Doorgy Project Group
May 27, 2021

Developer Guide

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1 System Overview

The Doorgy Project is a smart pet door that allows the user to lock and unclock the door with nothing but an app. The Doorgy Project is split into three major parts, the Doorgy Service which handles the physical operations, the Doorgy App which allows the user to controls the service, and the Doorgy Server which serves as a relay and an authentication service between the Doorgy Service and the Doorgy App.

2 Electrical Specifications

2.1 Block Diagram

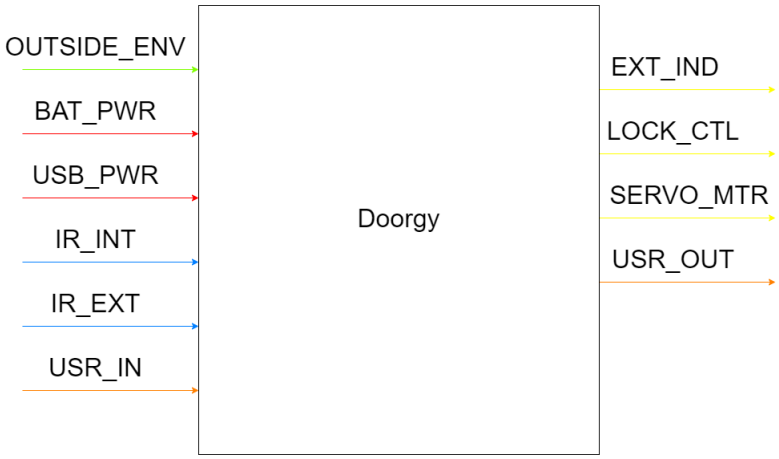

Figure 1: System Block Diagram

2.2 Interface Definition

Name	Type	Definition
BAT_PWR	DC POWER	• Voltage 5.1 V • Current 1.2 A
USB_PWR	DC POWER	• Voltage 5.1 V • Current 1.2 A
IR_EXT	Analog Signal	• Voltage 5.1 V • Current 1 mA
IR_INT	Analog Signal	• Voltage 5.1 V • Current 1 mA
USR_IN	DATA	• Standards: 2.4GHz IEEE 802.11b/g/n • Protocol: Restful API • Format: JSON Object

3 User Guide

3.1 Prerequisite

This project requires the Doorgy Installation Package that comes with the specific components require for the installation. Schematics of these components are available should you choose to create your own. You will not be able to proceed without these components.

Doorgy is part of the Doorgy Project, all parts of Doorgy Project are required to operate.

3.2 Doorgy Installation Package

- 1x Doorgy Printed Circuit Board
- 1x Raspberry Pi Zero WH
- 1x 16GB Doorgy Service Micro SD Card
- 2x HC-SR501
- 1x Doorgy LED Assembly
- 2x Servo Motors with Extended Arms
- 1x Battery Pack
- 1x Micro USB Power Supply
- 1x Doorgy Exterial Frame (Top/Bottom/Left/Right)
- 1x Doorgy Interial Frame (Top/Bottom/Left/Right) with Circuit Housing
- 1x Doorgy Door
- 1x Doorgy Door Connector
- 1x Doorgy Servo Connector
- 4x Doorgy M10 Nuts
- 2x Doorgy M10 Screws
- 4x Doorgy M2 IR Screws
- 4x Doorgy M2.5 Raspi Screws
- 4x Doorgy M2 PCB Screws
- 4x Doorgy M3 Battery Screws
- 4x Doorgy M2.5 Servo Screws

3.3 Required Software

If you have the Doorgy Service Micro SD Card, these has already been installed and configured.

If you do not have a Doorgy Service Micro SD Card, you will need a Micro SD Card with Raspbian Lite installed, more information available on https://www.raspberrypi.org/documentation/installation/installing-images/. Once you have a Micro SD Card with Raspbian Lite installed, you can use the `doorgy-init.sh` located in `resources` folder of this repo to install the require softwares.

- UFW
- Fail2ban
- Git
- Node.js
- NPM
- Express.js
- mongoDB
- bluetooth

- bluez
- libbluetooth-dev
- libudev-dev
- pigpio

Note: You should always secure your Raspberry Pi, Doorgy Service Micro SD Card will have security enabled by default. If you are using `doorgy-init.sh`, only firewall will be enabled. You will need to setup your Raspbian user and configure Fail2ban manually, more information available on https://www.raspberrypi.org/documentation/configuration/security.md.

3.4 Configuring Doorgy Service

If you have the Doorgy Service Micro SD Card, these has already been installed and configured.

3.4.1 From GitHub

```
git clone https://github.com/Anthonykung/Doorgy.git
sudo npm run config
sudo npm install
sudo systemctl enable doorgy
```

If the installation fail, you can use sudo npm run install to try again. Sudo is required for all operations.

Note: The service will ask for a username and password, it is suggested that you create an account on the app beforehand.

Once the service has been successfully configured, you can either start or reboot to start the service.

3.4.2 From NPM

```
mkdir ~/Doorgy
cd ~/Doorgy
sudo npm install doorgy
sudo npm run config
sudo npm run install
sudo systemctl enable doorgy
```

If the installation fail, you can use sudo npm run install to try again. Sudo is required for all operations.

Note: The service will ask for a username and password, it is suggested that you create an account on the app beforehand.

Once the service has been successfully configured, you can either start or reboot to start the service.

3.5 Install

This assume you have the Doorgy Installation Package and met all the prerequisites, if not please check that you have met the prerequisites before continuing.

3.5.1 Physical Installation

1. Remove the door and place it on a table

2. Mark the cutting area of Width 274mm X Height 399mm on the door
3. Leave at least 3 inches of space on each side and 4 inches on the bottom
4. Cut the door on the marked location, this should give you a rectangular hole for the Doorgy Exterial Frame
5. Assemble the Doorgy Interial and Exterial Frame, the sides should fit the holes on the top and bottom
6. On the Interial Frame, push the Doorgy Door in place with the hook on the top facing inside
7. Place the Doorgy Exterial Frame to the door (facing the outside), this should give you a tight fit
8. Place the Doorgy Interial Frame on the other side overlapping the Doorgy Exterial Frame sliding the screw on the Exterial Frame to the hole of the Interial Frame
9. Using the M10 Doorgy Nuts, tighten the Interial Frame with the Exterial Frame (the hole is located on the Interial Frame)
10. Using the M10 Doorgy Screws, secure the circuit housing to the door (you will need to dril a 1/2 inches hole on the door, do not penetrate the door)
11. Attach the IR sensors to the sensor housing and secure it with the M2 screws, connect the Interial IR to IR_INT and Exterial IR to IR_EXT
12. Attach the servo motors to the servo housing and secure it with the M2.5 screws, match the connector with the number on the housing (note, you will need to connect it to the PCB and the PCB with the Raspberry Pi and power it up once, then adjust the servo arms to 3 O'clock position before proceeding, you may want to consider connecting your Raspberry Pi with the app and set the door to unlock position for SERVO2)
13. Attach the Doorgy PCB to the PCB housing and secure it with the M2 screws
14. Attach the Battery Pack to the battery housing and secure it with the M3 screws
15. Attach the Raspberry Pi to the Raspberry Pi housing and secure it with the M2.5 screws
16. Attach the servo arm to the Servo Connecter and connect the Servo Connector with the Door Connector, hook the Door Connector to the hook on top of the door, do not touch the servo arm on the left
17. Plugin the Micro USB power cable or attach 4x AA batteries (not included) to the battery pack
18. You are good to go! (Remember to tidy up the power cable so it doesn't get pulled out!)

For a visual illustration of the frame installation, please check out this video: https://doorgy.anth.dev/videos/Doorgy%20Frame%20v39%20Animation.mp4.

3.5.2 System Configuration

1. Install the Doorgy app on your smartphone
2. Open the Doorgy app and follow the display to create an account
3. Enjoy your awesome new smart pet door!

4 Design Artifacts

4.1 Doorgy Block Diagram

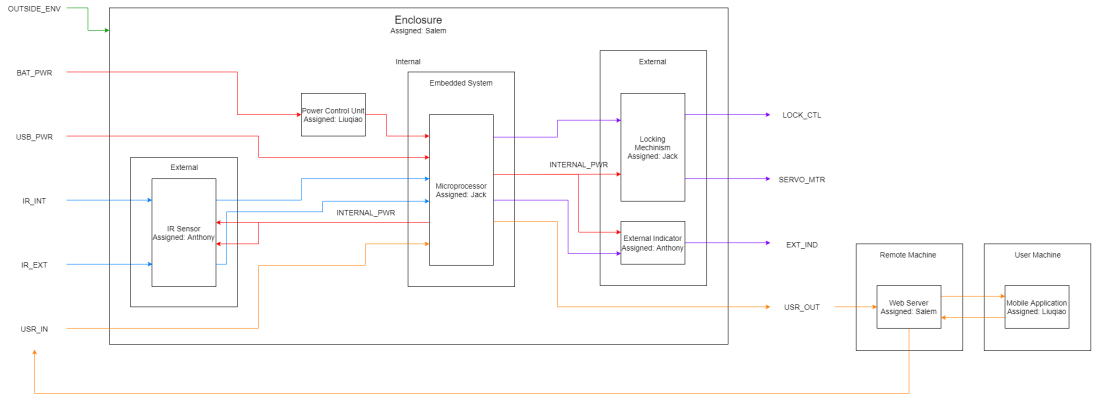

Figure 2: Doorgy Block Diagram

The block diagram shows the interfaces of each block in our project. The blocks consist of The the enclosure, power supply, external indicator, door/lock system, microcontroller desgin, app interface, web server, and IR sensors.

4.2 Doorgy Frame 3D Models

The Doorgy Frame 3D STL files can be found on the Doorgy Service GitHub repository. The Doorgy Frame Fusion 360 model can be found on `https://a360.co/3bQ4yVy`

4.3 Mechinical Drawings

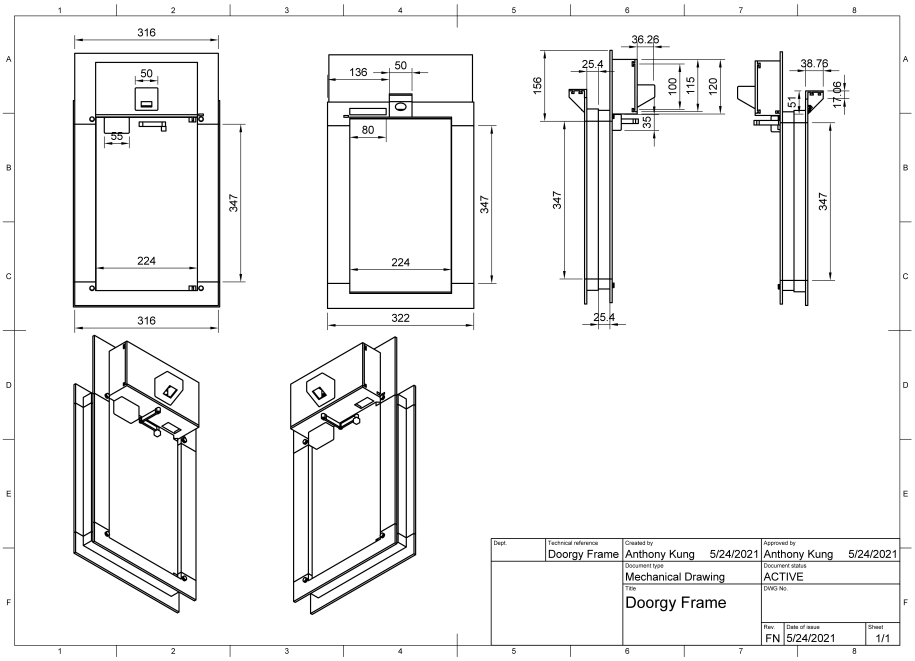

Figure 3: Doorgy Frame Mechinical Drawing

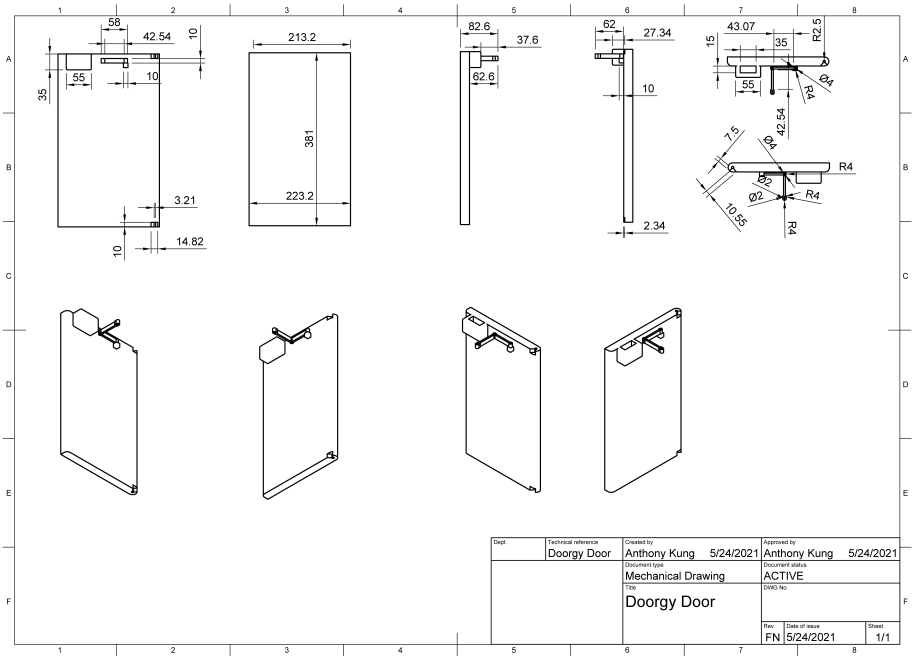

Figure 4: Doorgy Door Mechinical Drawing

The above 3d models show the 3d printed frame that is designed to fit into a 224mm by 347mm pet door. A basic design for the PCB and servos mounts is also presented. A similar model is used to secure the door at the top of the pet door. The IR sensors are encased on either side of the door and angled 45 degrees downward to limit unwanted detection. The box on the door is designed to catch a rhino attachment to a servo and lock the door.

5 PCB Information

The Doorgy Project comes with a PCB with a size of Width 100mm X Height 80mm and is composed of two layers.

5.0.1 PCB Layout

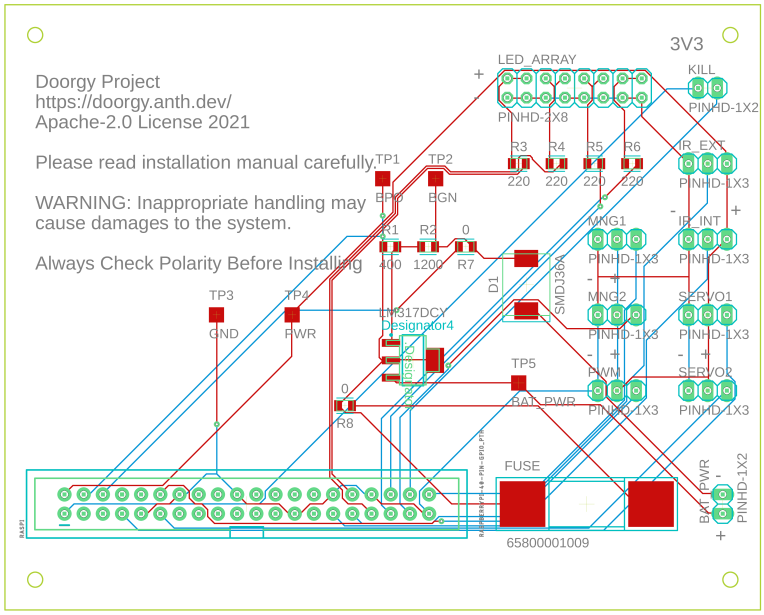

Figure 5: Doorgy PCB Layout

The PCB Layout shows the exact layout that was used to place the components onto the PCB, a seperate placement file (can be found on GitHub) is used to provide the exact coordinates for placement.

5.0.2 PCB Schematics

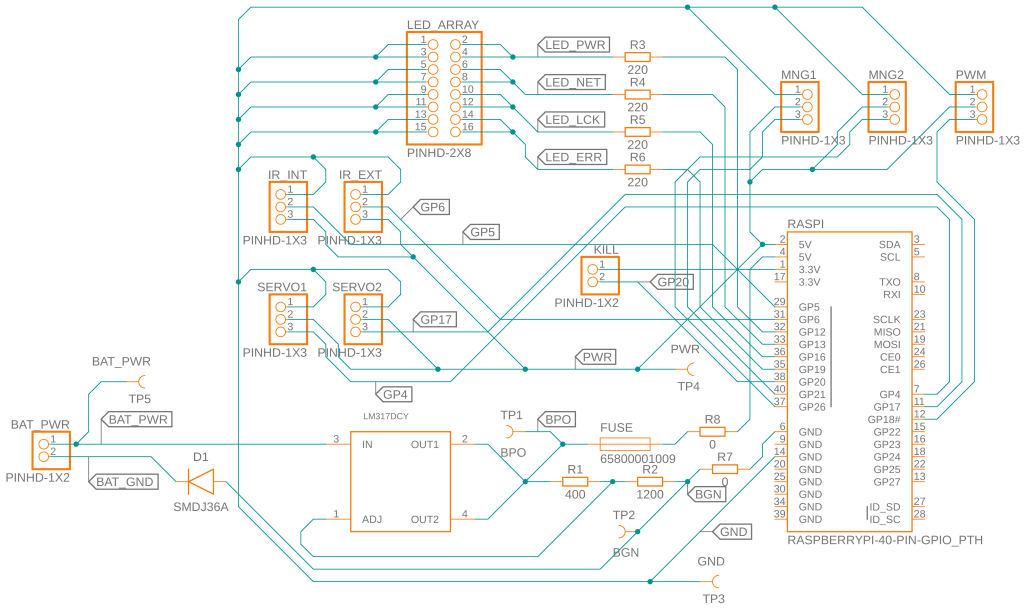

Figure 6: Doorgy PCB Schematics

The PCB schematics contains everything that the Doorgy Project uses, all electronic components has to go through the Doorgy PCB and therefore, is the overall schematics of the entire project. The red traces show the surface mount pad and the green represents the bottom layer of traces on the PCB. The grey text is information of handling the PCB as well as references to the project website.

5.0.3 PCB Picture

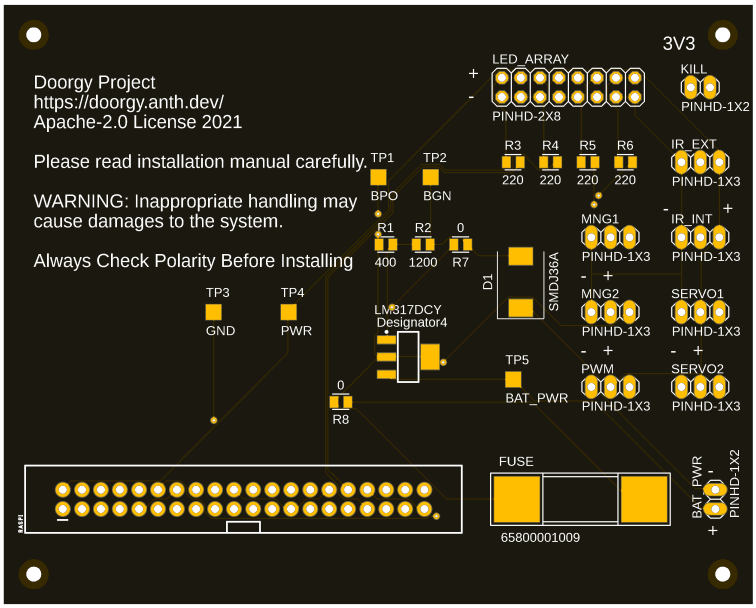

Figure 7: Doorgy PCB Picture

6 Part Information

Designator	Value	Footprint	Part Number	Alternate Part Number	MANUFACTURER	Quantity	Costs
BAT_PWR	PINHD-1X2	CONN_TH_2000-2P_D	C155876	C155876	Ckmtw (Shenzhen Cankemeng)	1	$0.6300
D1	SMDJ36A	"SMC DO-214AB"	SMDJ36A	C108363	Littelfuse	1	$0.8486
FUSE	65800001009	SMD Fuse Holders RoHS	65800001009	C122783	Littelfuse	1	$1.9850
IR_EXT	PINHD-1X3	SIP-3_2.5 x 7.62 x 2.54P	C49257	C49257	BOOMELE (Boom Precision Elec)	1	$0.6550
IR_INT	PINHD-1X3	SIP-3_2.5 x 7.62 x 2.54P	C49257	C49257	BOOMELE (Boom Precision Elec)	1	$0.6550
KILL	PINHD-1X2	HDR-TH_2P-P2.54-V	RE-H022TD-1190 (LF) (SN)	C160332	JST Sales America	1	$0.3675
LED_ARRAY	PINHD-2X8	HDR-TH_8P-P2.54-V-R2-C4-S2.54	A2541HWV-2x4P	C239344	CJT (Changjiang Connectors)	1	$0.1441
LM317DCYR	LM317DCYR	SOT-223	LM317DCYR	C51466	Texas Instruments	1	$0.7738
MNG1	PINHD-1X3	SIP-3_2.5 x 7.62 x 2.54P	C49257	C49257	BOOMELE (Boom Precision Elec)	1	$0.6550
MNG2	PINHD-1X3	SIP-3_2.5 x 7.62 x 2.54P	C49257	C49257	BOOMELE (Boom Precision Elec)	1	$0.6550
PWM	PINHD-1X3	SIP-3_2.5 x 7.62 x 2.54P	C49257	C49257	BOOMELE (Boom Precision Elec)	1	$0.6550
R1	400	0805_R	TR0805B400RPCT	C152298	Ever Ohms Tech	1	$0.6440
R2	1200	0805_R	0805W8F1201T5E	C17379	UNI-ROYAL (Uniroyal Elec)	1	$0.0900
R3	220	0805_R	0805W8F2200T5E	C17557	UNI-ROYAL (Uniroyal Elec)	1	$0.0880

7 Part Information

Designator	Value	Footprint	Part Number	Alternate Part Number	MANUFACTURER	Quantity	Costs
R4	220	0805_R	0805W8F2200T5E	C17557	UNI-ROYAL (Uniroyal Elec)	1	$0.0880
R5	220	0805_R	0805W8F2200T5E	C17557	UNI-ROYAL (Uniroyal Elec)	1	$0.0880
R6	220	0805_R	0805W8F2200T5E	C17557	UNI-ROYAL (Uniroyal Elec)	1	$0.0880
R7	0	0805_R	0805W8F0000T5E	C17477	Uniroyal Elec	1	$0.0940
R8	0	0805_R	0805W8F0000T5E	C17477	Uniroyal Elec	1	$0.0940
RASPI	RASPBERRYPI-40-PIN-GPIO_PTH	HDR-TH_40P-P2.54-V-M-R2-C20-S2.54	C124383	C221057	Ckmtw (Shenzhen Cankemeng)	1	$0.0940
SERVO1	PINHD-1X3	SIP-3_2.5 x 7.62 x 2.54P	C49257	C49257	BOOMELE (Boom Precision Elec)	1	$0.6550
SERVO2	PINHD-1X3	SIP-3_2.5 x 7.62 x 2.54P	C49257	C49257	BOOMELE (Boom Precision Elec)	1	$0.6550
TP1	BPO	N/A		N/A			
TP2	BGN	N/A		N/A			
TP3	GND	N/A		N/A			
TP4	PWR	N/A		N/A			
TP5	BAT_PWR	N/A		N/A			

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References

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https://doorgy.anth.dev

(2) Doorgy Service:
https://github.com/Anthonykung/Doorgy

(3) Doorgy Service NPM Registry:
https://www.npmjs.com/package/doorgy

(4) Doorgy Server:
https://github.com/Anthonykung/Doorgy-Server

(5) Doorgy App:
https://github.com/Anthonykung/Doorgy-App

(6) Doorgy App Expo Download:
https://expo.io/@anthonykung/Doorgy