ESP32 Microcontrollers & LoRa Boards

TinyGS Satellite Ground Receiving Station

By Dom, M9WHQ

Author: Dom Wilkinson, M9WHQ

SDARC
Swindon & District Amateur Radio Club

PRESENTATION AGENDA

What will this talk be covering?

This presentation is a greatly reduced presentation taken from a 2 hour presentation which I gave to the Swindon & District Amateur Radio Club, which covered Microcontrollers and Microcomputers and covered multiple projects. This presentation concentrates just on a specific Microcontroller and the TinyGS Ground Satellite Receiving Station project.

Brief Introduction To Microcontrollers - I'll give you a very brief introduction to Microcontrollers.

Hardware & Software Required - I'll explain what Hardware and Software is required for this project.

Practical Demonstration Of Setup - I'll demonstrate how to build, setup and configure the project. Due to time limitations, some of the steps may be abridged, but where possible, I'll show the entire build process to demonstrate how easy it is to have a go at building each project.

What Project Are We Going To Build? - **TinyGS Satellite Ground Receiving Station**

NO PREVIOUS EXPERIENCE IS REQUIRED

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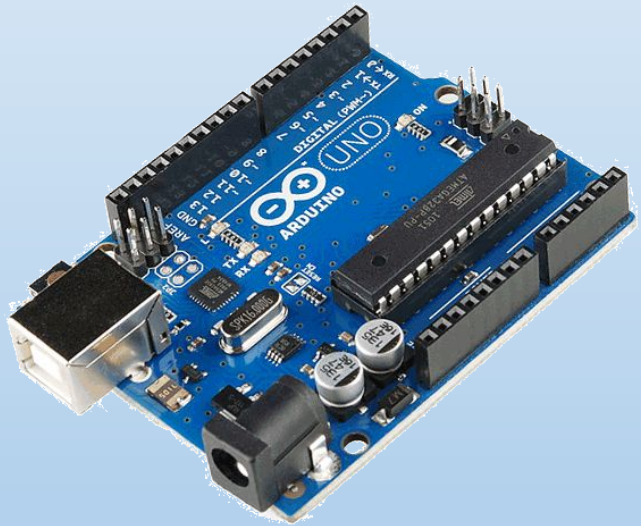
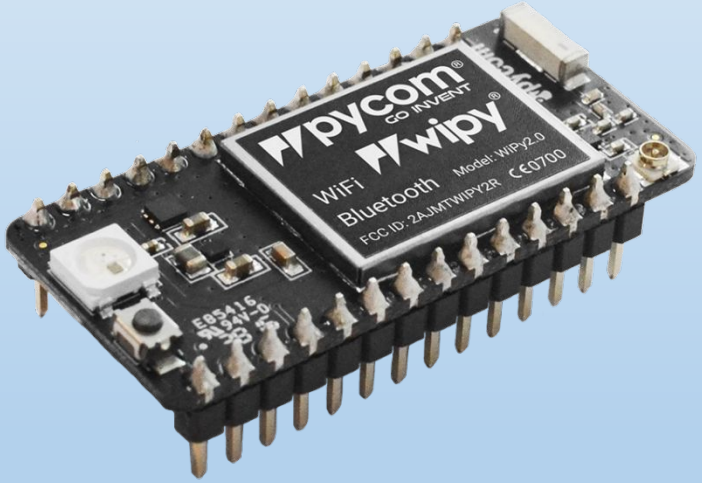
WHAT ARE MICROCONTROLLERS & MICROCOMPUTERS?

Microcontrollers

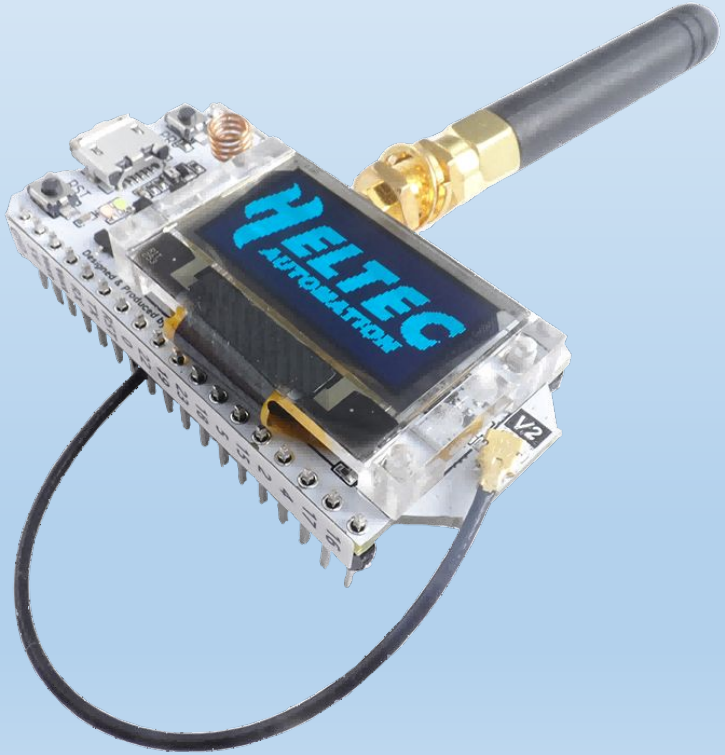
A microcontroller is a small computer on a single integrated circuit (IC) that contains a processor, memory and programmable input/output (I/O) peripherals. They are used in embedded systems to perform a single, specific task repeatedly.



Arduino UNO



ESP32



ESP32 With Embedded LoRa

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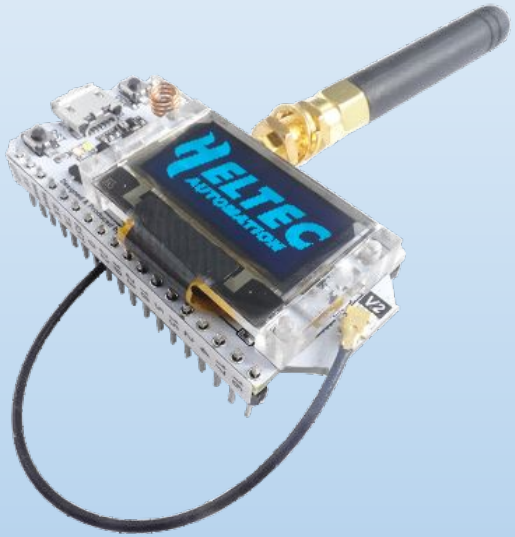
THE HARDWARE WE'LL BE USING



Heltec ESP32, LoRa 32, V3 Board. ESP32 with embedded LoRa.

The board comes in four different variants, which cover different LoRa frequency ranges:

Heltec ESP32, LoRa 32, V3 – LF (Low Frequency) - 433-510Mhz
Heltec ESP32, LoRa 32, V3 – HF (High Frequency) - 863-928Mhz
Heltec ESP32, LoRa 32, V3 – (US Market) - 915Mhz
Heltec ESP32, LoRa 32, V3 – (Chinese Market) – 407Mhz-510Mhz

Processor: ESP32-S3FN8 (dual-core, 240MHz).
LoRa Radio: Semtech SX1262.
Memory: 8MB Flash, 512KB SRAM.
Display: 0.96-inch 128x64 OLED.
Wireless: Wi-Fi, Bluetooth 5.0 (LE).
Power Management: Type-C USB with battery charging and 2-pin JST 1.25mm battery connector.

Boards cost around £15 - £20.

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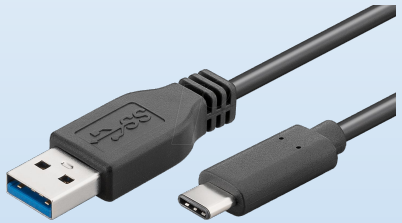
PROJECT – TinyGS – Satellite Ground Station

Parts Required For Project

Laptop/Computer



USB C Cable

Heltec LoRa 32 V3
433-510Mhz Board

SMA RF Adapter Cable
Connector To Match Antenna

433Mhz Antenna

Any laptop or computer will do, as long as it's connected to the Internet, has a browser and a USB port.
The USB cable is used to power and program the Heltec LoRa board. Once programmed, you use a 1A USB PSU to power the board. **DO NOT USE A HIGH AMPERAGE PSU (2A Max.) OTHERWISE YOU WILL FRY THE HELTEC BOARD.**

Connect an antenna to the Heltec LoRa board **BEFORE** you power it up. Treat these boards like a transceiver and **ALWAYS** have an antenna attached. If it accidentally goes in to transmit with no antenna attached, then it can overheat and will damage the board.

To get you up and running any resonant antenna will do. A 70cm antenna is absolutely fine for testing.

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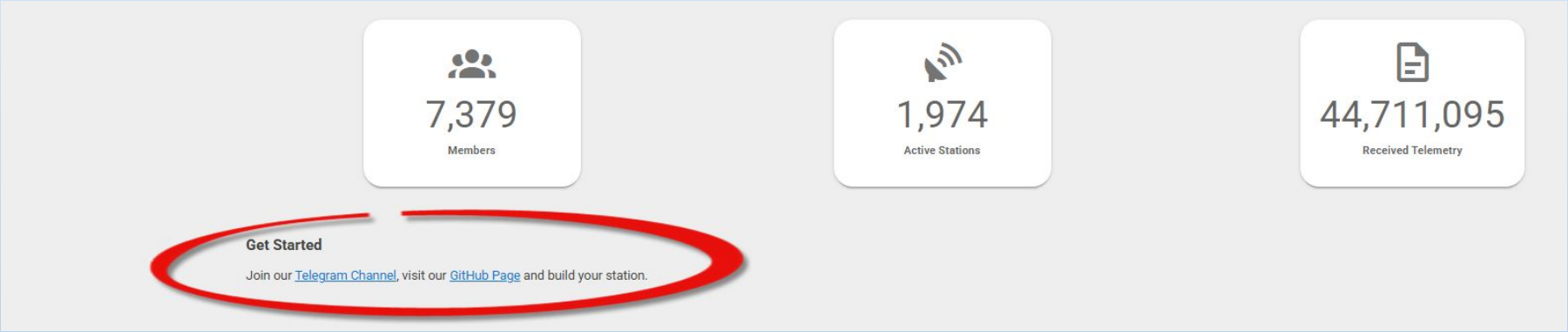
PROJECT – TinyGS – Satellite Ground Station

WHAT IS TINYGS?

TinyGS is an open-source, community-driven project that builds a global network of low-cost ground stations for tracking satellites and receiving data from them. It allows hobbyists, students and makers to build their own affordable satellite receiving stations using open-source technology and readily available components to participate in satellite tracking and data reception.

https://tinygs.com/



https://t.me/joinchat/DmYSElZahiJGwHX6jCzB3Q - You need to join the Telegram Chat Channel.

https://github.com/G4lile0/tinyGS - This is the main software repository site and also contains all the documentation.

https://installer.tinygs.com/ - This is the web based software installer which will program the Heltec LoRa 32 board.

LIVE BUILD & DEMO

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THANK YOU FOR WATCHING

I HOPE THIS PROJECT AND PRESENTATION WILL INSPIRE YOU TO TRY AND BUILD A TinyGS GROUND RECEIVING STATION YOURSELF

ANY QUESTIONS?