

# **ANTI-THEFT SYSTEM FOR CATALYTIC CONVERTER**

## **Team: Theft-Away**

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## **Electrical Detail Schematic**

## I. Electrical Block Diagram

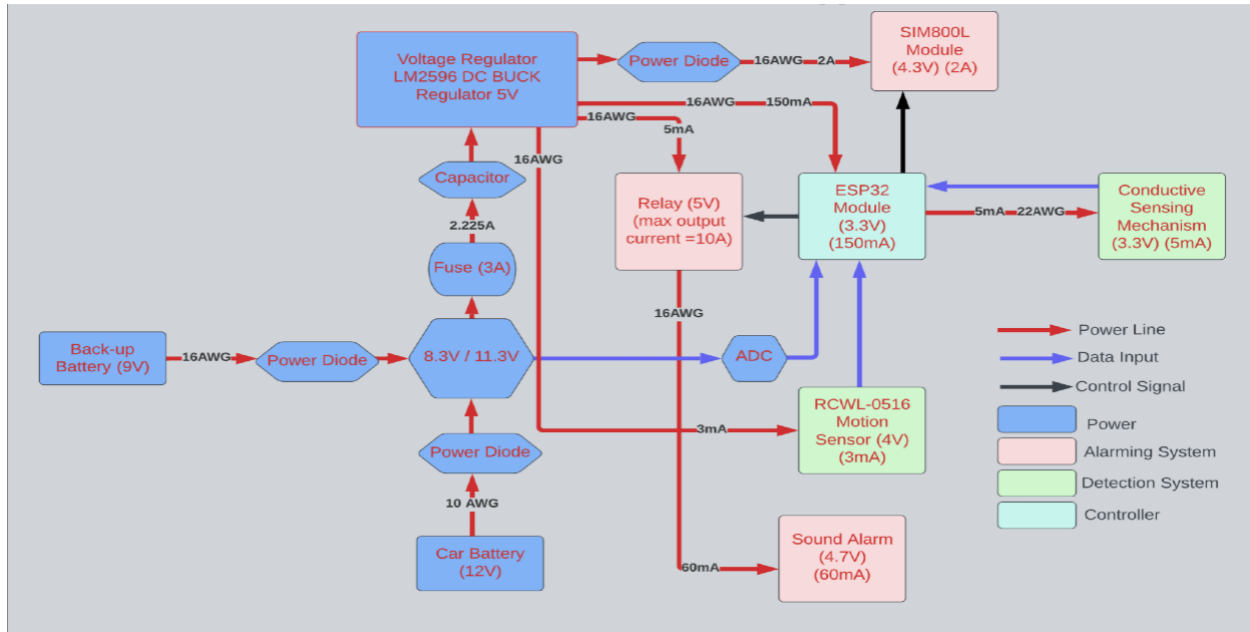


Figure 1. Electrical Block Diagram

On the electrical side, the electronics will consist of the following:

### 1.1. Power:

The electronics will primarily be powered by 12V car battery. To enhance the redundancy of the system, a secondary 9V battery will also be added. Each battery connects with a diode before joining together. Normally, because 12V car battery has a higher voltage than secondary 9V battery, no current from the backup battery will be drawn because of diodes, only car battery will supply power to other components. However, in case of failing car battery, the 9V backup battery will supply power instead. A capacitor of 900uF is added to temporarily provide power when the main power supply is switched from car battery to backup battery, so other electronics will still smoothly operate. A fuse is also added to protect the critical component from overcurrent. The power subsystem is then added a DC-DC buck converter to step voltage down to 5V.

### 1.2. Alarming system:

The alarming system will consist of a loud horn connected to power via relay, and a GSM module. The relay needs 5V battery from DC-DC converter to operate. The sound alarm, i.e. horn, draws 60mA and 5V from the converter. The GSM module requires an operating voltage of 4.3V, so power from the converter (5V) needs to be stepped down first via a diode, which can be approximate as drawing 0.7 constant voltage. The GSM module typically draws about 100mA, but peak current may reach 2A.

### 1.3. Detection system:

Detection system comprises of conductive sensing mechanism, which draws 5mA from 3.3V regulated source of the microcontroller, and the motion sensor, which draws a current of 10mA directly from the diodes connect to the battery (about 8.3-11.3V).

### 1.4. Microcontroller:

The microcontroller is ESP-32, which will be powered by 5V voltage from converter. It may draw a current of 150mA. The microcontroller will receive digital input from motion sensor and conductive sensing mechanism, then send control signal to the relay and GSM module. The ADC unit on microcontroller will also sample the voltage from battery.

## II. Electrical Schematic

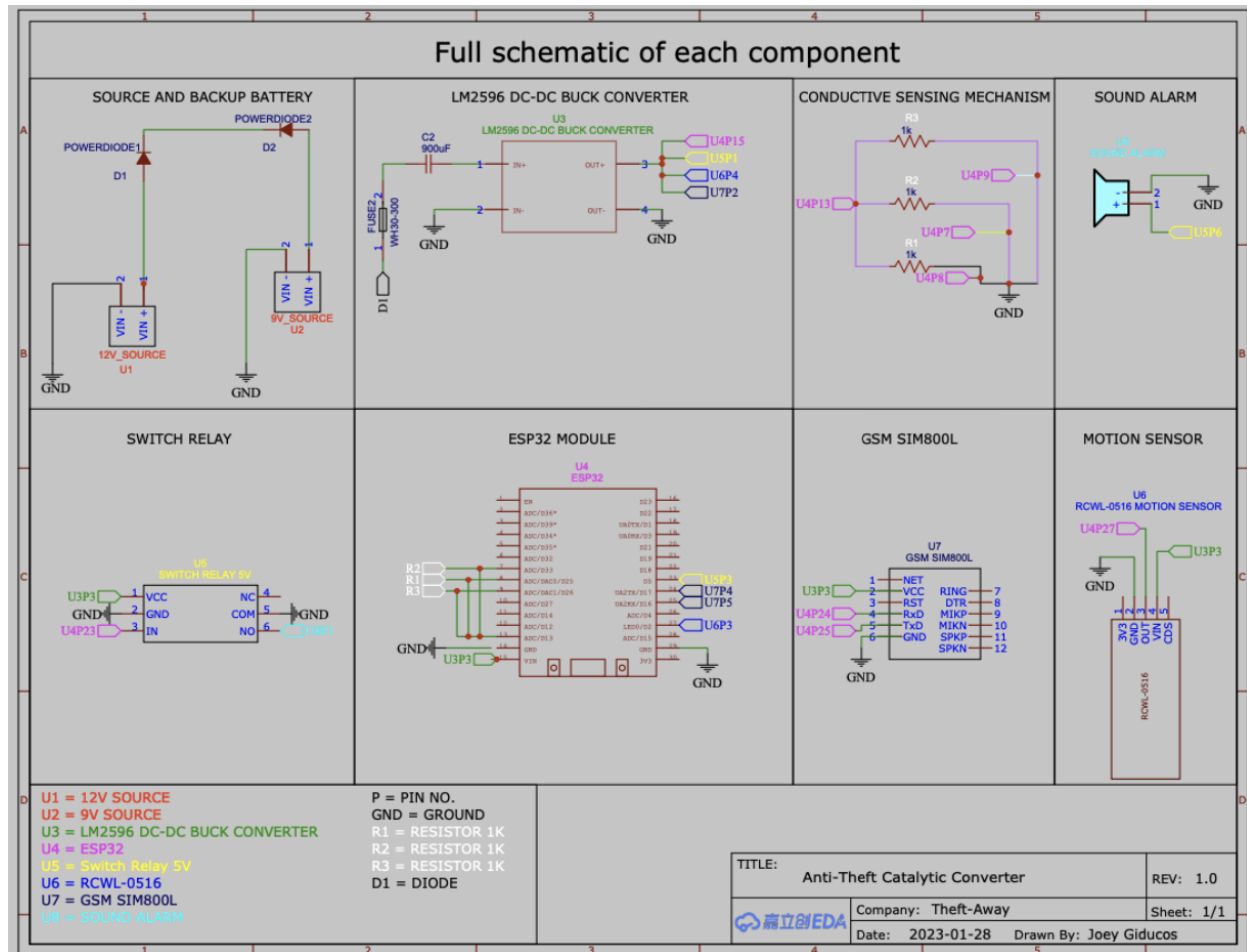


Figure 2. Full Schematic of Each Component

### III. Wiring Diagram

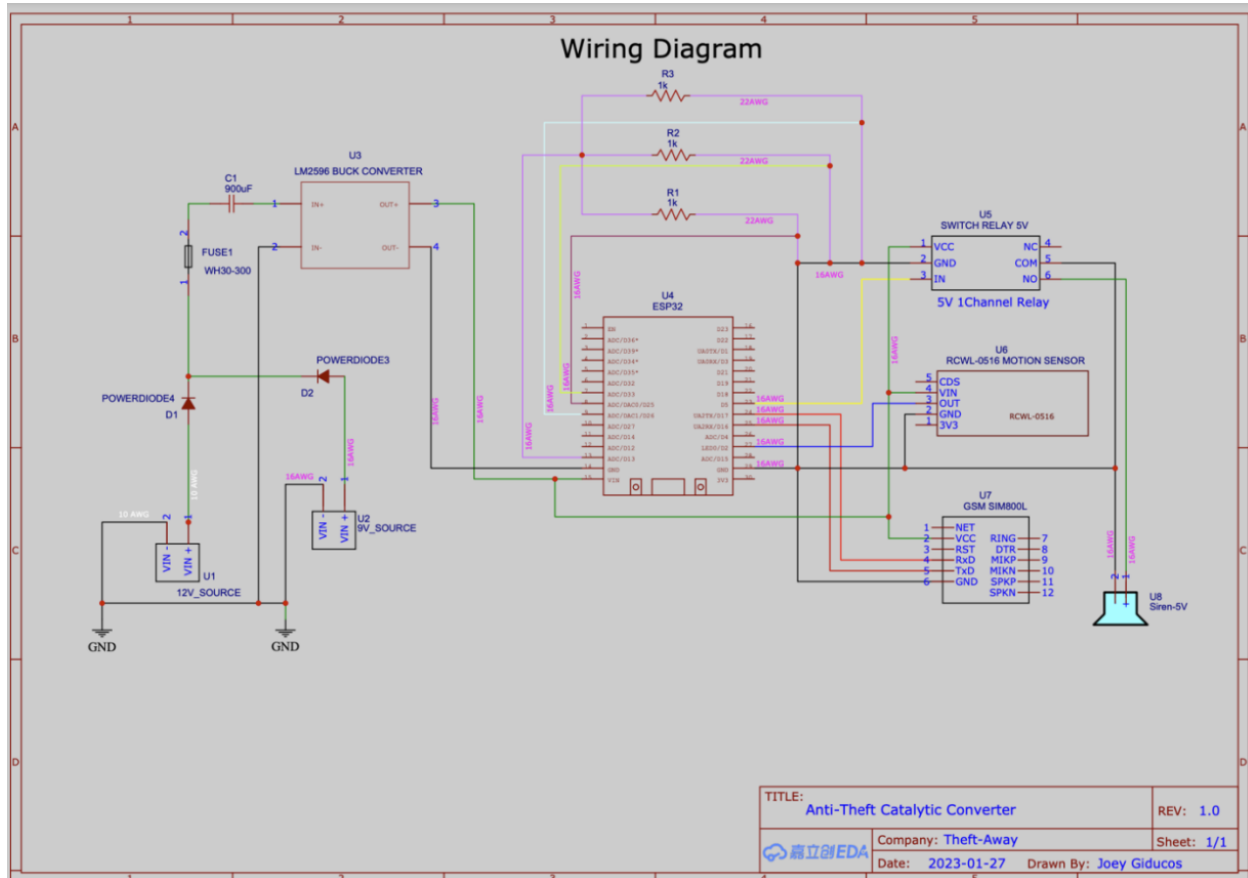


Figure 3. Wiring Diagram

10 AWG wires will be used for connection between batteries to the rest of the system. Because the system includes a fuse to limit the current from battery, 10 AWG wire can safely handle the current without overheating. 22 AWG wire will be used for within the conductive mechanism, as it only requires a small amount of current. 16 AWG will be used for all other connections.

### IV. PCB Design

The PCB design here is merely conceptual, we have not yet finalized whether to build PCB or not. Having a PCB design will make us have more choices to consider in the future.

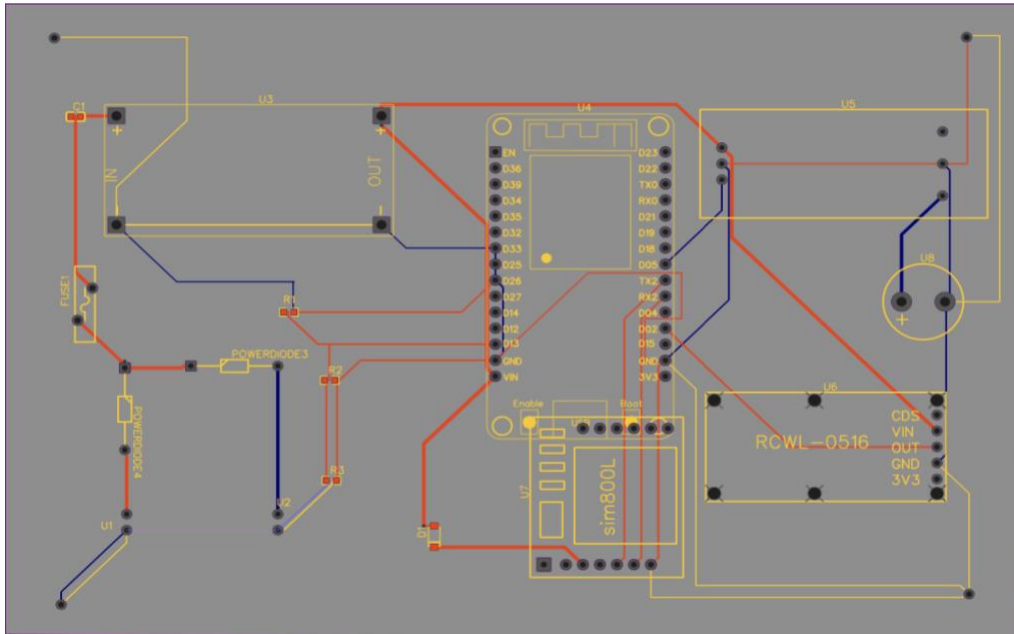


Figure 4. Manually drawn diagram for PCB

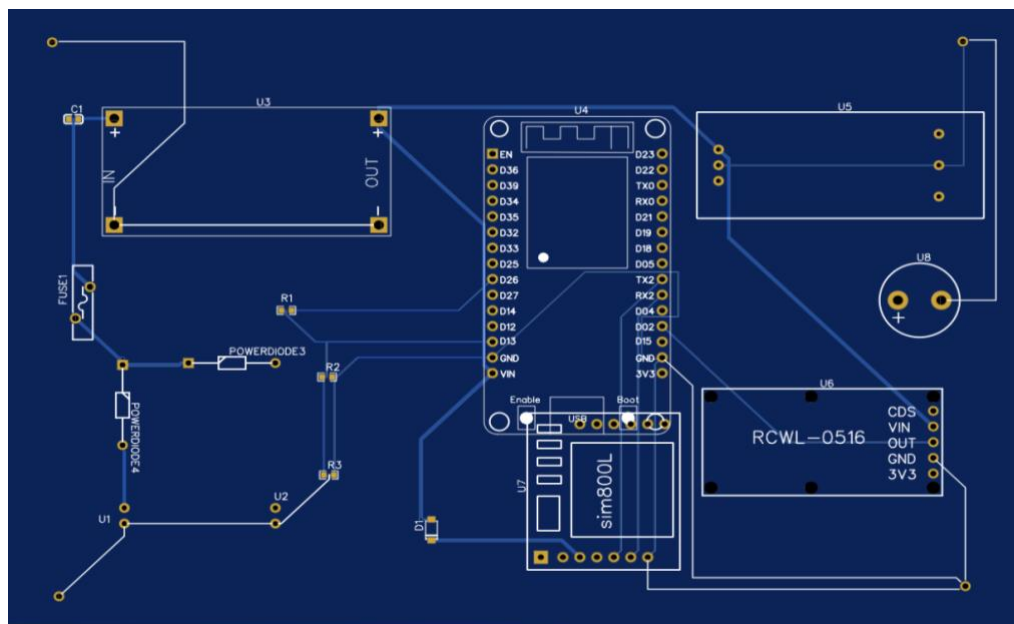


Figure 5. Final PCB