T-Echo User Guide

LILYGO®

Version 1.0 Copyright © 2022

About This Guide

This document is intended to help users set up the basic software development environment for developing applications using hardware based on the **T-Echo**. Through a simple example, this document illustrates how to use **Arduino**, including the menu based configuration wizard, compiling the **Arduino** and firmware download to the **NRF52840** module.

Release Notes

	Date	Version	Release notes			
	2022.08	V1.0	First release.			
Wire-I2C	BME280(Optional) SDA P0.26 SCL P0.27 433/470Mhz LORA SX1262	LoRa Antenna MISO P0.23 MOSI P0.22 SCLK P0.19 CS P0.24 RST P0.25 LORa Pin DIO1 P0.20	TX RX Wake Reset PPS	P1.08 P1.09 P1.02 P1.05 P1.04	G	PS nable LEDS
	B68/915Mhz Acry	DIO3 P0.21 Busy P0.17 /lic logo	BAT_ADC POWER_EN	P0.16 P0.04 P0.12		P1.03 P1.01 P0.14
- 102535 + 3.70 850mPh	P0.11 P0.11 RST = Button1	SoftRF			MISO MOSI SCLK	P1.06 P0.29 P0.31
Flash CS P1.15	BAT Button2 P1.10	and LilyGO ME HOR-9-95 DE LO-45	Soft an Lily	A A A A A A A A A A A A A A A A A A A	CS DC RST BUSY	P0.30 P0.28 P0.02 P0.03
MISO P1.13 MOSI P1.12 SCK P1.14	LILYGO -	T-ECHO nRF5284	E-Pa Board PINM	per 1AP	BL	P1.11

Table of Contents

1.	Introd	luction1
	1.1.	T-Echo1
	1.2.	Arduino1
	1.3.	Preparation1
2.	Get S	Started2
	2.1.	Download the Arduino Software
		2.1.1. Install Prerequisites
		2.1.2. Toolchain Setup
	2.2.	Install the Arduino Software3
	2.3.	Set up Path
3.	Confi	gure4
4.	Conn	ect5
5.	Test	Demo6
6.	Uploa	ad Sketch7
	6.1.	Build and Flash7

Introduction

1.1. T-Echo

T-Echo is a development board. It can work independently. It consists of NRF52840 SOC, LoRa chip SX1262 and GNSS module.

The nRF52840 is fully multiprotocol capable with full protocol concurrency. It has protocol support for Bluetooth LE.

The nRF52840 is built around the 32-bit ARM® Cortex[™]-M4 CPU with floating point unit running at 64 MHz. The ARM TrustZone® CryptoCell cryptographic unit is included onchip and brings an extensive range of cryptographic options that execute highly efficiently independent of the CPU. It has numerous digital peripherals and interfaces such as high speed SPI and QSPI for interfacing to external flash and displays, PDM and I2S for digital microphones and audio, and a full speed USB device for data transfer and power supply for battery recharging.

Xinyuan provides the basic hardware and software resources that empowers application developers to build their ideas around the NRF52 series hardware. The software development framework provided by Xinyuan is intended for rapidly developing Internetof-Things (IoT) applications, with LoRa, Bluetooth, GPS and flexible power management and other advanced system features.

T-Echo can also be hand-held, wall-mounted or placed on a table to run

1.2. Arduino

A set of cross-platform applications written in Java. The Arduino Software IDE is derived from the Processing programming language and the integrated development environment of the Wiring program. Users can develop applications in Windows/Linux/ MacOS based on Arduino. It is recommended to use Windows 10. Windows OS has been used as an example in this document for illustration purposes.

1.3. Preparation

To develop applications for NRF52840 you need:

- PC loaded with either Windows, Linux or Mac operating system
- Toolchain to build the Application for NRF52840
- Arduino that essentially contains API for NRF52840 and scripts to operate the Toolchain
- The NRF52840 board itself and a USB cable to connect it to the PC

Get Started

2.1. Download the Arduino Software

The quickest how to install the Arduino Software (IDE) on Windows machines

2.1.1. Quick Start Guide

The website provides a quick start tutorial

• Windows:

https://www.arduino.cc/en/Guide/Windows

• Linux:

https://www.arduino.cc/en/Guide/Linux

• Mac OS X:

https://www.arduino.cc/en/Guide/MacOSX

2.1.2. Installation steps for Windows platform Arduino



Enter the download interface, select Windows installer to install directly

2.2. Install the Arduino Software

💿 Arduino Setup: Installation Opt	ions	5. ⁰⁰ 6		\times
Check the components you w you don't want to install. Clic	ant to install a Next to conti	ind uncheck the inue.	compone	ents
Select components to install:	Install Ardu Install USB Create Star Create Des Associate .i	ino software driver 't Menu shortcut ktop shortcut ino files		
Space required: 392.7MB				
Cancel Nullsoft Install Sys	tem v2.46	< <u>B</u> ack	Nex	t >
Arduino Setup: Installing Extract: c++.exe		-		×
Show <u>d</u> etails				

Wait for installation

Nullsoft Install System v2.46

Cancel

⊆lose

< <u>B</u>ack

Configure

3.1 Install nRF52 Environment

Open Arduino, open preferences

-> add https://adafruit.github.io/arduino-board-index/package_adafruit_index.json to the board installation manager address list

Preferences		×		
Settings Network				
Sketchbook location:				
D:\Documents\Arduino	Browse			
Editor language:	English (English) v (requires restart of Arduino)			
Editor font size:	25			
Interface scale:	Automatic 100 * (requires restart of Arduino)			
Theme:	Default theme \checkmark (requires restart of Arduino)			
Show verbose output during:	🗹 compilation 🗹 upload			
Compiler warnings:	None 🗸			
Display line numbers				
Enable Code Folding				
🗹 Verify code after upload				
Use external editor				
Aggressively cache compiled core				
Check for updates on startup				
✓ Update sketch files to new extension on save (.pde → .ino)				
Save when verifying or uploading				
Additional Boards Manager URLs: https://adafruit.github.io/arduino-board-index/package_adafruit_index.json				
More preferences can be edited directly in the file				
C:\Users\15840\AppData\Local\Arduino15\preferences.txt				
(edit only when Arduino is not running)				
	OK Cancel			

Open the board installation manager, wait for the index update to complete, select 'Adafruit nRF52 by Adafruit' and click install

🥺 Boards Manager	×
Type All v nrf52 overus included in virs yeckayer Arduino Primo, Arduino Primo Core. Online help More info	^
Adafruit nRF52 by Adafruit Boards included in this package: Adafruit Bluefruit nRF52 Feather. <u>Online help</u> More info	0.9.1 V Instal

Connect

You are almost there. To be able to proceed further, connect board to PC, check under what serial port the board is visible and verify if serial communication works.



Test Demo

Download the zip file		
E Xinyuan-LilyGO / T-Echo		\star 🛇 Edit Pins 🗸
<> Code ③ Issues 2 \$? Pull requests ④ Actions	🗄 Projects 🕮 Wiki 😲 Se	curity 🗠 Insights 🐯 Settings
😚 main 🗸 😚 1 branch 🕟 0 tags		Go to file Add file - Code -
Pedestrian11 Merge branch 'main' of ht	tps://github.com/Xinyuan-LilyGO/T-E	E Clone 3
D_file	Add files via upload	HTTPS SSH GitHub CLI
Enchiridion/L76K	docs: L76k enchirdion	https://github.com/Xinyuan-LilyGO/T-Echo.
bootloader	Merge pull request #8 from mkinn	Use Git or checkout with SVN using the web URL.
docs	perfect: LoRa Precautions for sett	[上] Open with GitHub Desktop
examples	test: sleep	
image	perfect: image	Open with Visual Studio
🖿 lib	test: sleep	Download ZIP
gitignore	misc: Ignore all files in .vscode dire	ctory 2 months ago
	Initial commit	13 months ago
C README.MD	Merge branch 'main' of https://gith	nub.com/Xinyuan-LilyGO/T-Echo into 8 days ago
T-Echo_Schematic.pdf	Add files via upload	10 months ago

Open https://github.com/Xinyuan-LilyGO/T-Echo

Copy all the folders in the lib directory to "C:\User\<YourName>\Documents\Arduino\libraries"

6.

Upload Sketch

6.1. Select Board

Tools << Board << Nordic nRF52840(PCA10056)

Tools Help				
Auto Format Archive Sketch	Ctrl+T			
Fix Encoding & Reload				
Manage Libraries	Ctrl+Shift+I			
Serial Monitor	Ctrl+Shift+M			
Serial Plotter	Ctrl+Shift+L			
WiFi101 / WiFiNINA Firmware Updater				
Board: "Adafruit Metro M0 Express"	3	Boards Manager		
USB Stack: "Arduino"	2	Adafruit Boards (in sketchbook)	>	
Debug: "Off"	2	Adafruit nRF52 Boards	2	Adafruit Feather nRF52832
Port: "COM16"	2	Adafruit nRF52 Boards (in sketchbook)	;	Adafruit Feather nRF52840 Express
Get Board Info		Adafruit SAMD (32-bits ARM Cortex-M0+ and Cortex-M4) Boards	:	Adafruit Feather Bluefruit Sense
Programmer "Atmel-ICE over OpenO('D"	Adafruit SAMD (32-bits ARM Cortex-M0+ and Cortex-M4) Boards (in sketchbook)	:	Adafruit ItsyBitsy nRF52840 Express
Burn Rootloader	1	Alorium Technology SAMD (32-bits Cortex-M4) Boards	:	Adafruit Circuit Playground Bluefruit
Bum bouloader		Arduino AVR Boards	:	Adafruit CLUE
ount = 1;		Arduino Mbed OS Boards (nRF52840 / STM32H747)		Adafruit Bluefruit Metro nRF52840 Express
irePort = 0;		Arduino nRF528x Boards (Mbed OS)	-	Nordic nRF52840DK (PCA10056)
		Arduino SAMD (32-bits ARM Cortex-M0+) Boards	1	Particle Xenon
ces from 50 to 800KHz I2C speeds.		ESP32 Arduino	3	Raytac MDBT50Q-RX Dongle

6.2. Upload

Sketch << Upload



FCC Caution:

Any Changes or modifications not expressly approved by the party responsible for compliance could void the user's authority to operate the equipment.

This device complies with part 15 of the FCC Rules. Operation is subject to the following two conditions: (1) This device may not cause harmful interference, and (2) this device must accept any interference received, including interference that may cause undesired operation.

This transmitter must not be co-located or operating in conjunction with any other antenna or transmitter.

IMPORTANT NOTE:

Note: This equipment has been tested and found to comply with the limits for a Class B digital device, pursuant to part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference in a residential installation. This equipment generates, uses and can radiate radio frequency energy and, if not installed and used in accordance with the instructions, may cause harmful interference to radio communications. However, there is no guarantee that interference will not occur in a particular installation. If this equipment does cause harmful interference to radio or television reception, which can be determined by turning the equipment off and on, the user is encouraged to try to correct the interference by one or more of the following measures:

-Reorient or relocate the receiving antenna.

-Increase the separation between the equipment and receiver.

-Connect the equipment into an outlet on a circuit different from that to which the receiver is connected.

-Consult the dealer or an experienced radio/TV technician for help.

FCC Radiation Exposure Statement:

This equipment complies with FCC radiation exposure limits set forth for an uncontrolled environment .