

Introduction: AUTO VENT TT3 PROJECT

Wednesday, September 01, 2021 10:54 AM

Reason for the project:

Has been required to implement functionality to handle auto vents in a rotatory table TT3 due to new production demands.

Resolution:

The first option was to try to activate this functionality using the native resources of the system but I could not find a functional way to do it because it needs to access the plc and there is no software available for this task.

A second option was to use an external system. It could be independent of the PLC, but linked to the necessary conditions relating to the carrier stations that allow recreating safely the auto vent functionality.

After analyzing the requirements and having determined the number of inputs and outputs necessary to control the required system, I selected to build an electronic circuit using a little microcontroller such as the ATtiny85 with enough capacity for this task.

This microcontroller will be provided with the necessary interfaces for:

- Receiving signals from **the lid** when it opens completely **and** from the **airbag** when it is in a down position.
- Handles an electro-pneumatic **valve**(this valve will control the auto vents air flows).

To facilitate the construction of the circuit, I designed a **pc board**.

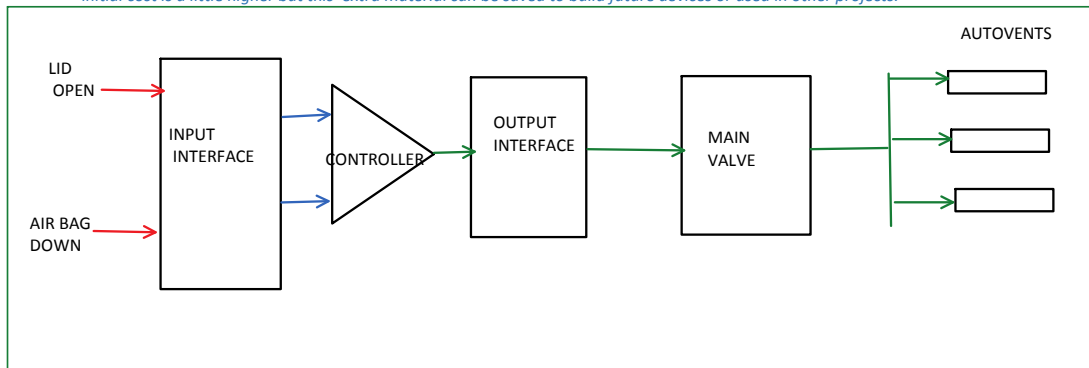
Another benefit of having a PC-board is, to make the troubleshooting easier, in case it is needed in the future.

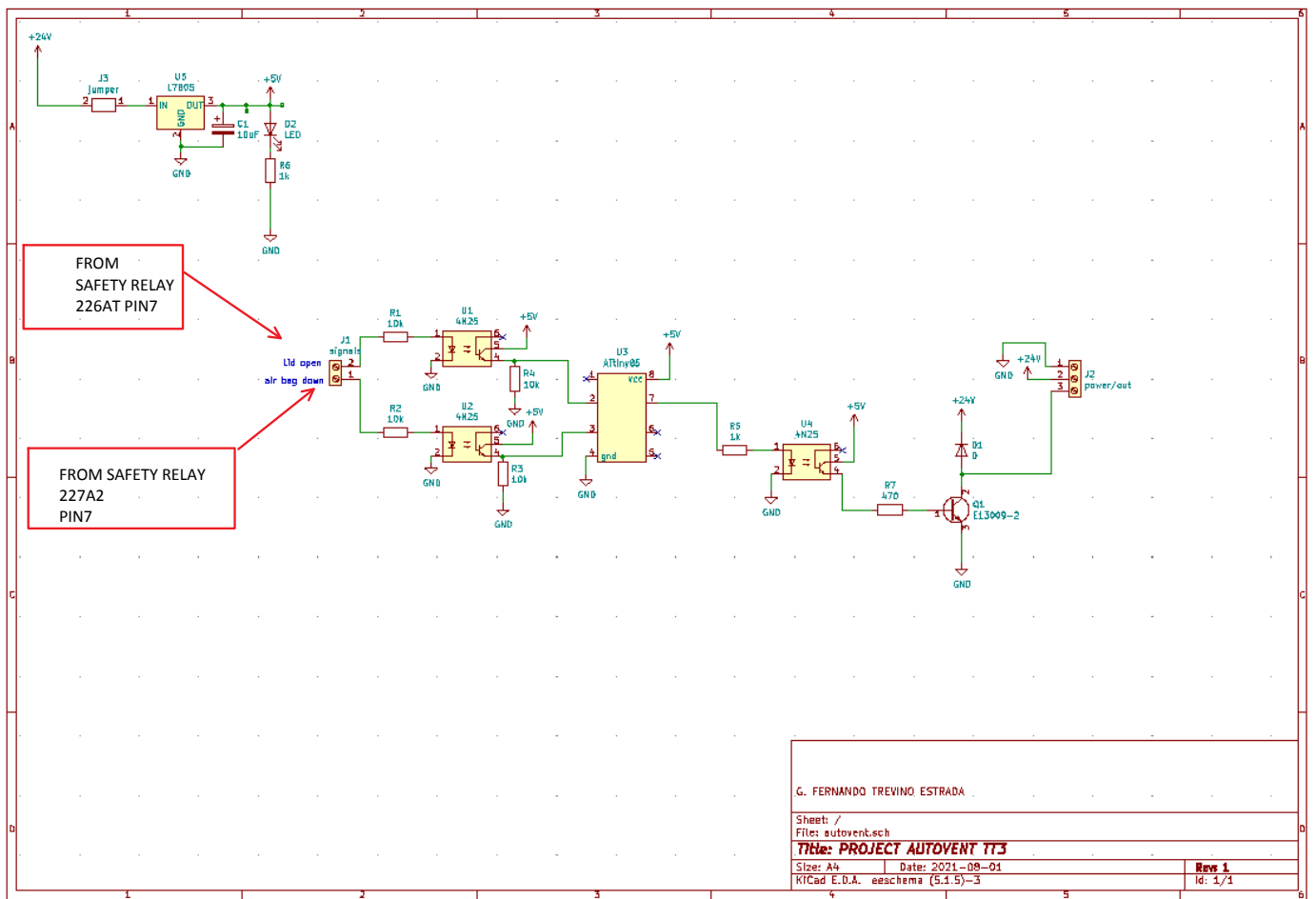
Costs.

The approximate cost for producing one unit is around 33.00 dollars.

- The time required to prepare one unit is around 2 hours.
- Initially, for this project, I spent around 10 hours to design, research, make prototypes, and testing.

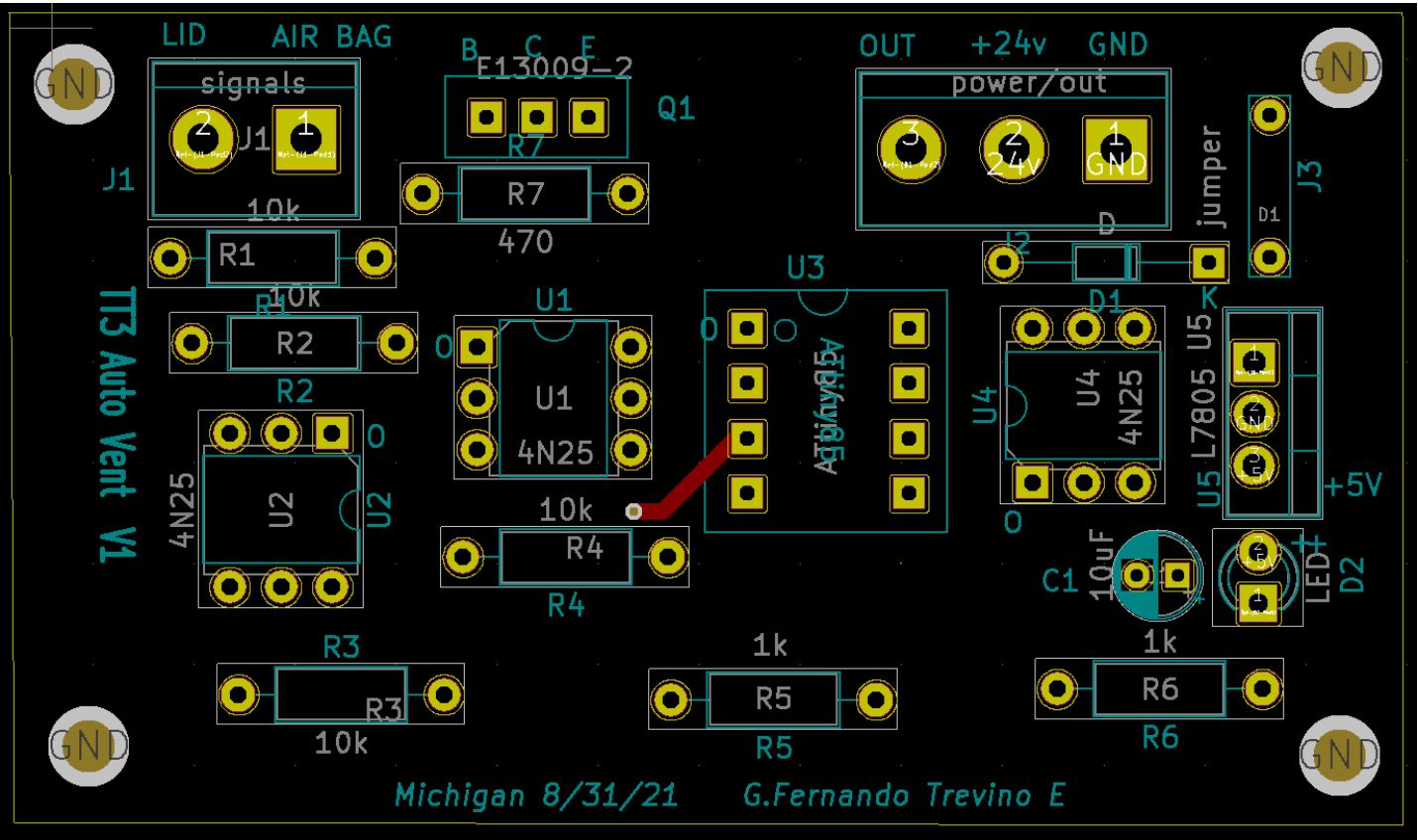
Note: Because many of the materials that are necessary for this project are only available in packages of more than one unit, the initial cost is a little higher but this extra material can be saved to build future devices or used in other projects.





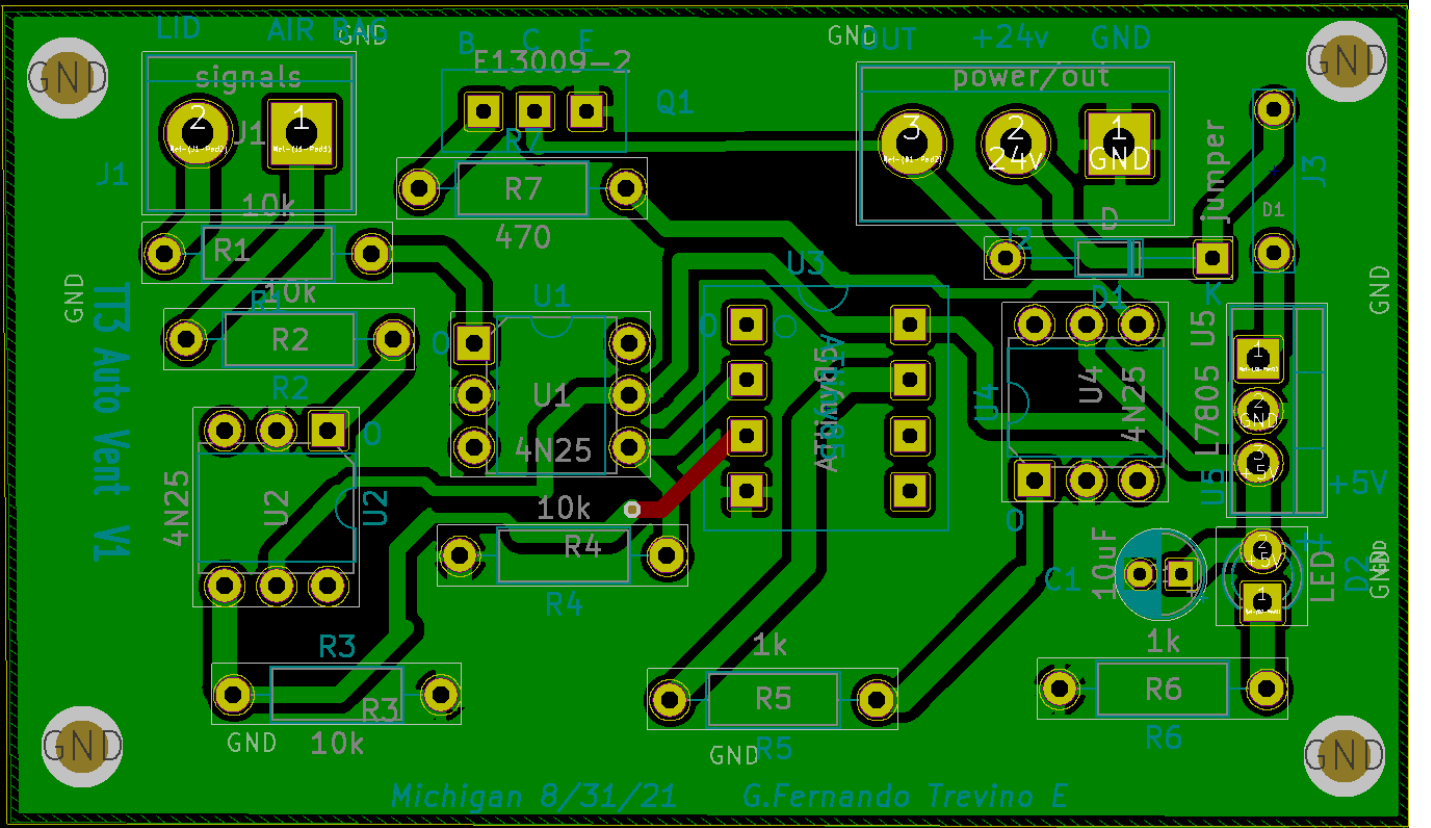
Electrical drawing: 9/1/2021 11:49 AM

Position of the pads and components



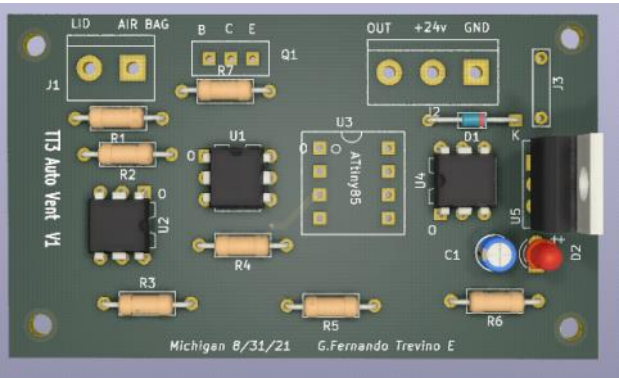
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Filling spaces with ground net



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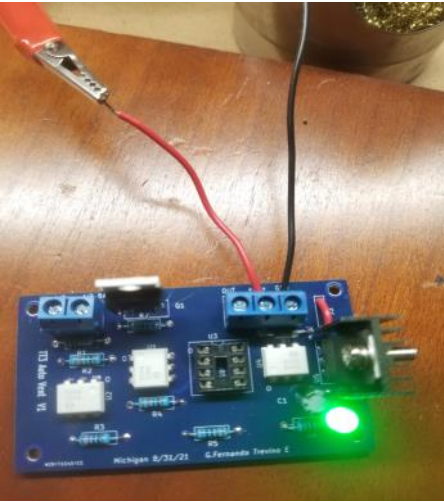
This is a simulation of the card with some of the electrical components.



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The card was sent to PCBWay for manufacturing(China).

Here the Real card with all the components assembled except the controller in a preliminary test.



Next is the code I wrote for programming the micro controller:

I used other arduino as a serial programmer for load the program inside the ATtiny85.

```

autovent_tt3.ino X
H: > autoventTT3_project > autovent_tt3 > autovent_tt3.ino
1  //*****
2  /*          PROJEC:AUTOVENT FOR TT3          */
3  /*          G.FERNANDO TREVINO              */
4  /*          7/21/2021                      */
5  //*****
6
7  //*****variables *****
8  const int lid_pin=4; //it is physicaly pin 3 in ATtiny85
9  const int bag_pin=3; //it is physicaly pin 2 in ATtiny85
10 const int output_pin=2; //it is physicaly pin 7 in ATtiny85
11
12 bool lid_open; //senses signal for lid when it is open
13 bool airbag_down; // senses signal for airbag when it is down
14
15 bool cicle=0; // to indicate when the secuencie out-in on autovent is complete(value 1)
16
17 int counter=0; //for secuencies out/in of autovent
18
19
20 //*****TIME *****
21 const int timeOn=100;
22 const int timeOff=100;
23 int t_on;
24 int t_off;
25 unsigned long time_ini_on=0;
26 unsigned long time_ini_off=0;
27 unsigned long time_elapsed_on=0;
28 unsigned long time_elapsed_off=0;
29
30 //*****Prototypes *****
31 void monitoreo();
32 void reset_cicle();
33 void secuency();
34
35 //*****
36 void setup(){
37     pinMode(lid_pin,INPUT);
38     pinMode(bag_pin,INPUT);
39     pinMode(output_pin,OUTPUT);
40     digitalWrite(output_pin,LOW);
41 }
42 //*****

```

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```

42  /*******
43  void loop(){
44      monitoreo();
45      reset_cicle();
46      secuency();
47
48      //Time managment
49
50
51      switch(t_on){
52          //=====
53          case 0://autovent is in
54              break;
55          case 1://autovent is out
56              time_elapsed_on=millis()-time_ini_on;
57
58              if(time_elapsed_on>=timeOn ) {
59                  digitalWrite(output_pin,LOW);
60                  t_on=0;
61                  t_off=1;
62                  time_ini_off=millis();
63              }
64              break;
65          }
66      }
67      //=====
68
69      switch(t_off){
70          case 0:
71              break;
72
73          case 1:
74              time_elapsed_off=millis()-time_ini_off;
75              if(time_elapsed_off>=timeOff ) {
76                  t_off=0;
77              }
78              break;
79          }
80      }
81  }
82

```

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```

83  //*****FUNCTIONS *****
84
85  void monitoreo(){
86      //Read signals
87      lid_open = digitalRead(lid_pin);
88      airbag_down = digitalRead(bag_pin);
89  }
90  //*****
91  void reset_cicle(){
92
93      if(!lid_open && !airbag_down ){
94
95          cicle=0;
96      }
97  }
98
99  //*****
100
101  void secuency(){
102
103      if(lid_open && airbag_down){
104
105          if(cicle==1){
106              goto salida;
107          }else{
108              if(t_on || t_off){
109
110                  goto salida;
111              }else{
112                  if(counter<=3){
113                      digitalWrite(output_pin,HIGH);
114                      t_on=1;
115                      time_ini_on=millis();
116                      counter++;
117                  }else{
118                      cicle=1;
119                      counter=0;
120                  }
121              }
122          }
123      }
124  }
125
126  salida ;;
127
128  }

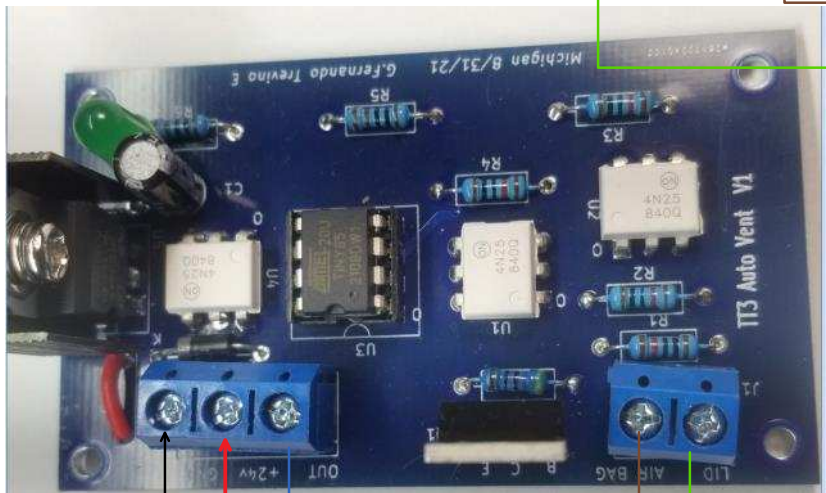
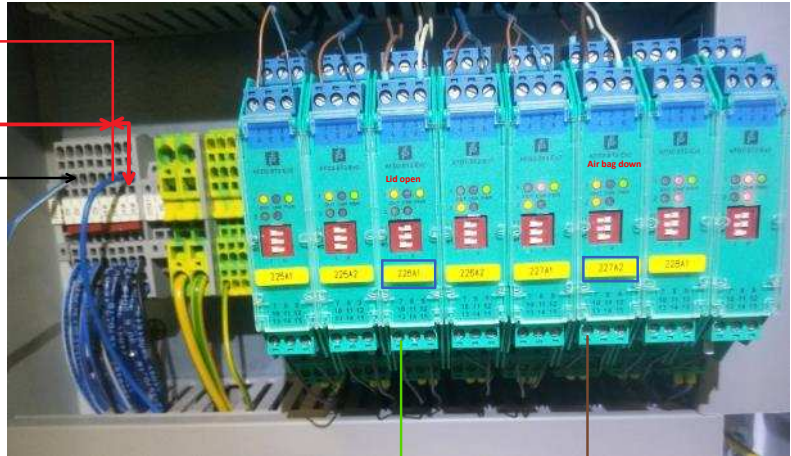
```

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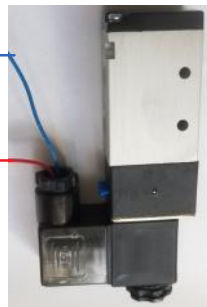
How to connect the card

SAFETY RELAYS MODULE

Take negative and +24 volts from here



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Electro pneumatic valve



Air source: was used this hose output



Outputs To auto vents

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First prototype: Autovent installed in mold of station#8

