



# Kitsat User Guide v1.03

This document will guide you to get started with Kitsat and Kitsat Ground station.

Estimated setup time: **12-20 mins**

# Kitsat User Guide

This guide explains how to get set up with Kitsat and guides to further use in different environments.

If you have never used Kitsat before and want to know what you should do after unboxing, keep on reading.

For further uses, educational material, and courses, see Kitsat Downloads on <https://kitsat.fi/downloads>.

## Introduction

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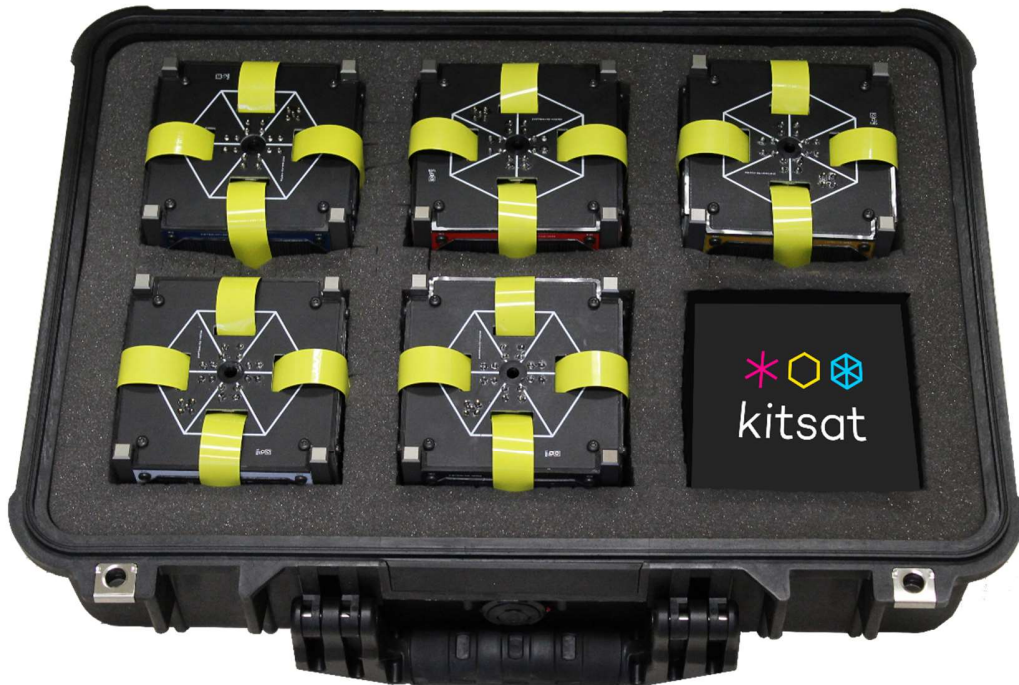
Kitsat is a fully functional satellite made for anyone who wants to learn more about space science. You can fly it to the stratosphere, leave it in the classroom or use it everywhere in between. Kitsat has been designed for use at the schools, science centres and space-related educational organisations, but also curious individuals just like you.

## Getting started (step-by-step)

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This document will guide you through getting set up and demonstrate basic uses with Kitsat. Approximate time to complete this guide is 12-20 minutes.

## Step 1) Unboxing



*Picture 1.1: PELI case with 5 Kitsats*

Unbox your Kitsats from the PELI case. You will find the following:

- 5 x Kitsat
- 1 x Kitsat Ground station unit
- 1 x Tweezers
- 1 x MicroSD/SD adapter
- 1 x Container for screws
- 1 x Hex head screwdriver
- 2 x USB Type-A - USB-mini cable



Picture 2.2: Ground station



Picture 2.3: Tweezers (bottom) and hex head screwdriver (top)



Picture 2.4: USB Type-A-USB-mini cable



Picture 2.5: Kitsat



Picture 2.6: Container for screws



Picture 2.7: microSD / SD card adapter

### Step 3) Downloading Kitsat Ground Station (Windows users)

Kitsat Ground station V1.0 GUI is compatible with Windows 7, 8 and 10. If you use another operating system, jump to **Step 5 B**.

Download and install Kitsat Ground station V1.0 (kitsat\_groundstation.msi, shown in red on Picture 3.1) from <https://kitsat.fi/downloads>.

#### Download

Your download should start, when you click on the *kitsat\_groundstation.msi*.

# Downloads

## Ground Segment PC client

To use Kitsat with your PC, you need to install the latest release of the Kitsat ground segment PC client.

Compatible with Windows 8.1/7/10

 [kitsat\\_groundstation.msi](#)   
[kitsat\\_groundstation\\_user\\_guide.pdf](#)

## Flight software

Kitsat comes preloaded with the latest flight software. However, you might need to upgrade the device flight software at times. See the following documentation for detailed instructions.

### SATELLITE FLIGHT SOFTWARE

Version 1.0:

[flight\\_firmware\\_1.0.bin](#)

[sat\\_upgrade\\_guide.pdf](#)

### GROUND SEGMENT UNIT FIRMWARE

Version 1.0:

Picture 3.1: A screen capture from Kitsat download site.

## Installation

If you are unsure which installation configuration to choose, you can go with the default options by agreeing on Terms and clicking 'next'.

#### Step 4) Launching Kitsat Ground Station



*Picture 4.1: If you chose the default options during installation, a shortcut will be created on your Desktop. If not, the program can be launched from the installation location. (Default: C:\Program Files (x86)\ArcticAstronautics\Kitsat\_GS.exe)*

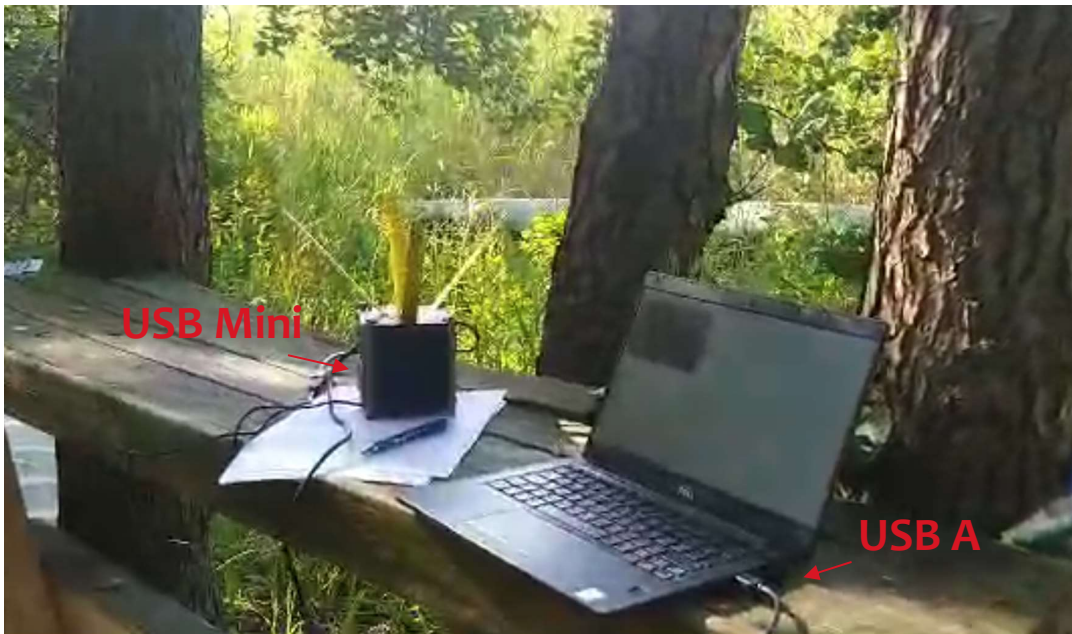
After installing the Kitsat Ground Station PC client, rebooting your system might be necessary, due to possible changes in COM port usage.

Once your system has been rebooted, turn on your Kitsat. Then plug your Kitsat to your computer with the USB mini cable that came with your package.

#### Troubleshooting

If you are having problems with installing or launching Kitsat Ground Station GUI, don't hesitate to contact our customer support: <https://kitsat.fi/support>

**Step 5 A) Checking connectivity (Windows users)**

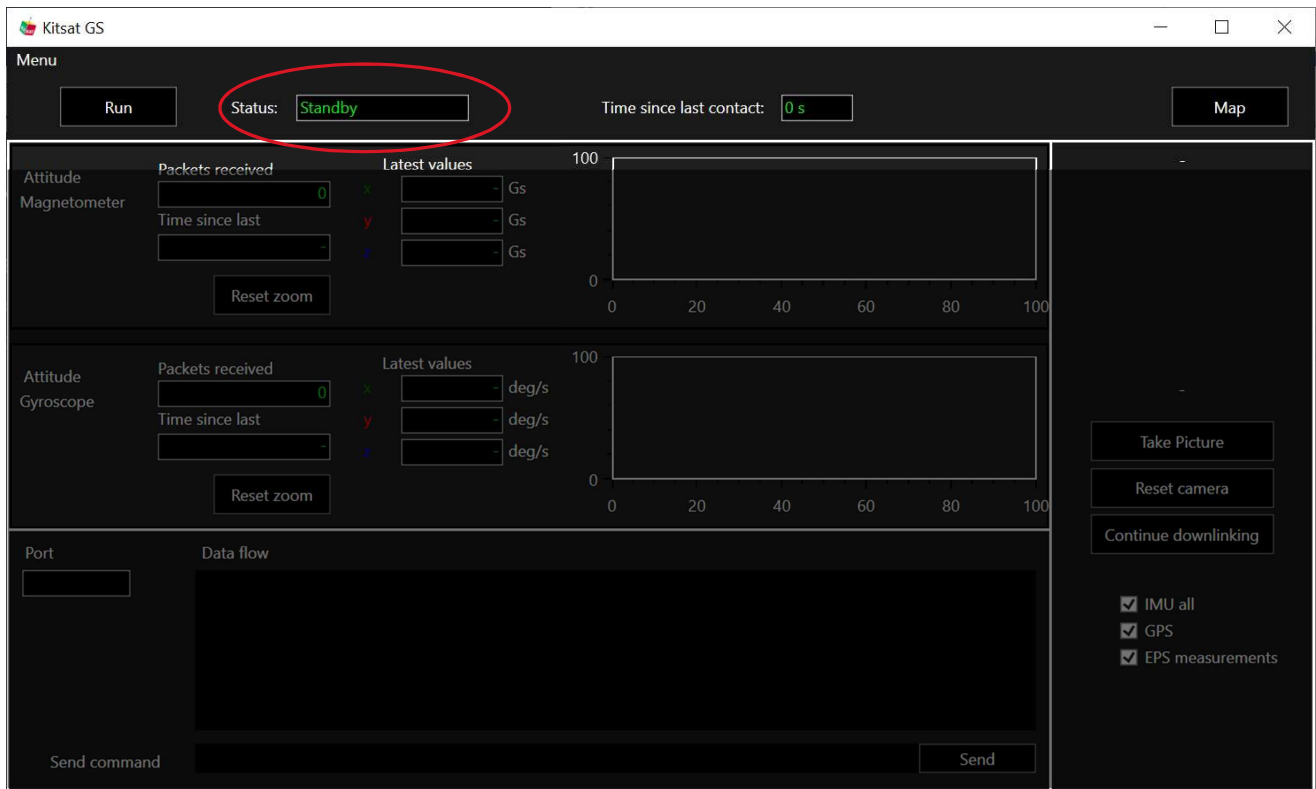


*Picture 5.1: Connect Kitsat to PC with the USB Type-A - USB-mini cable.*

Kitsat comes preloaded with flight software. To check that everything works, your Ground station client program should now read “Satellite connected”.

In case you connect to the Ground station from PC, it should read “Groundstation connected”.





Picture 4.2: Groundstation client GUI showing 'Standby' status, when no Kitsat or Ground station unit is detected.

### Troubleshooting

If you encounter any problems with the connectivity check, make sure you have the latest software on your machine. The Ground station GUI also notifies you if your satellite is malfunctioning.

Please refer to <https://kitsat.fi/downloads> Section 'Flight software' and upgrade your satellite flight software to the latest version in case you have any problems accessing Kitsat with your PC.

### **Step 5 B) Checking connectivity (other operating systems)**



On Linux, a common and free alternative is *screen*, which can be downloaded from GNU FTP servers:

<ftp://ftp.gnu.org/gnu/screen/>

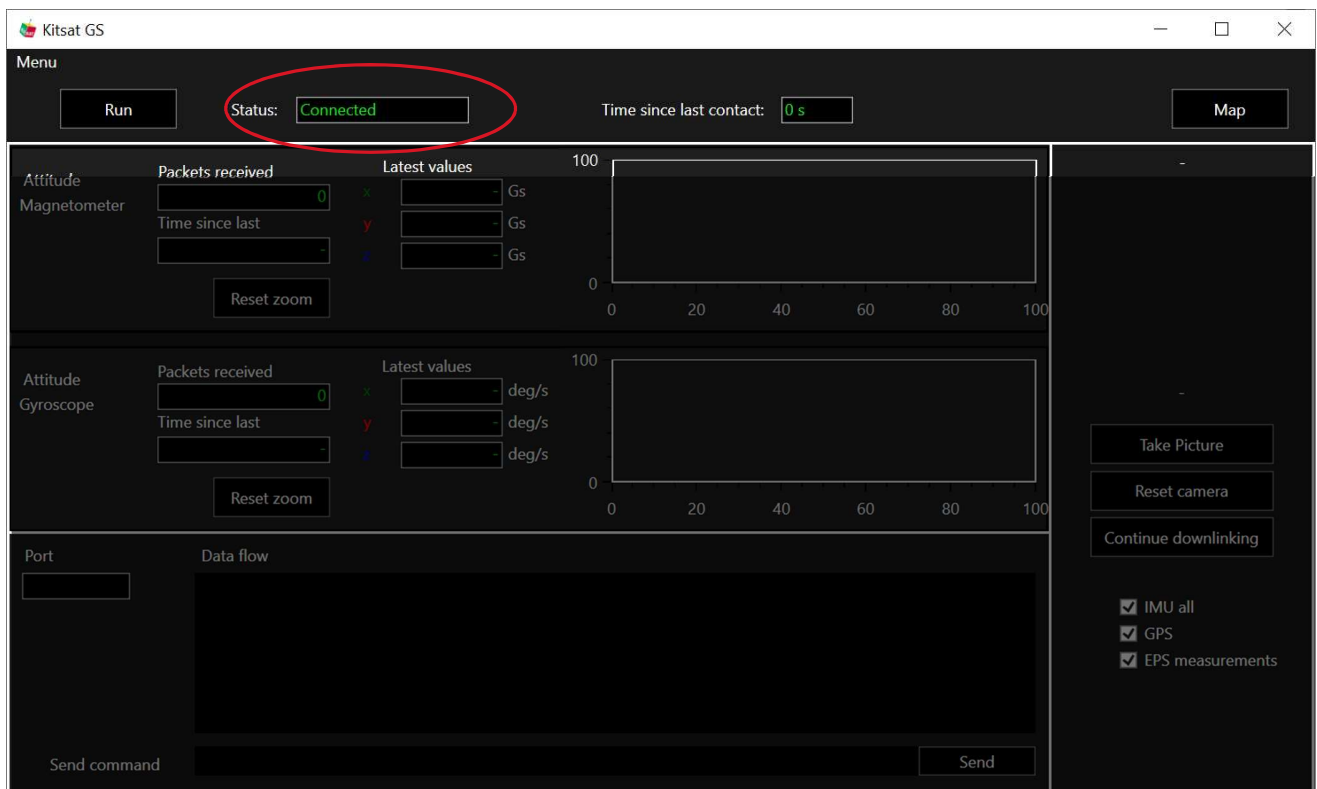
It can also be obtained with a package manager on most Linux systems. Users of Debian-based distros, such as Linux Mint and Ubuntu, would use:

```
$ sudo apt install screen
```

After the program has been installed, turn on Kitsat and connect it to your PC. The Kitsat CLI can be initiated with the following command:

```
$ sudo screen /dev/ttyACM0 9600,cs8
```

## Step 6) Starting your satellite



Once the satellite status shows “Connected”, it is ready for use.

(NOTE: for CLI users, entering the device through screen means that it is connected.)

To ensure basic functionality, press “Run”. This will run the main script, which will downlink all satellite data. You can also run imaging commands on the right pane.

To further use the satellite, use the commands in the Ground station client terminal shown in **Table 8**.

### **Step 7)**

When the satellite is plugged directly to the PC, the commands are executed via USB serial.

When the Ground station is plugged to the PC, the commands are executed remotely. This way, you can simulate overpasses with the satellite.

Alternatively, you can use graphical buttons for triggering different functionalities of the satellite (on the right).

See the Command lookup for list on Page 12 for all available commands.

Please note that the commands are case-sensitive.

## Next steps

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For further guidance with Kitsat and its uses with missions, courses, and more, see our Lessons on Kitsat Downloads:

<https://kitsat.fi/downloads>



**Table 8. Satellite commands (USB serial or RFM69)**

| Command            | Parameters | Explanation   | Parameter explanation           |
|--------------------|------------|---|---------------------------------|
| beep               | int        | Beep n times  | int n                           |
| beep_stop          |            | Stop buzzer   |                                 |
| morse              | str        | Morse with buzzer                                     | str message                     |
| WhoAmI             |            | Gets version number                                   |                                 |
| ping_local         |            | Test the UART   |                                 |
| ping               |            | Test the connection                                   |                                 |
| cam_get_latest     |            | Get last image name                                   |                                 |
| reset              |            | Reset satellite                                       |                                 |
| cam_list           | int        | List n latest images                                  | int n                           |
| cam_num_blocks     | int        | Number of blocks in image chunks                      | int img_index                   |
| cam_get_blocks     | int int    | Get blocks with index of image i (defaults to latest) | int block_index   int img_index |
| cam_take_pic       |            | Takes picture   |                                 |
| cam_reset          |            | Resets camera   |                                 |
| cam_ping           |            | Pings camera  |                                 |
| cam_get_latest     |            | Get latest image name                                 |                                 |
| gps_get_time       |            | GPS time  |                                 |
| gps_get_location   |            | GPS location  |                                 |
| gps_get_velocity   |            | GPS velocity  |                                 |
| gps_get_altitude   |            | GPS altitude  |                                 |
| gps_fix            |            | GPS fix status  |                                 |
| gps_get_all        |            | GPS all data in binary format                         |                                 |
| bmp_get_temp       |            | BMP temperature                                       |                                 |
| bmp_get_pres       |            | BMP pressure  |                                 |
| imu_get_mag        |            | IMU magnetometer                                      |                                 |
| imu_get_gyr        |            | IMU gyroscope   |                                 |
| imu_get_acc        |            | IMU accelerometer                                     |                                 |
| imu_calibrate      |            | Calibrate IMU   |                                 |
| imu_get_all        |            | IMU all measurements                                  |                                 |
| rf_get_temp        |            | RF temperature  |                                 |
| rf_get_RSSI        |            | Satellite rssi  |                                 |
| led_off            | int        | Shut down LED i                                       | int led                         |
| led_on             | int        | Lit LED i   | int led                         |
| reset_gs           |            | Reset groundstation                                   |                                 |
| TestTransmission   |            | Test transmission                                     |                                 |
| gs_network         | int        | Set network id  | int id                          |
| eps_get_voltage    |            | Get battery voltage                                   |                                 |
| eps_measure        |            | Get ADC measurements                                  |                                 |
| eps_get_sp_voltage |            | Get EPS x current                                     |                                 |
| eps_get_sp_current |            | Get EPS y current                                     |                                 |
|                    |            |   |                                 |
|                    |            |   |                                 |
|                    |            |   |                                 |