 4 deployment sensors **In actuator power unit**
- 4 actuator sensors **In actuator power unit**
- 3 axis IMU **In main control unit and failure recovery unit**
- 1 barometer **In main control unit and failure recovery unit**

Low Speed Payload All the low speed payload will be in the low speed sensor unit.

- 4 high pressure sensors for propulsion system
- 2 low pressure sensors for pitot tube
- 4 high temp sensors for propulsion system
- 4 low temp sensors for electronics
- 4 low temp sensors for batteries
- 2 low temp sensor for ambient

High Speed Payload All the high speed payload will be in the high speed sensor unit.

- 9 axis IMU
- GNSS
- 4x cameras

3.3 Computing and Operation Module (COM)

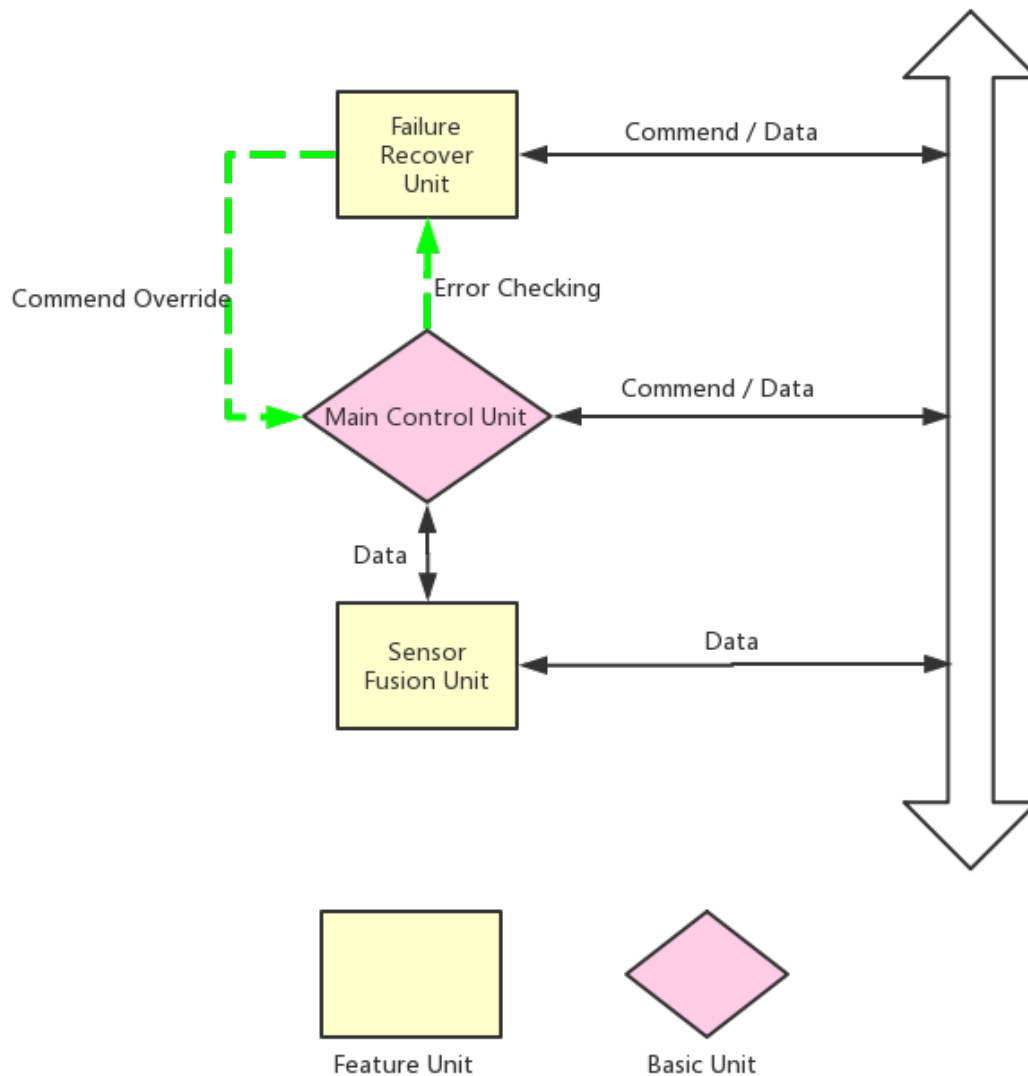


Figure 2: Computing and Operation Module Diagram

3.3.1 Main Control Unit (1)

The main control unit will execute all the critical process during the whole launch. It will send commend via a commend lane to other module main unit to perform action. **This unit is require for all the OA-II VEH system.**

3.3.2 Failure Recover Unit (2)

The failure recover unit will execute similar code as the main control unit and detect any error that send out from the main control unit. When main control unit have error, it will inquire the main unit and check the answer. If a failure scenario is fullfill, it will take over the commend line and try to fix the problem by the program storage inside.

3.3.3 Sensor Fusion Unit (3)

The sensor fusion unit will communicate with the TAM and analyze the data. It will provide to the main control unit for more information.

This unit will be include in the improved version.

3.4 Telecommunication and Acquisition Module (TAM)

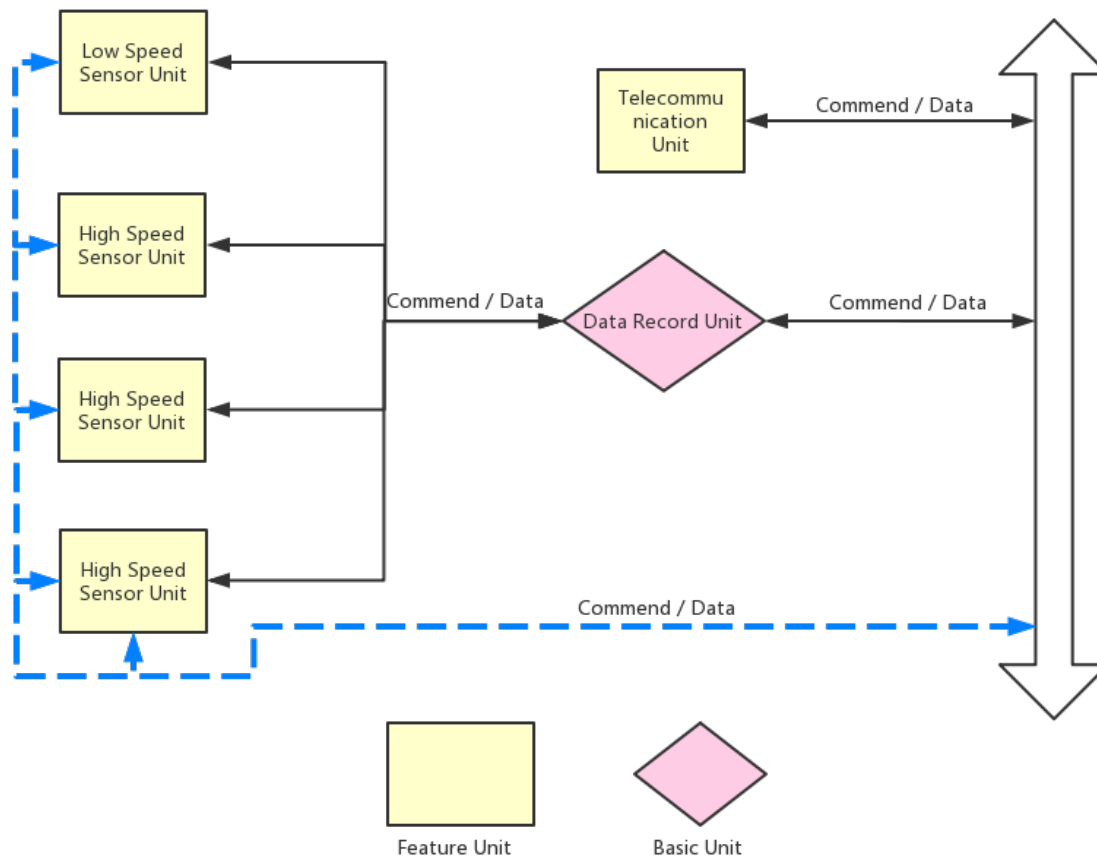


Figure 3: Telecommunication and Acquisition Module Diagram

3.4.1 Data Record Unit (1)

The data record unit is used to record log and data which send from the COM control. It will also include additional protection for protect storage unit from heavy impact.

3.4.2 Telecommunication Unit (2)

The telecommunication unit is used to collect data from the record unit and send it down to the base station. It also will get commend that send from the base station and relay it to the COM.

3.4.3 Low Speed Sensor Unit (3)

The low speed sensor unit is use to contain sensors that have less then 100MB/s data rate. This unit will also have memory to buffering some of the data. The power supply for this unit will be a low voltage line from the PAM.

3.4.4 High Speed Sensor Unit (4)

The high speed sensor unit will use to contain sensors that have more than 100MB/s (ex: camera)

3.5 Power and Actuator Module (PAM)

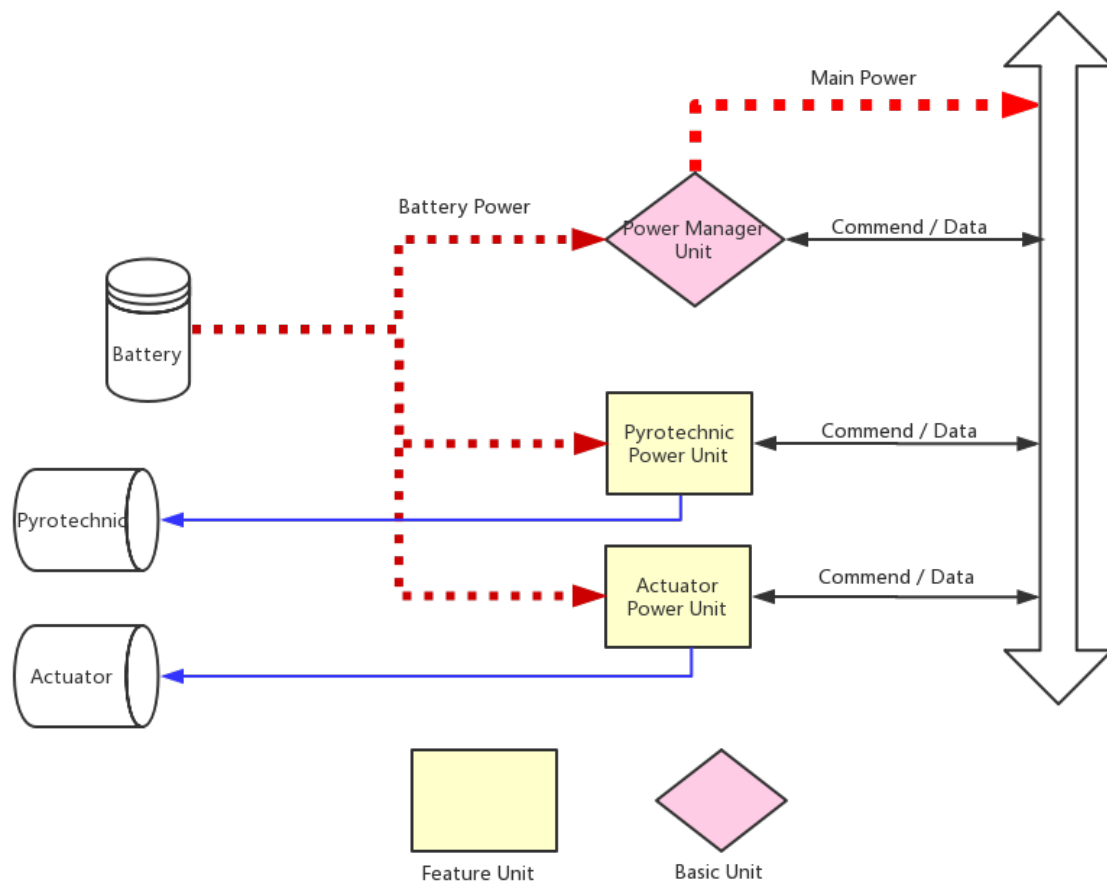


Figure 4: Power and Actuator Module Diagram

3.5.1 Power Manager Unit (1)

The power manager unit is used to control charge and discharge of the on-unit main battery. It also has a regulator to provide main rail power for the whole vehicle. **This unit is required for all the OA-II VEH system.**

3.5.2 Pyrotechnic Power Unit (2)

This unit contains a special purpose voltage regulator and pyrotechnic driver. It will be used to control the pyrotechnic device in the ship based on the command from the COM.

3.5.3 Actuator Power Unit (3)

This unit contain special purpose voltage regulator and actuator driver. It will use to control the actuator in the ship base on the command come from the COM.

3.6 Product Code

OA2-<COM/PAM/TAM>-XXX-[YY-Z]

XXX The first letter is indicate which kind of rocket it fit for. **H** for high power, **N** for general purpose, **S** for small scale. The number follow it is depend unit. The last number is what this unit belongs to.

YY Designer name.

Z Revision number.

example: OA2-COM-N01-[JC-1]

First generation Computing and Operation Module main unit design by Jinzhi Cai.

4 Revision History

Rev#	Editor	Delta	Date
A01	Jinzhi Cai	Initialize	2019-7-2
-	Jinzhi Cai	change name from "board" to "unit"	2019-7-3
-	Jinzhi Cai	change product code	2019-7-3
A02	Jinzhi Cai	change PAM unit description	2019-7-3
-	Jinzhi Cai	add diagram	2019-7-3
A03	Jinzhi Cai	change DRU	2019-7-8
A04	Jinzhi Cai	add sensors	2019-7-16

Table 1: Summary of Revision History