LoRa Radio for Makers
at Arduino Hannover

Arduino Zero compatible

Wire antenna
SMA antenna connector*
U.FL antenna connector*

LoRa wireless modem

LCD display connector
(can be switched-off)

AA battery holder
– Also rechargeable cells
– 2 years service life

4 buttons

(backside view, with SMA antenna)

62 mm

32-bit CPU

3 LEDs

Connector blocks
(Arduino compatible)

Debugger interface

Voltage converter
(can be switched-off)
5 V/150 mA
3.3 V/150 mA

70 mm

Micro USB connector
– Power supply
– Programming interface
– Serial monitor
– USB host/device

Power supply
(external 5 … 7 V)

Jumper (Battery/USB)

* optionally available (not included)

LoRa wireless technology

The LoRa wireless technology allows sensors to communicate in the free 868 MHz band across great distances from 200 m to 20 km. The LoRa technology is characterized by a very low energy requirement and a wide range, and is suited for small data rates. At the Maker Faire Hannover 2017 (Germany) we will present our own Arduino 32-Bit LoRa board, which, even if battery-powered, can communicate via its proprietary wireless protocol software for years. Existing LoRa modules of renowned manufacturers could not convince us, hence we have developed the hardware and software completely on our own. We are sure that we can present a groundbreaking LoRa wireless solution, including different sensor applications.

LoRa basics

LoRa utilizes a special spread spectrum modulation. Basically, this kind of modulation can be used on all frequencies, typically the free 433 MHz, and 868 MHz frequencies in Europe. We use 868 MHz because this band is less busy and better controlled, which offers a better wireless basis.

Peer-to-peer LoRa wireless protocol software

We do not use the standardized LoRaWAN protocol because it is not efficient enough, does not support direct node-to-node communication, and is far too complicated and costly for hobbyists.

We have developed a completely new LoRa wireless protocol software, called "RadioShuttle", which can efficiently send messages in a fast and secure way between simple LoRa modules.

This software is equally suitable as a node or as a station (server).

Arduino 32-bit LoRa module

The turnkey Arduino Genuine Zero compatible board can immediately be employed in the original Arduino environment. The included Radio-Shuttle wireless protocol software allows node-to-node communication without the need of additional routers or servers. The solution is designed for battery operation (2 AA battery holder) but can also be operated with an external power supply. A standard Arduino connector allows extensions that require 3.3 V or 5 V. Simply brilliant!
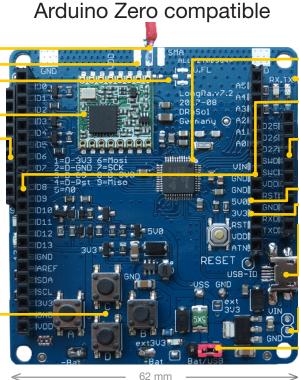
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Hardware

- Arduino compatible Genuino Zero board
- ARM 32-bit MCU (D21 M0+)
- 256 kB Flash, 32 kB RAM
- Integrated clock (RTC)
- 5 buttons (4 freely assignable)
- 4 LEDs (3 freely assignable)
- Arduino Zero compatible extension slots
- USB connector for power supply and programming
- Connector for TFT display (optional), can be switched off
- Optimized for battery usage:
  - 2.1-3.6 V operating voltage
  - Battery holder (2 AA batteries/ rechargeable cells)
  - Reduced energy consumption in sleep mode (2 years of operation)
- Voltage converter provides 3.3 or 5 V from 2 AA batteries
- LoRa chip 168 dB link budget (Semtech SX1276 based)
  EU: 868 MHz
  US: 915 MHz

- Optimized antenna:
  - 8.2 cm external wire (antenna ground plane on board)
  - U.FL connector (optional)
  - SMA connector (optional)

Development environments

- Standard Arduino development environment for Mac, Windows, and Linux
- Atmel Studio 7 IDE (Windows)
- ARM mbed (planned)

Wireless protocol software »RadioShuttle«

- Secure message transmission, receipt is confirmed, lost data is automatically repeated
- Insecure message transmission (requires less time/energy), e.g. temperature data
- Parallel sending of different messages to one or more stations (energy saving in the background)

- Unique 32-bit device ID (device number) per LoRa participant, unique 16-bit app ID (program number for communication)

Data security

- AES 128-bit encryption
- Login with encrypted password and a random number (SHA-256)
- Hackerproof

Operating mode

- As a node (Node-offline)
- As a node (Node-online)
- As a station (Server)

More information:
www.arduino-hannover.de

Technical guide:
www.radioshuttle.de/en/longra-en/board-en/

Typical applications

Antenna 868 MHz

Particulate sensor

LoRa board

LoRa board prototypes