

# RASCUBE

EDUCATIONAL SATELLITE

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**QUICK START GUIDE**  
WITH SAFETY + WARRANTY INFORMATION

**ROBINSON**  
AEROSPACE SYSTEMS



## CONTENTS

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<b>PARTS LIST</b>	<b>3</b>
<b>STRUCTURE ASSEMBLY</b>	<b>4</b>
<b>ELECTRONICS ASSEMBLY</b>	<b>9</b>
<b>ELECTRONICS INTEGRATION</b>	<b>15</b>
<b>CONNECTING TO COMPUTER</b>	<b>21</b>
<b>LED DESCRIPTIONS</b>	<b>22</b>
<b>BATTERY CHARGING</b>	<b>23</b>
<b>WIRELESS COMMUNICATIONS</b>	<b>24</b>
<b>PACKAGING REFERENCE</b>	<b>25</b>
<b>SAFETY WARNINGS</b>	<b>26</b>
<b>WARRANTY INFORMATION</b>	<b>27</b>

## GLOSSARY

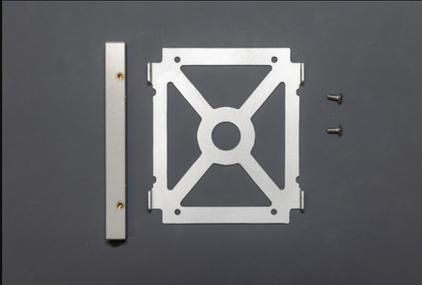
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EPS	Electrical Power System: A module to charge batteries and distribute power
OBC	On-Board Computer: The module which completes most of the satellites processing
RBF	Remove Before Flight
RF	Radio Frequency
UI	User Interface: Computer software used to display data.
Telemetry	Wireless data transmission





## STEP ONE



### PARTS

- x2 Edge Rail
- x2 Side Panel (A - No Thread Inserts)
- x4 6mm Screw

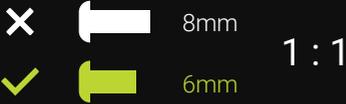
### STEPS

Screw the side panel to the edge rail in the orientation shown below. Note the position of the brass thread inserts on the edge rail.

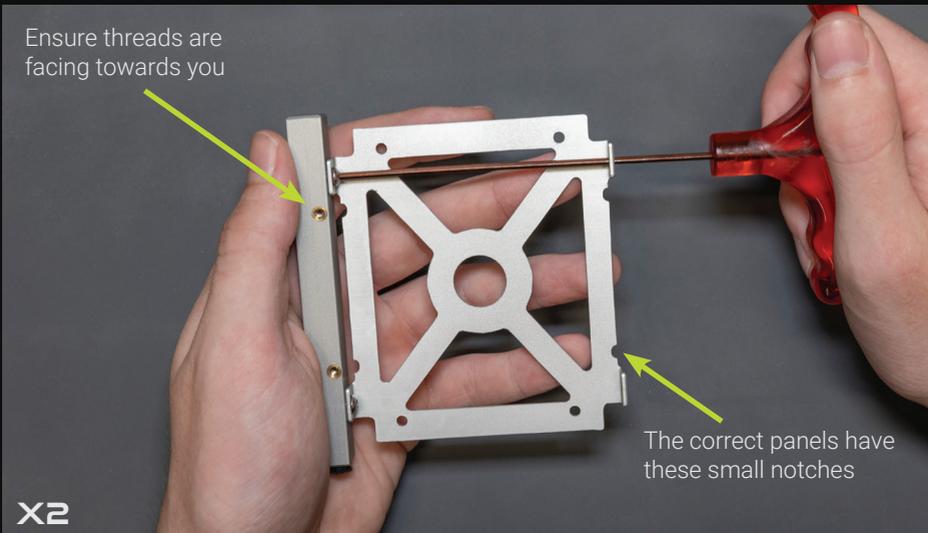
Repeat this step to ensure you have x2 of these assemblies.

### NOTE

Insert both screws loosely before tightening properly. Do not over-tighten!

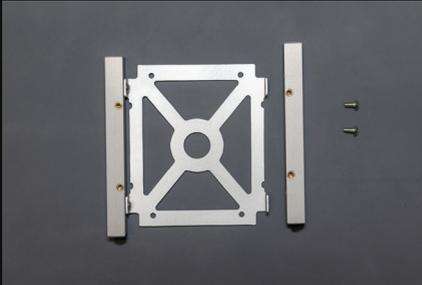


Ensure threads are facing towards you



**X2**

## STEP TWO



### PARTS

- x2 Edge Rail
- x4 6mm Screw
- x2 Assembly from Step 1

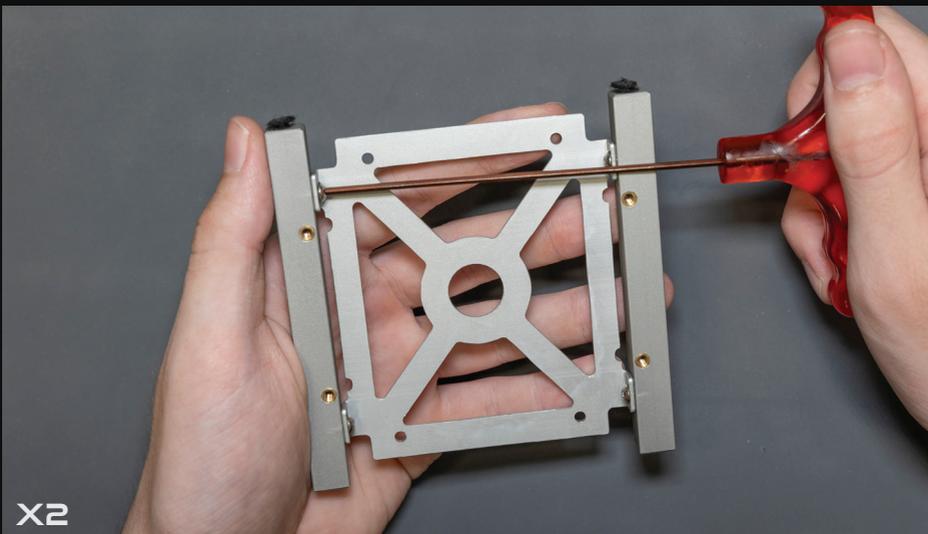
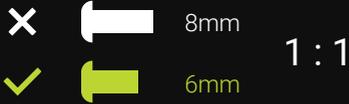
### STEPS

Screw the edge rail to the assembly from Step 1, as shown below.

Repeat this step so you have two of these.

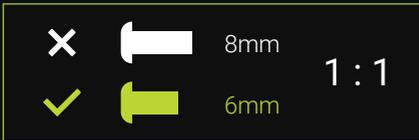
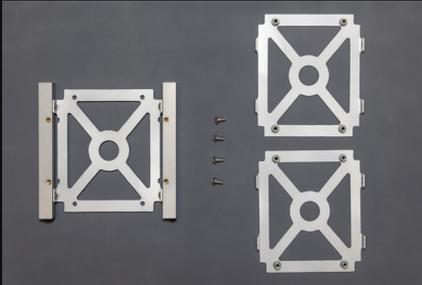
### NOTE

If the felt feet are already installed on the edge rails, ensure they are facing the same direction!





## STEP THREE

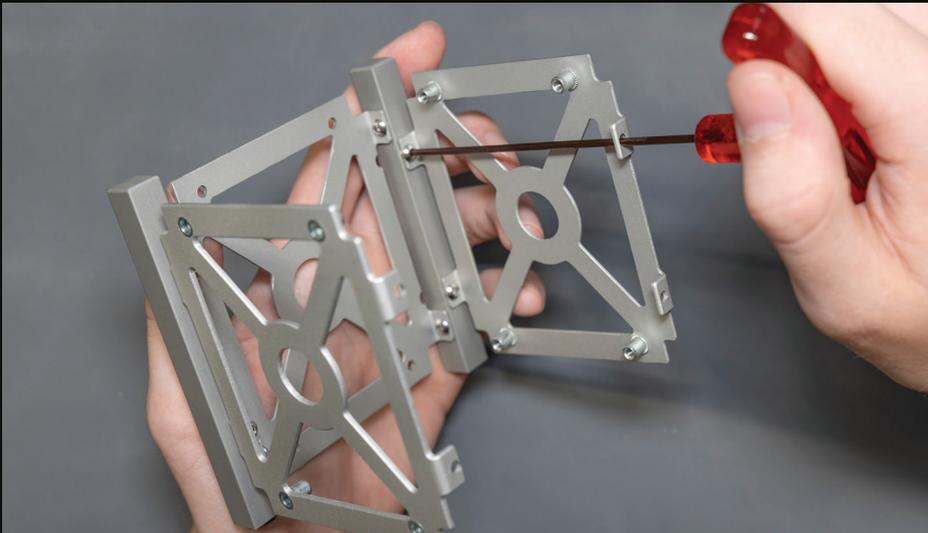


### PARTS

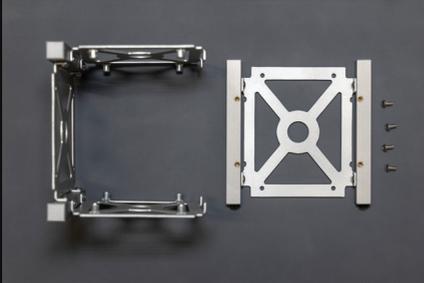
- x2 Side Panel (B - With Thread Inserts)
- x4 6mm Screw
- x1 Assembly from Step 2

### STEPS

Screw two side panels onto one of the assemblies from Step 2, in the orientations shown below.

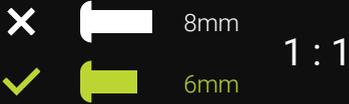


## STEP FOUR



### NOTE

Ensure the hex key stays in the designated slots, otherwise it may get stuck.



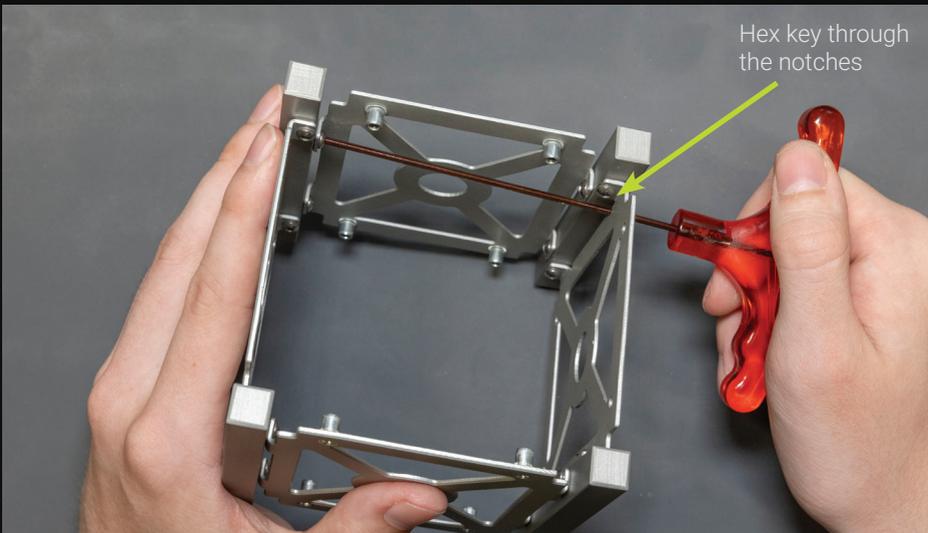
### PARTS

- x4 6mm Screw
- x1 Assembly from Step 2
- x1 Assembly from Step 3

### STEPS

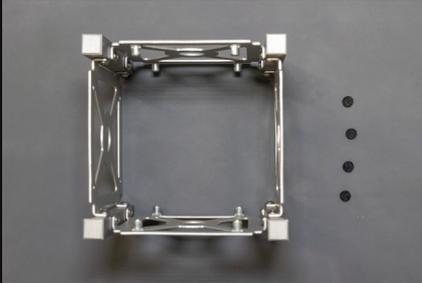
This step can be very tricky, take your time to carefully understand how to do it!

Screw both of the Step 2 and Step 3 assemblies together, along both edge rails.





## STEP FIVE



### PARTS

x4 Felt Feet

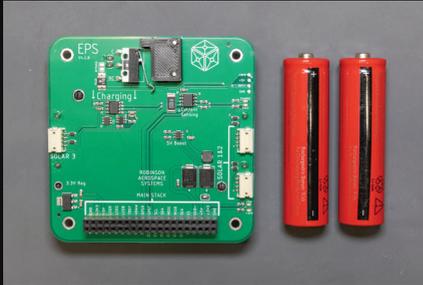
x1 Assembly from Step 4

### STEPS

If the felt feet have not been previously installed, peel off the adhesive protection and stick the felt feet onto the base of each edge rail.



## STEP SIX



### PARTS

- x1 EPS Module
- x2 18650 Battery

### STEPS

Install the two batteries into the EPS module. Ensure the batteries are orientated correctly.

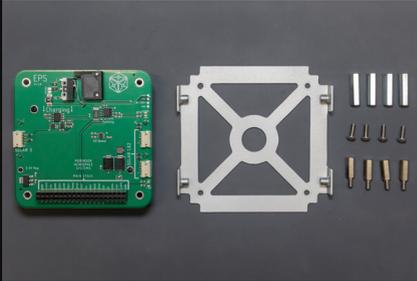
### NOTE

Failure to insert batteries correctly may damage the electronics or become a safety hazard!

Battery +



## STEP SEVEN

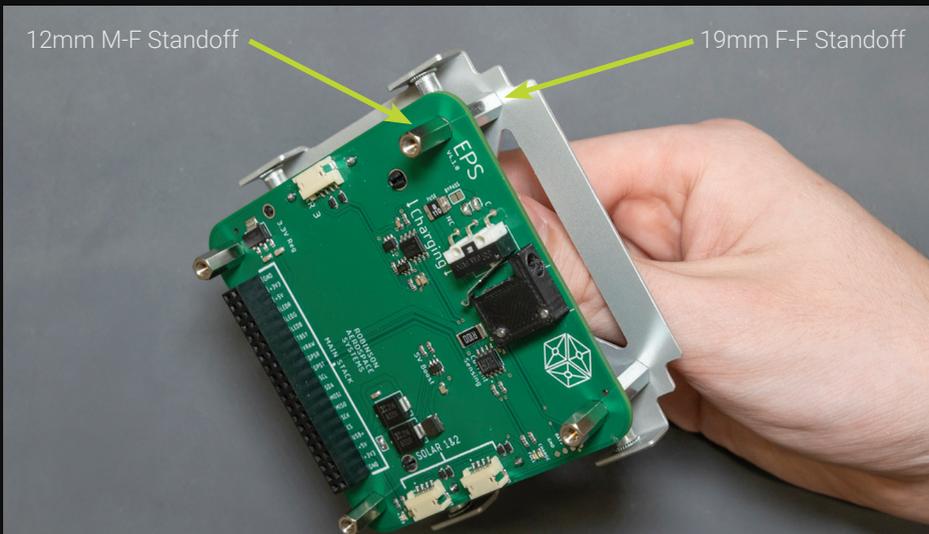
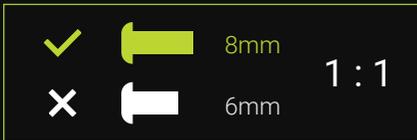


### PARTS

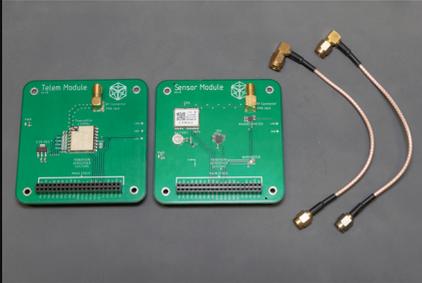
- x1 Base Plate
- x4 19mm F-F Standoff
- x4 12mm M-F Standoff
- x4 8mm screw
- x1 Assembly from Step 6

### STEPS

Screw each of the 19mm standoffs to the inside of the aluminium base plate. Then, attach the EPS module by using the 12mm standoffs, as shown below.



## STEP EIGHT

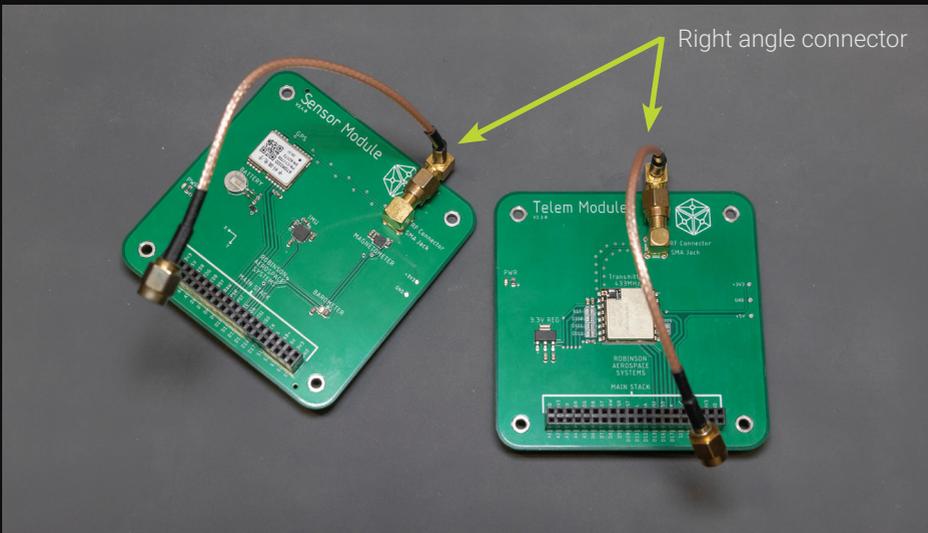


### PARTS

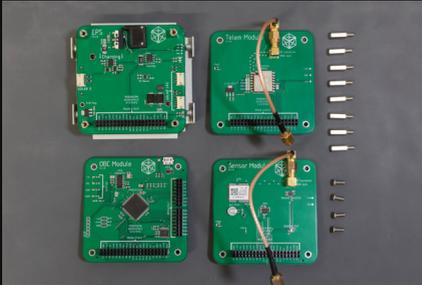
- x2 RF Cable
- x1 Sensor Module
- x1 Telemetry Module

### STEPS

Screw the right angle ends of the RF cables into the RF connectors on both modules. Ensure the cables are facing upwards, away from the circuit boards.



## STEP NINE



### NOTE

To avoid major damage, carefully ensure the 40x pins on each module are aligned perfectly.

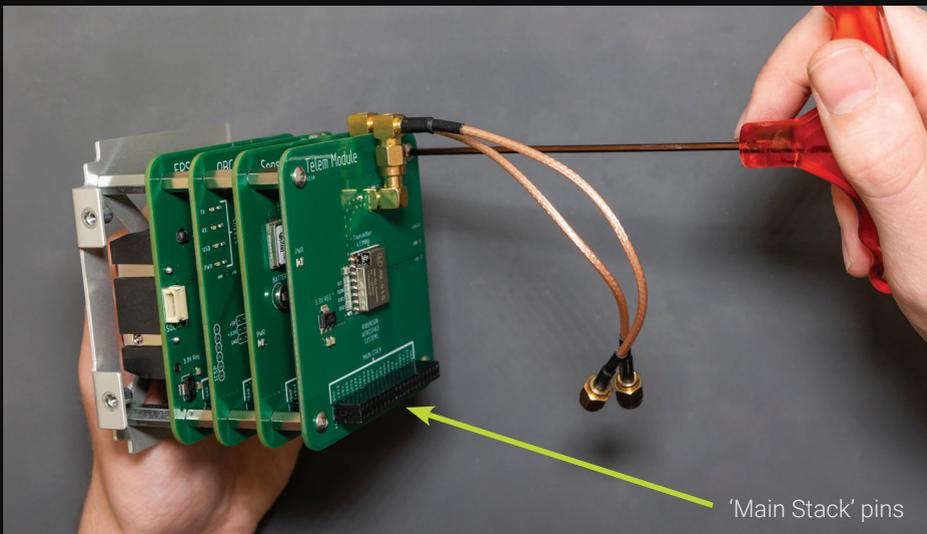


### PARTS

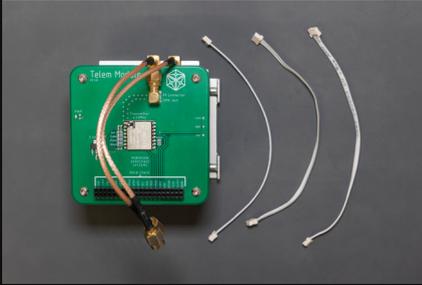
- x1 OBC Module
- x8 12mm M-F Standoff
- x4 8mm Screw
- x1 Assembly from Step 7
- x1 Assemblies from Step 8

### STEPS

Stack the remaining modules on top of the EPS with 12mm standoffs in between each. The order is EPS (bottom), then OBC, Sensors and Telem (top). Secure the Telem module with screws.



## STEP TEN



### PARTS

x3 Ribbon Cable

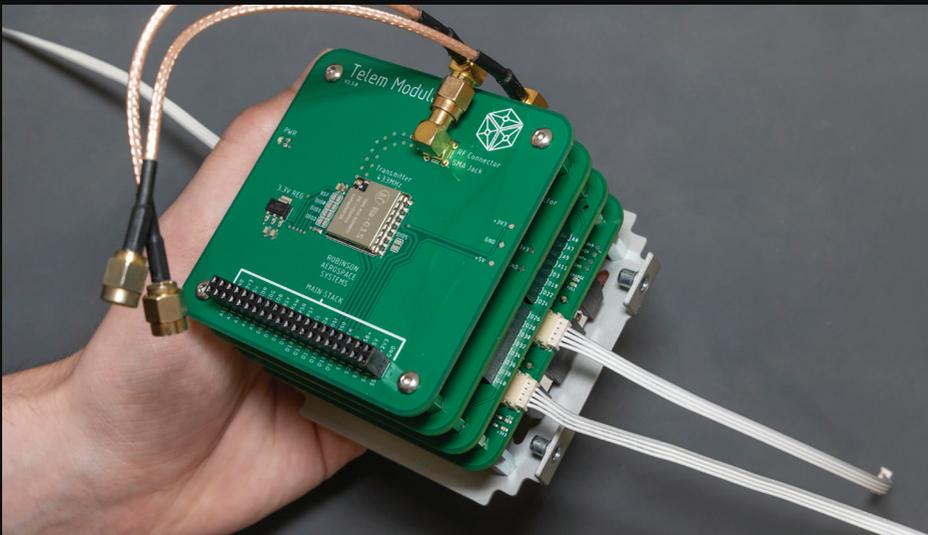
x1 Assembly from Step 9

### STEPS

Connect a ribbon cable to each of the 3 solar connectors on the EPS module.

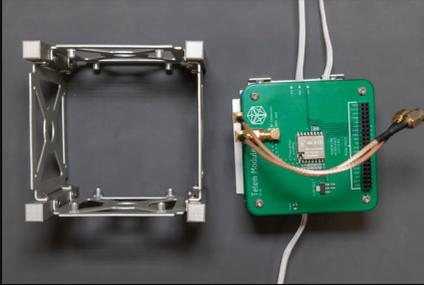
### NOTE

Ensure the cables are in all the way.





## STEP ELEVEN



### NOTE

Do not feed a solar cable through the side with the USB connector. There will not be a solar panel here.

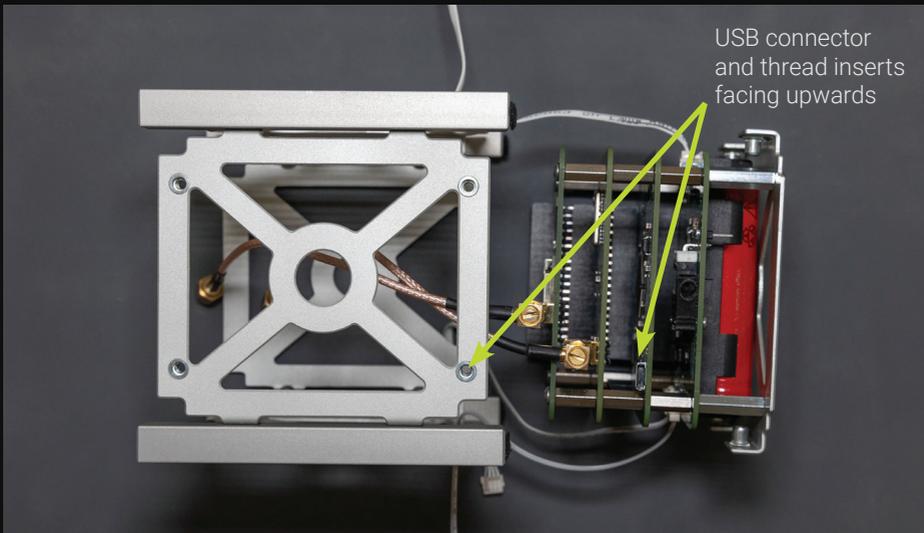
### PARTS

- x1 Assembly from Step 5
- x1 Assembly from Step 10

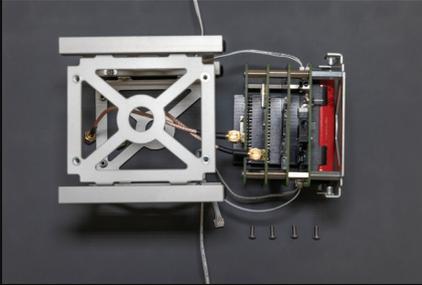
### STEPS

Align the stack and structure as shown below. Ensure the USB connector and a side panel without notches are facing upwards.

Feed the cables through the structure as shown below.



## STEP TWELVE



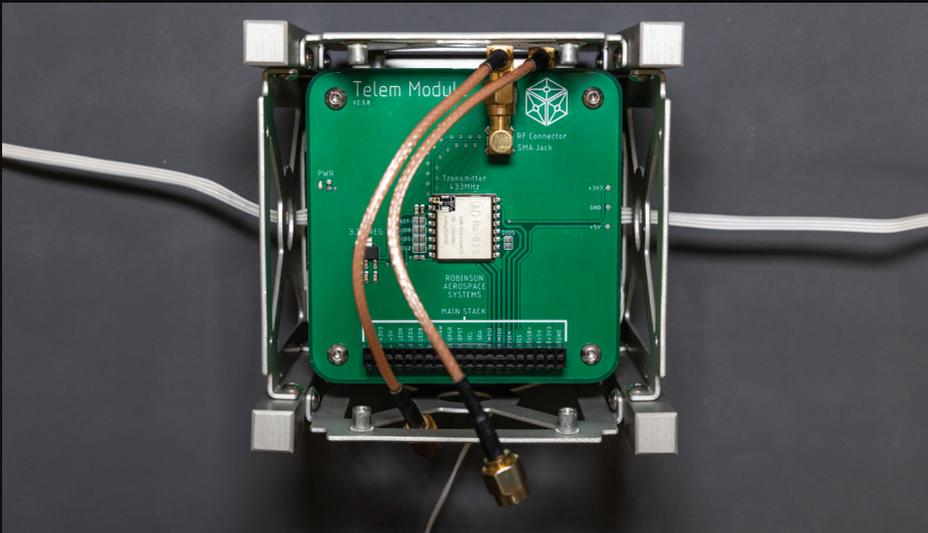
### PARTS

x4 8mm Screw

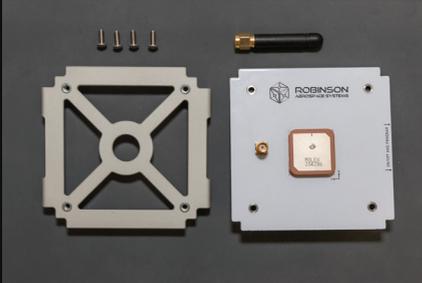
x1 Assembly from Step 11

### STEPS

Carefully slide the electronics stack into the aluminium structure, pulling each cable through slowly. Screw 4x screws through the side panels and into the base plate to secure the stack in place.



## STEP THIRTEEN



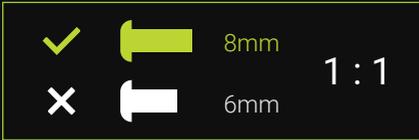
### PARTS

- x1 Top Plate
- x1 Antenna Board
- x1 Short Antenna
- x4 8mm Screw

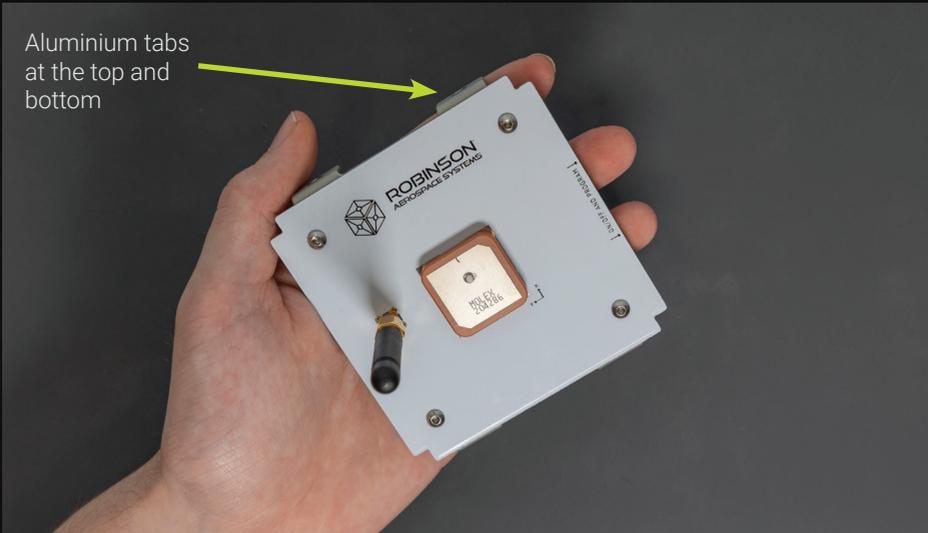
### STEPS

Screw the antenna board to the top plate in the orientation shown below.

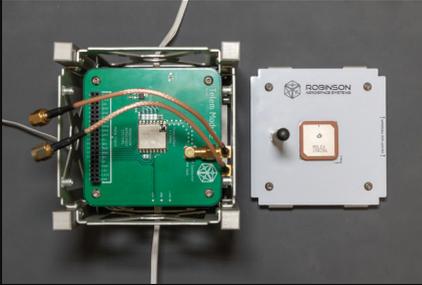
Screw the communications antenna onto the antenna connector.



Aluminium tabs  
at the top and  
bottom



## STEP FOURTEEN



### NOTE

It is critical to attach the cables to the correct connectors!

### PARTS

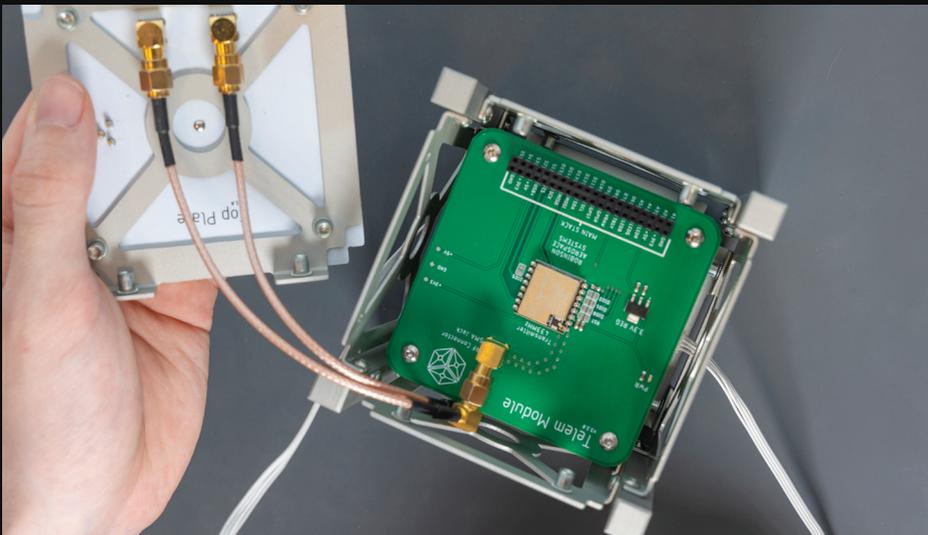
x1 Assembly from Step 12

x1 Assembly from Step 13

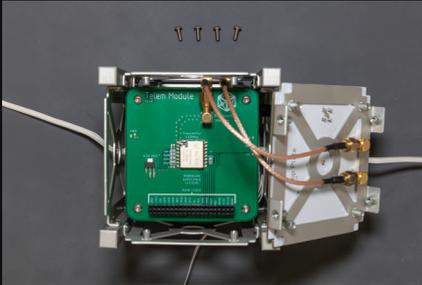
### STEPS

Screw the RF cables from the electronics stack onto the connectors on the antenna board.

The cable from the Sensor Module goes to the connector labeled 'GPS'. The cable from the Telem module goes to the connector labeled 'Telem'.



## STEP FIFTEEN



### PARTS

x4 8mm Screw

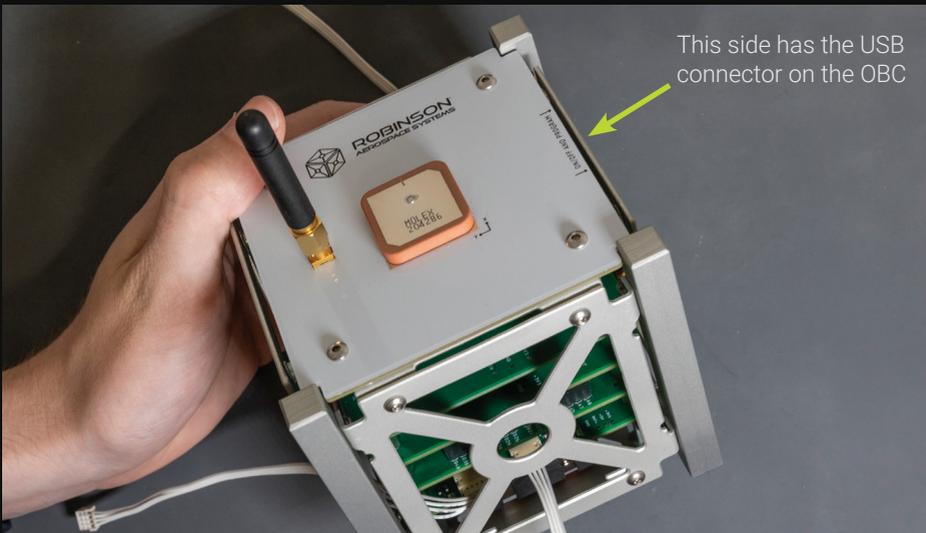
x1 Assembly from Step 14

### STEPS

Screw the antenna board onto the top of the satellite.

### NOTE

Ensure the arrows saying 'on/off and program' on the antenna board points towards the USB connector.



## STEP SIXTEEN



### NOTE

Two of these solar panels will require existing screws to be temporarily removed for installation.

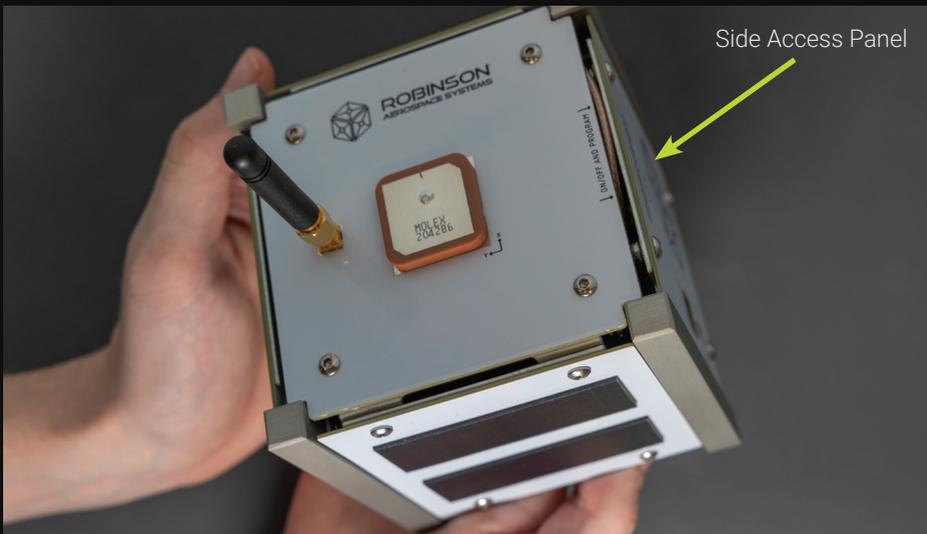


### PARTS

- x1 Side Access Panel
- x8 8mm Screw
- x3 Solar Panel
- x1 Assembly from Step 15

### STEPS

Screw the side access panel to the aluminium structure. Connect a ribbon cable to each solar panel. Feed the excess cable into the satellite and screw the solar panels into place.





## STEP SEVENTEEN



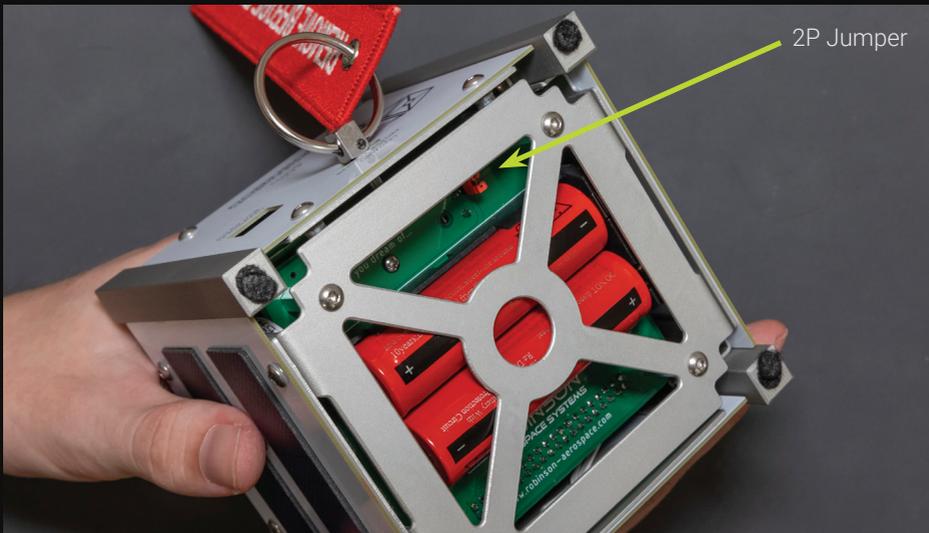
### PARTS

- x1 2P Jumper
- x1 RBF Pin

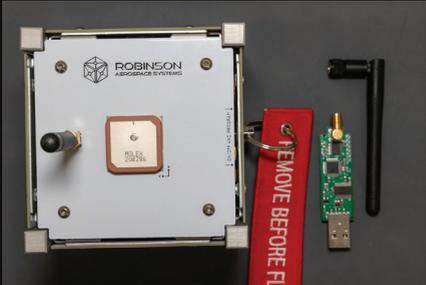
### STEPS

Slide the RBF pin into the satellite where it says 'REMOVE BEFORE FLIGHT'.

Then insert the 2P jumper onto the pins underneath the EPS module.



# STEP EIGHTEEN



**NOTE**  
In the drop-down menu, your USB receiver should say 'USB Serial Port'.

### PARTS

- x1 Receiver
- x1 Assembled CubeSat

### STEPS

Insert the receiver into a computer's USB port. Open an internet browser and go to 'ui.robinson-aerospace.com'. Select your USB receiver from the drop-down menu, then type in the Serial Number of your satellite (EG '59'). Remove the RBF pin to turn on the satellite, do not touch the satellite until the red LED starts blinking blue.

Supported browsers: Chrome, Edge



## LED DESCRIPTIONS

### EPS LEDS

The EPS has four green LEDs to show voltages and charging status. The LEDs indicate batteries charging ('CHARGE'), charging complete ('FULL'), 5V power ('+5V') and 3.3V power ('+3V3').

### OBC LEDS

The OBC has four green LEDs and one RGB (colour changing) LED. 'RX' and 'TX' will flash when data is being received or transmitted respectively. 'USB' indicates the USB cable is plugged in and providing power, while 'PWR' indicates if the OBC is on/off. Note that if the EPS is not connected, the 'USB' LED will turn on, but there will be no power to the OBC ('PWR').

The RGB LED (located next to the USB connection) will be solid red when RASCube is first turned on, indicating the sensors are calibrating and RASCube should not be moved. This will then flash blue every time RASCube transmits data, this is typically five times per second. Future versions of RASCube's software will show other colours and patterns to signal various actions or problems.



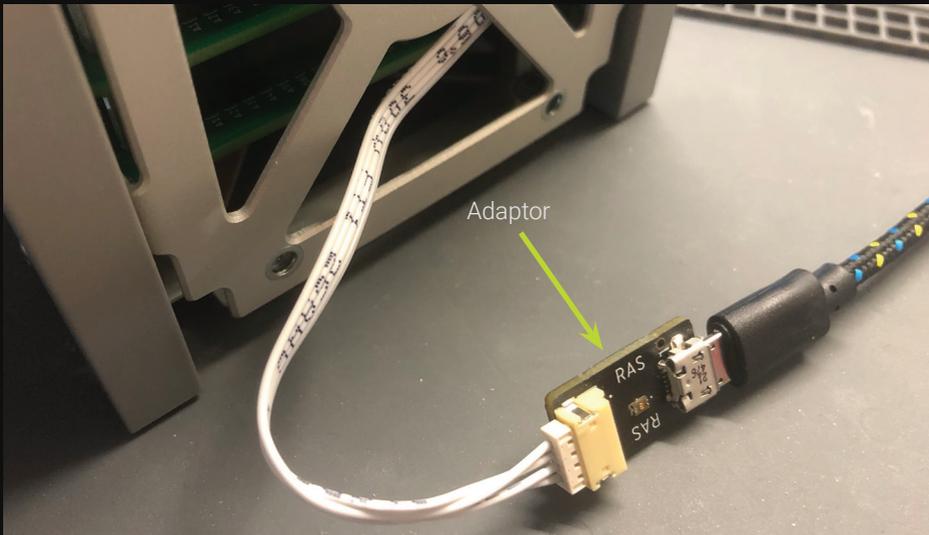
# BATTERY CHARGING

## TWO WAYS TO CHARGE

RASCube V1.0 includes two main ways to charge the batteries:

**Solar** - When put in bright light conditions, the solar panels will generate power and charge the batteries.

**USB Charging** - RASCube V1.0 does not support charging through its USB connector. Instead, we've included a small adaptor which charges the batteries by replacing a solar panel with a 5V USB cable (see below diagram). RASCube V1.1 onwards fixes this and allows charging through the OBC's USB connection.



## GENERAL BATTERY INFORMATION

The batteries can also be removed and charged using a Li-ion battery charger which is designed to be used with 18650 battery cells.

If you require new batteries, please contact Robinson Aerospace for advice on which batteries to purchase.

Note: The batteries will continue to charge when RASCube is turned off and/or the isolation connector is removed.

## WIRELESS COMMUNICATIONS

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### WIRELESS SYSTEMS

RASCube communicates through LoRa, at 433MHz. Each Serial Number communicates at a slightly different frequency, which is why the User Interface asks for your SN. This is to ensure multiple units in one area will not interfere with each other.

### WIRELESS SYSTEMS AREN'T WORKING

There are many reasons your wireless communications may not be working. Check the following:

1. Cables or antennae may not be connected properly. Check all connections.
2. The battery voltage is too low. Charge the batteries or try using the USB cable to power RASCube.
3. Another device in the area may be interfering. This is very unlikely, but if you suspect this is happening, do not use RASCube.

RASCube can send data to the User Interface through the USB cable (instead of the wireless system) if needed.



## PACKAGING REFERENCE

### REFERENCE IMAGES

If you are disassembling RASCube for the next group/person to use, you may want to put RASCube's parts in their respective places. Here are some reference images to help. The work mat and documentation package rest on top, so they are seen first when the lid is opened.



## SAFETY WARNINGS

### BATTERIES

RASCube uses two (2) 18650 Li-Ion battery cells to power its systems.

When misused, these cells can become damaged and cause harm.

1. Do not tamper with the batteries.
2. If you notice your operating time has greatly reduced, replace the batteries.
3. Do not short battery terminals. This may result in fire, burns or overheating.
4. Do not store or use batteries where the ambient temperature may exceed 50 degrees Celsius.
5. Dispose of batteries responsibly. Never incinerate or crush battery cells. Always follow local regulations.
6. Only use 18650 cells which include protection circuitry. All unprotected cells are highly volatile.
7. When not using RASCube for long periods of time, remove the batteries and put tape over the battery terminals.
8. Always switch off RASCube before removing batteries.

### ELECTRICAL CONTACTS

Never short any electrical contacts.

1. Shorting contacts may damage components or batteries.
2. Contacts may be sharp, avoid touching when possible. Handle with care to avoid injury.
3. Always ensure all forty (40) header pins align correctly to avoid damage.

### TOOLS

Misuse of included tools may result in physical harm.

1. Hex keys should only be used for screwing in the provided screws and should always face towards RASCube.
2. Never point the sharp end of a hex key towards a person or yourself.

### FLIGHT AND LAUNCH

RASCube is designed to be used in-class, on a table or bench.

1. RASCube is not designed for launch to space. It will not survive the harsh environment, including temperatures and radiation.
2. RASCube can be used on flights involving weather balloons, however we do not encourage this. Safe recovery of RASCube is the responsibility of the user. RAS has not tested weather balloon flights.

### AGE RATING

RASCube is designed to be used by ages 12+. Younger ages may not understand the use of tools, the assembly process or the dangers involved. Small parts may be of risk to young children.

### WATER AND WEATHER

Water may damage RASCube's electronics. Do not use in wet conditions. If water is spilt on RASCube, immediately isolate and remove the batteries.

### ELECTRONICS

RASCube's electronics can be damaged when misused, or cause harm.

1. Electronics may become hot. Avoid touching electronics when hot.
2. Handle electronics carefully to ensure small parts do not become detached from the Printed Circuit Boards (PCB).

### ALUMINIUM STRUCTURE

Aluminium parts may have sharp edges as a result of manufacturing variations or misuse. Regularly inspect each piece for sharp edges and contact Robinson Aerospace if you are concerned. Sharp edges or burrs may cause injury.

### WIRELESS SYSTEMS

1. Avoid turning on RASCube without an antenna installed. This can damage the wireless transmitter.
2. If you are aware of other devices in the area using the 433MHz LoRa band, do not use RASCube. This may cause interference of potentially important data.

### DATA PRIVACY

All data sent to RASCube's User Interface (UI) is saved locally (temporarily, on your computer).

1. Note: No data is saved offsite on servers, for your privacy. This includes GPS location.
2. Never use RASCube to track someone's location without their permission.

# MANUFACTURER'S WARRANTY

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## RASCUBE EDUCATIONAL SATELLITE KITS - LIMITED WARRANTY

### HEAD OFFICE - ADELAIDE

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Marnirni-Apinthi Building, Lot Fourteen  
North Terrace, Adelaide SA 5000

Robinson Aerospace products are manufactured to high quality standards and are thoroughly inspected and tested before dispatch. In addition to any statutory rights you may have, Robinson Aerospace warrants its products sold new in Australia against defective workmanship and faulty materials from the date of purchase by the customer, for two (2) years.

Robinson Aerospace will repair or replace as necessary, free of charge, each product or part which qualifies on the condition that:

- The complete product is returned to Robinson Aerospace in person or via freight paid for by the customer and found on examination to be suffering from a manufacturer defect.
- The product or part has not been subject to misuse, neglect or abuse.
- The repairs are not required as a result of normal wear and tear.

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### IMPORTANT NOTE FOR AUSTRALIAN CUSTOMERS

Robinson Aerospace products come with guarantees that cannot be excluded under the Australian Consumer Law (ACL). You are entitled to a replacement or refund for a major failure and for compensation for any other foreseeable loss or damage. You are also entitled to have the products repaired or replaced if the goods fail to be of acceptable quality and the failure does not amount to a major failure.

Please go to [www.robinson-aerospace.com](http://www.robinson-aerospace.com) to contact Robinson Aerospace support.

Please retain a copy of your tax invoice for warranty.

RASCube is an educational satellite kit that's designed to replicate a real satellite, but not go to space. It's a 1U CubeSat, allowing students to conduct experiments and develop their own unique expansions. This kit includes all circuit boards, aluminium pieces and hardware required to assemble and use RASCube.

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[robinson-aerospace.com/assembly](http://robinson-aerospace.com/assembly)

QSG V1.2 – 2024