# Teacher's guide to the ISS-ABOVE

## About the displays

**The ISS-ABOVE offers display information to appeal to different levels of technical understanding/ age groups. The LED lights let you know when the ISS is approaching your skies, the information displays give you lots of facts and figures about where it is and who's the crew is. The live video shows you the Earth from 'up there'.**

## LED Flashing Lights

(Default is a PiGlow). The PiGlow starts flashing to notify you when the ISS is approaching your skies. Count the colored flashes to tell you how long it is until the ISS passes overhead. The number of flashes tells you:

- If it's flashing **RED** the # of hours to go
- If it's flashing **GREEN** the # of 10 minute intervals to go
- If it's flashing **BLUE** the number of minutes to go
- If it's flashing **all different colors** that means the ISS is ABOVE you RIGHT NOW!!

## Information Screens

### NEXT PASS SUMMARY SCREEN

This screen tells you when the ISS will next be above your horizon. (It doesn't mean it will be visible. See NEXT VISIBLE PASS screen for information on when you can next SEE the ISS).

**Next Pass In**: How long until the start of the next flyby in hours, minutes and seconds.

**Start**: The day, hour, minutes and seconds when the flyby will begin.

**Duration**: How long the ISS will be above the horizon in minutes and seconds

**Max Mag**: A scale that indicates the brightness of an astronomical object (including man-made ones!) Oddly, higher numbers are dimmer to the eye (you usually cannot see below +5).

Negative number measures are bright and fairly obvious objects if you know where to look. These numbers below can vary (for example, the planets vary in brightness dependent where they are in their orbits compared to the Earth).

**SUN**: -26

**FULL MOON**: -13

**VENUS**: -4 at brightest

**International Space Station**: Varies from -3.5 to +0.6 (so can be brighter than Venus).

**JUPITER**: -2

**SIRIUS** (brightest northern hemisphere star): -1

**SATURN**: +1

**BIG DIPPER (PLOUGH) STARS**: +2

**JUPITER'S MOONS**: +5 (you can see the largest ones through binoculars or a small telescope)

You can see why humans have always been fascinated by planets (firstly, they move against the background of stars – and they're bright). So is the ISS. If you've never seen it, plan to get out there! ISS-ABOVE will tell you when and where to look. Both Venus and the ISS are only visible around dawn or dusk, so the brightness comparison can be helpful.

**Max Alt**: If 0º is the horizon and 90º is straight up, then this is the angle between the horizon and the ISS at its highest (on any given pass). Any Max Alt below 30o can be hard to see (allowing for trees, buildings and hills).

**Closest:** In miles at Max Alt (in other words, when it's at its highest on any given pass, this will be how far away it will be). The ISS orbits around 260 miles above the Earth, so anything close to that means it will be high up in the sky and very bright.

**Az at transit**: "Azimuth". The angle between North and the highest point of the flyby (you have to imagine drawing a line from the ISS to the nearest point on the horizon). The display also shows a compass bearing. Astronomers use Alt and Az to describe where an object is in the sky.

## How to use your ISS-Above

ISS-ABOVE - a device that tracks the International Space Station


Need help setting up your ISS-ABOVE?

Check the Get Help section on www.issabove.com for video and instructions.

Or email support@issabove.com

## Information Displays

### NEXT PASS SUMMARY SCREEN


*"My 150 students thank you for your efforts. They have even attempted to figure out what part of the Earth the camera is seeing. We look forward to future products from your team."*

**Middle School, OK, USA**

## NEXT VISIBLE PASS SUMMARY SCREEN

This screen has exactly the same information as the NEXT PASS SUMMARY screen except that it's giving you the data for the next opportunity to run outside and see the ISS. It has the date and time and where the ISS appears and sets, plus green bars to show you how bright it will be. Use the ACTIVE PASS SKY MAP screen to know more on where to look as the pass happens.

**ORBIT**: This screen shown a map of the Earth with the path of the ISS. The curvy line show one and a half orbits. Find the little image of the ISS – that's where it is right now. You will see it move slightly on the orbit (we're talking 4.8 miles/second or 17,500 miles per hour). Parts of the orbit are yellow (the ISS is in daylight) and parts are blue (the ISS is in darkness). There's a short grey part of the curve between yellow and blue – this is dawn/dusk, when you are most likely to see ISS. The ISS orbits from West to East. The red dot shows your location.

**ACTIVE PASS SKY MAP**: If the ISS is in your skies, you will see the active pass screen/ This screen shows the important information for tracking a pass, plus the orbital path. You are at the center of the circle (where the blue cross is). The numbers on this screen change quickly as the ISS passes across your sky.
The green dot on the orbit path is the ISS.

**Sets**: How long until the ISS will set (finish its pass and go below the horizon)
**Range**: The distance between you and the ISS at that moment.
**Mag**: The brightness (see information from the NEXT PASS screen).
**Altitude**: The current height of the ISS above the horizon.
**Direction**: The current direction of the ISS from you.

Also showing on this screen are the Sun. Moon and Planets. Can you guess which are which? Hint: Sun is yellow, Moon is gray (large), Venus is light blue, Jupiter is orange, Mars is red (small), Saturn is light yellow.

**NEXT PASS SKY MAP**: If the ISS is not in your skies, the next pass screen shows you when it will be coming by. On this sky, there's no green dot – yet! The ISS is not in your skies at the moment.
Next pass in: How long until the ISS will rise above the horizon, in hours, minutes and seconds.
Rise time and Direction: Which direction the ISS will rise from and what time.
Set time and Direction: Which direction the ISS will set and what time.

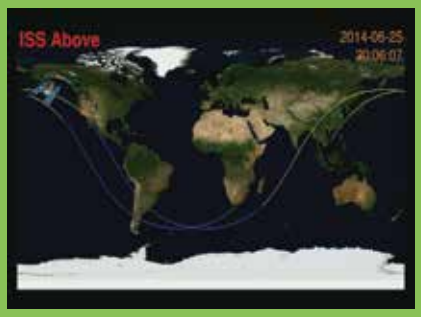
**EXPEDITION CREW**: An expedition is the time from a change out of astronauts to the next change out – usually 3 months. Each expedition has an Expedition number and a crew "patch". As a tour of duty is usually 6 months, most astronauts are part of 2 Expeditions. The ISS typically houses 6 people (2-3 US, 2-3 Russian and 1-2 from other countries in Europe, Canada and Japan who support the ISS). In 2015 longer stays on the ISS (Scott Kelly and Mikael Kornienko going for 1 year – "the 1-year mission") are starting to assess how well humans will manage long-term space travel – like to Mars!

**LIVE HD Video**: The live stream of video is coming from 4 cameras in a housing attached to the underneath of the ISS (the side facing the Earth). The camera system is an experiment called HDEV (High Definition Earth Viewing) and was launched to the ISS in April 2014. The cameras are enclosed in a temperature specific housing and are exposed to the harsh radiation of space. Analysis of the effect of space on the video quality, over the time HDEV is operational, may help engineers decide which cameras are the best types to use on future missions. High school students helped design some of the cameras' components, through the High Schools United with NASA to Create Hardware (HUNCH) program, and student teams operate the experiment.

The live video only shows when the ISS is in sunlight (i.e. half of every 92 minute orbit). During those 46 minutes, the HDEV cycles through the 4 cameras showing forward facing, downward facing and read facing views. ISS-ABOVE adds a geographic location letting you know where in the world the ISS-ABOVE is.
The rear facing camera shows part of the ISS – the two docking stations for the Soyuz and Dragon modules. You can see the modules arriving, docked and leaving from time to time – it's very exciting. You may also see the Canada arm moving – it's the device that moves large sections of hardware and places them where needed – it was used to help in the installation of the HDEV experiment.

# Information Displays

## ORBIT SCREEN




## ACTIVE PASS SKY MAP/ NEXT PASS SKY MAP SCREENS


## EXPEDITION CREW SCREEN


## LIVE HD VIDEO SCREEN

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