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Build

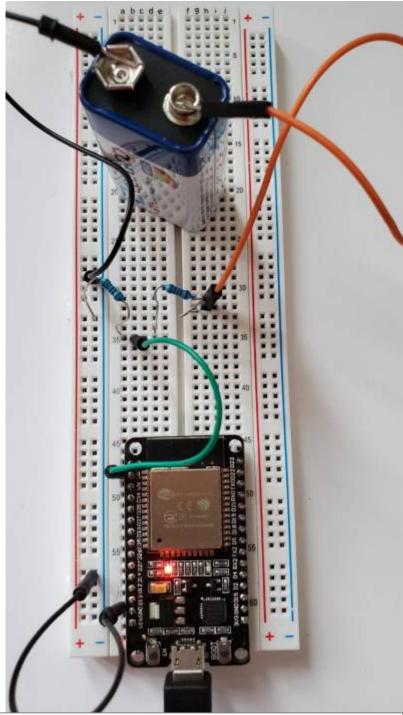


figure 5.1 Setup showing the connections for battery voltage reading on ESP32

Schematics

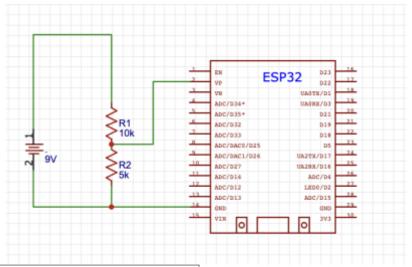


figure 5.2 Schematic for battery voltage reading

Code & Description

```
*//Reading of voltage is done by the Analog Pin reader.
*//Because the max input voltage on the pins is 3.3 V we cant directly read
the 9V battery voltage.
                          // Analog pin has to be ADC 1, because ADC 2 are
int potPin = A0;
used by wifi and wont work
int potValue;
float voltage =0;
                        // float because its a decimal number not integer
float battery percent;
void setup() {
 Serial.begin(115200);
  {
  potValue = analogRead(potPin);
  float voltage = (3.3/4095.0) * potValue * 2.73;
 *//Resistors and other components can have a varying number of outputs,
although they are usually minimal
 *//additional calibration has to be done in order to get accurate readings
  *//We have found that the use of a multimeter will help in determining the
values that will provide best outcomes
  *//Because we have different boards, resistors and setups, the final code
could have alterations in the calibrating numbers
 Serial.print("potValue:");
 Serial.print(potValue);
```

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```
*//While the serial monitor output can be changed, we are more interested is
in the overall result which is transmitted
*//to Grafana for easy access
 Serial.print(" Voltage:");
 Serial.print(voltage);
 Serial.println("V");
  battery percent = mapfloat(voltage, 3.0, 9.0, 0 , 100); // min value cut
off at 6V and maximum voltage is 9V
 if (battery percent > 100)
   battery_percent = 100;
 if (battery percent < 0)</pre>
   battery percent = 0;
*//For the conversion between the actual Analog reading to a percentage we
use a mapFloat function
*//It uses the input range from the analog sensor to produce another set of
useful values
*//float values will allows to get decimal numbers and a more accurate
reading
*//We use a the min voltage value, then max voltage value, and min
percentage and max percentage
*//Then we ask the program to give us the corresponding percentage value
within the parameters
 Serial.print("Battery Percentage = ");
 Serial.println(battery_percent);
 if (voltage > 7.0 && voltage < 8.2)</pre>
                                                 // THIS VALUES HAVE TO
CHANGE ACCORDING TO SOURCE
 {Serial.print("Low bat");
                                                  // USE VOLTMETER TO FIND
THE ACCURATE VOLTAGE
 }
 if (voltage <6.5)</pre>
                                                  //cut-off value is at 5.4V
according to specification , we use 6V
  {Serial.print("Replace Battery");
```

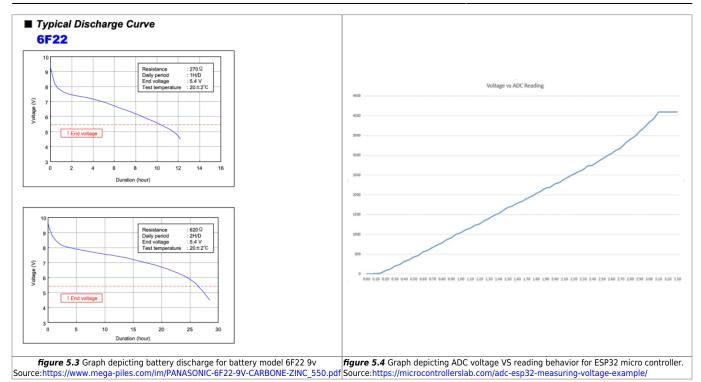
```
delay(1000);
*//We have included a notification that will tell us what is going on with
the voltage and overall battery status
*//We include a parameter that will produce 2 warning signs:
*// LOW BAT means that our battery is within 7 to 8.2V
*// REPLACE BATTERY means voltage has dropped below 6.5V, number obtained
from data sheet
 float mapfloat(float x, float in min, float in max, float out min, float
out max)
  return (x - in min) * (out max - out min) / (in max - in min) + out min;
*//here we include the parameters and equation that will serve as the
backbone for the mapFloat function above.
void loop()
*// NO LOOP NEEDED,,, ONE VALUE WITH WARNING SHOULD BE DISPLAYED ON GRAFANA
```

Issues & Characteristics

The actual voltage will not be 100% accurate because the ADC pins have a non-linear behavior. This means according to the Figure # down below that, above a certain threshold the reading will produce equal inputs, thus we consider that from 3 to 3.3V the battery is at a 100% charge.

Additionally we can see that the discharge behavior of the battery we are using, which is a model 6F22 is a curve that has a specific equation, we could find the curve's equation and use it to better represent the discharge values, however since we plan to upgrade our battery system we purposely used a simpler version in our code to achieve good enough results.

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Results

```
sslef Zs = 04ss
f SpotValue:0 Voltage:0.00V
Battery Percentage = 0.00
Replace Batteryets Jun 8 2016 00:22:57
rst:0x1 (POWERON_RESET),boot:0x13 (SPI_FAST_FLASH_BOOT)
configsip: 0, SPIWP:0xee
clk_drv:0x00,q_drv:0x00,d_drv:0x00,cs0_drv:0x00,hd_drv:0x00,wp_drv:0x00
mode:DIO, clock div:1
load:0x3fff0030,len:1344
load:0x40078000,len:13516
load:0x40080400,len:3604
entry 0x400805f0
potValue:2566 Voltage:5.65V
Battery Percentage = 44.09
Replace Batteryets Jun 8 2016 00:22:57
rst:0x1 (POWERON_RESET),boot:0x13 (SPI_FAST_FLASH_BOOT)
configsip: 0, SPIWP:0xee
clk_drv:0x00,q_drv:0x00,d_drv:0x00,cs0_drv:0x00,hd_drv:0x00,wp_drv:0x00
mode:DIO, clock div:1
load:0x3fff0030,len:1344
load:0x40078000,len:13516
load:0x40080400,len:3604
entry 0x400805f0
potValue:0 Voltage:0.00V
Battery Percentage = 0.00
Replace Batteryets Jun 8 2016 00:22:57
rst:0x1 (POWERON_RESET),boot:0x13 (SPI_FAST_FLASH_BOOT)
configsip: 0, SPIWP:0xee
clk_drv:0x00,q_drv:0x00,d_drv:0x00,cs0_drv:0x00,hd_drv:0x00,wp_drv:0x00
mode:DIO, clock div:1
load:0x3fff0030,len:1344
load:0x40078000,len:13516
load:0x40080400,len:3604
entry 0x400805f0
potValue:2557 Voltage:5.63V
Battery Percentage = 43.76
Replace Battery
```

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