



## Connecting Growing Beyond Earth® Devices to Wi-Fi Information for IT Technicians

### Overview of Growing Beyond Earth®

Growing Beyond Earth® (GBE) is a NASA-funded project that equips school classrooms with an internet-connected plant habitat. The primary goal of GBE is to assist NASA in choosing the best plants and environmental conditions for growing food on spacecraft. During each multi-week experiment, students collect environmental data and measure plant growth while controlling factors such as lighting and ventilation. Throughout the world, more than 400 classrooms participate in GBE each year, all supporting ongoing research on the International Space Station.

### About GBE Equipment

- **Device:** The GBE plant habitat is an IoT (Internet of Things) device based on a Raspberry Pi Pico W microcontroller (datasheet: [Pico W Datasheet](#)).
- **Wi-Fi:** 2.4 GHz Wi-Fi connectivity
- **Main Functions:**
  - Controls parameters such as lighting and fan speed.
  - Collects environmental data (temperature, relative humidity, CO<sub>2</sub> concentration, barometric pressure, and light level) from within the growing environment.

### How GBE Equipment Uses the Network

- **Connection Frequency:** Every 10 minutes
- **Data Transmission:** Uses a low bandwidth, stateless connection over HTTPS (port 443).
- **Communication with Servers:**
  - Sends sensor data to the server at [growingbeyondearth.com](https://growingbeyondearth.com) via HTTP POST.
  - Receives JSON programming data to adjust the light and fan settings.

### Why is Wi-Fi Connection Important?

- **Remote Data Access:** Teachers and students can monitor real-time data through an online portal, graphing the sensor readings for classroom experiments.
- **Program Updates:** The GBE project team can push new experimental settings, making it easy to implement new experiments without requiring physical access to the devices.
- **Accurate Timekeeping:** Wi-Fi allows the device to synchronize its internal clock, ensuring that the light and fan schedules are followed accurately.
- **Synchronized Experiments:** When connected, the device's lights can be set to match the natural light/dark cycles in specific locations on Earth or in space.
- **Educational Benefits:** Connecting to Wi-Fi allows students to actively engage in the experiment, see immediate feedback from environmental changes, and contribute valuable data to NASA's research efforts.

## Connecting GBE Equipment to School Networks

Lacking a screen or keyboard, the GBE device requires specific setup steps to connect:

1. **Wi-Fi Setup File:** The GBE device uses a JSON configuration file to store the Wi-Fi credentials. **The file is located on a removable micro SD card** under the filename `wifi_settings.json`. Format of the file:

### `wifi_settings.json`

```
{  
  "NETWORK_NAME": "Your_SSID",  
  "NETWORK_PASSWORD": "Your_Password"  
}
```

Your SSID and password should be provided by the IT department and saved directly onto this file (replacing the highlighted text) using a text editor.

2. **MAC Address:** The GBE device may require special permissions to access the school's network, especially in environments with captive portals. **The device's MAC address can be found by scanning the QR code on the top of the light panel.** The MAC address should be whitelisted on the router to allow network access, bypassing the captive portal.

## Security Considerations

- **Low Risk Device:** The device only connects via HTTPS to `growingbeyond.earth`, uploading small amounts of environmental data and downloading JSON programming files.
- **No Sensitive Data:** The device transmits non-sensitive data related to environmental conditions within the enclosed plant growth environment.
- **No Local Interaction:** The device does not offer interactive network services such as file sharing, nor does it access other network resources apart from its own server.

## Support and Contact Information

Growing Beyond Earth® is operated by Fairchild Tropical Botanic Garden in Miami, Florida, USA. If you have any questions or require assistance with connecting the GBE Control Box to your network, please contact: [gbe@fairchildgarden.org](mailto:gbe@fairchildgarden.org)

Thank you for supporting this exciting research project!