Astro\_casco Transmitter

# Overview

## General Layout

Astro\_casco Trasmitter uses an ATmega328p microcontroller together with modules that allows it to perform the following tasks:

1. Precise availability of on-board time
2. SD card access for saving telemetry locally
3. Wireless transmission using LoRa

The hardware layout

The hardware used for each task is described below.

## Precise availabity of on-board time

Having a time accounting on-board device is crucial for the telemetry timestamp of Astro\_casco. For this, the RTC (real-time clock) chip DS3132 is connected to the microcontroller.

DS3132 is an I2C real-time clock with integrated temperature-compensated crystal oscillator and crystal. The The microchip is integrated in a common Arduino module that facilitates prototyping for this first version. When connected to an external battery it keeps the time even when Astro\_casco transmitter is powered off.

## SD card access

## Wireless data transmission

# Astro\_casco Transmitter Telemetry

The telemetry in astro\_casco contains the following information

* Timestamp: in the format YYYY-MM-DDTHH:mm:ss. Example 2022-07-10T13:30:45.
* clock reliability: possible values OK, NOK. Indicates whether the timestamp is reliable or not. This information comes from an internal bit on the DS3132 that indicates if the external battery has been removed.
* Astronaut index: there are two Astro\_casco transmitters available for the mission. The index corresponds to the ID of each transmitter, which can be ACT01 or ACT02
* Information the on-board sensors: three values are contained in the telemetry, corresponding to Text, T1 and T2. Text is the external environmental temperature. T1 and T2 are two temperature sensors reading inside the astronaut’s helmet.

# Troubleshooting:

1. ACT does not power on:
   1. check if batteries are not discharged.
2. ACT indicates an error on the SD card.
   1. Reset ACT and check if error disappeared.
   2. Check presence of SD card. Reset.
   3. Check that SD card is formatted in FAT32 format. Reset.
   4. Check if a folder inside of the SD card has been created with the name YYYYMM (current year, month). If it has a strange format (eg., not an actual folder) delete it, create it manually, reinsert SD card. Reset.
3. ACT indicates an error on RF transmission.
   1. Contact PI.
4. ACT shows strange characters
   1. This means that a packet has been received but the quality of the transmission is below the required power and bytes have been corrupted.

Astro\_casco Receiver

# Overview

Astro\_casco Receiver (ACR) is a device that allows to visualize in real time the information transmitted by one or multiple Astro\_casco Transmitters. During EVAs, ACR must stay at the base so that the base astronaut has the real time readings on hand as soon as they are available.

ACR is built as a plastic box that features one USB port for power, and one LCD 0.96” screen that shows received astronaut information in real time.

# On-screen information

The information shown on the screen corresponds to the last telemetry received from an Astro\_casco transmitter. Temperatures are contained in the telemetry, corresponding to Text, T1 and T2. Text is the external environmental temperature. T1 and T2 are two temperature sensors reading inside the astronaut’s helmet. RX CLK OK or NOK (not OK) whether the timestamp is reliable or not. This information comes from an internal bit on the DS3132 that indicates if the external battery has been removed.

A screen shot of a computer

Description automatically generated with low confidence