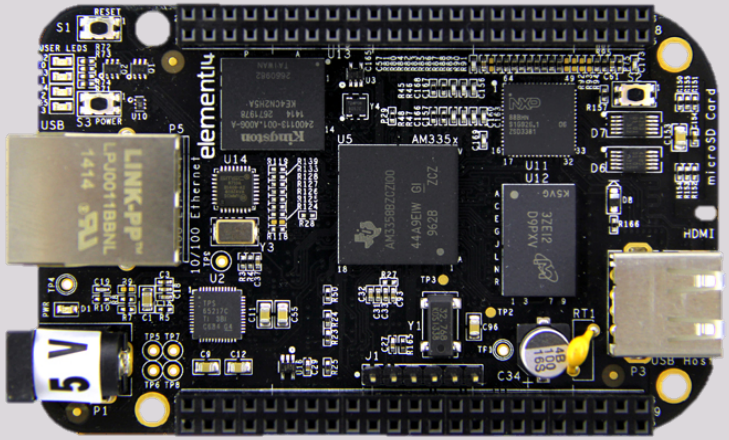
Internet of Things

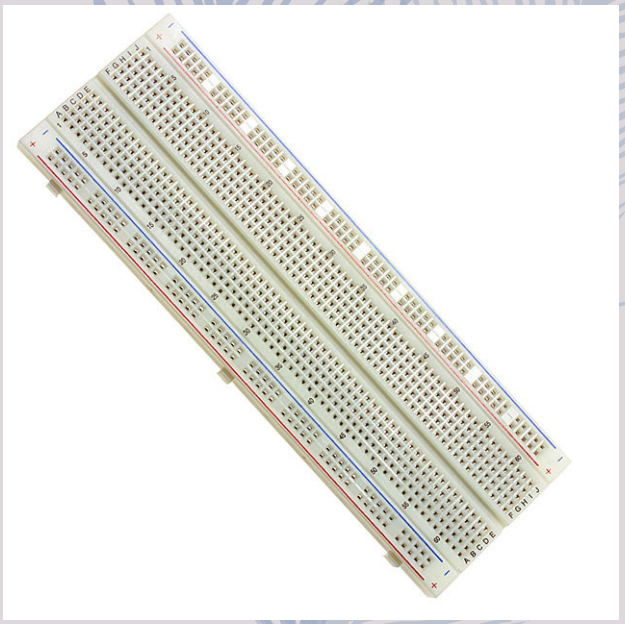
Activity: Using Sensors to Measure Distances

Sensor



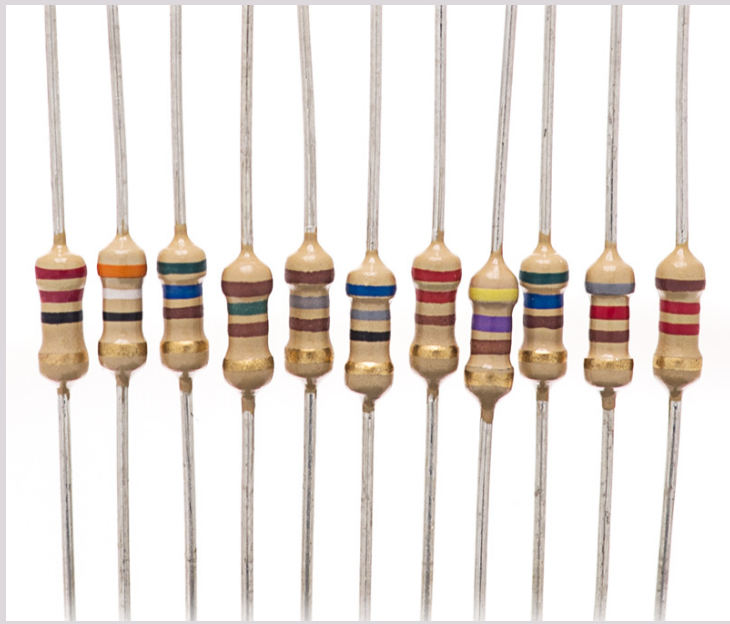
Beaglebone

Switch

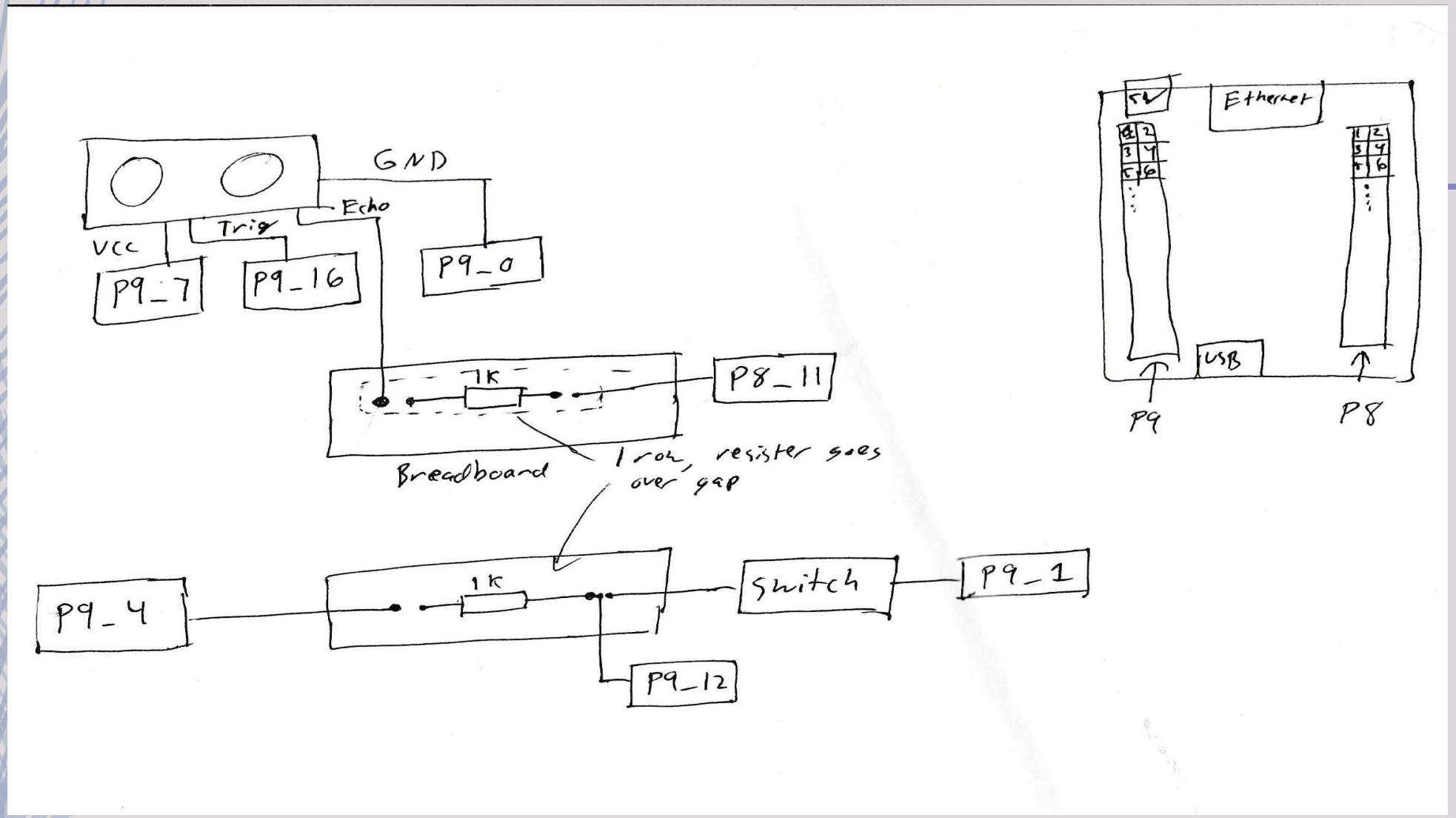


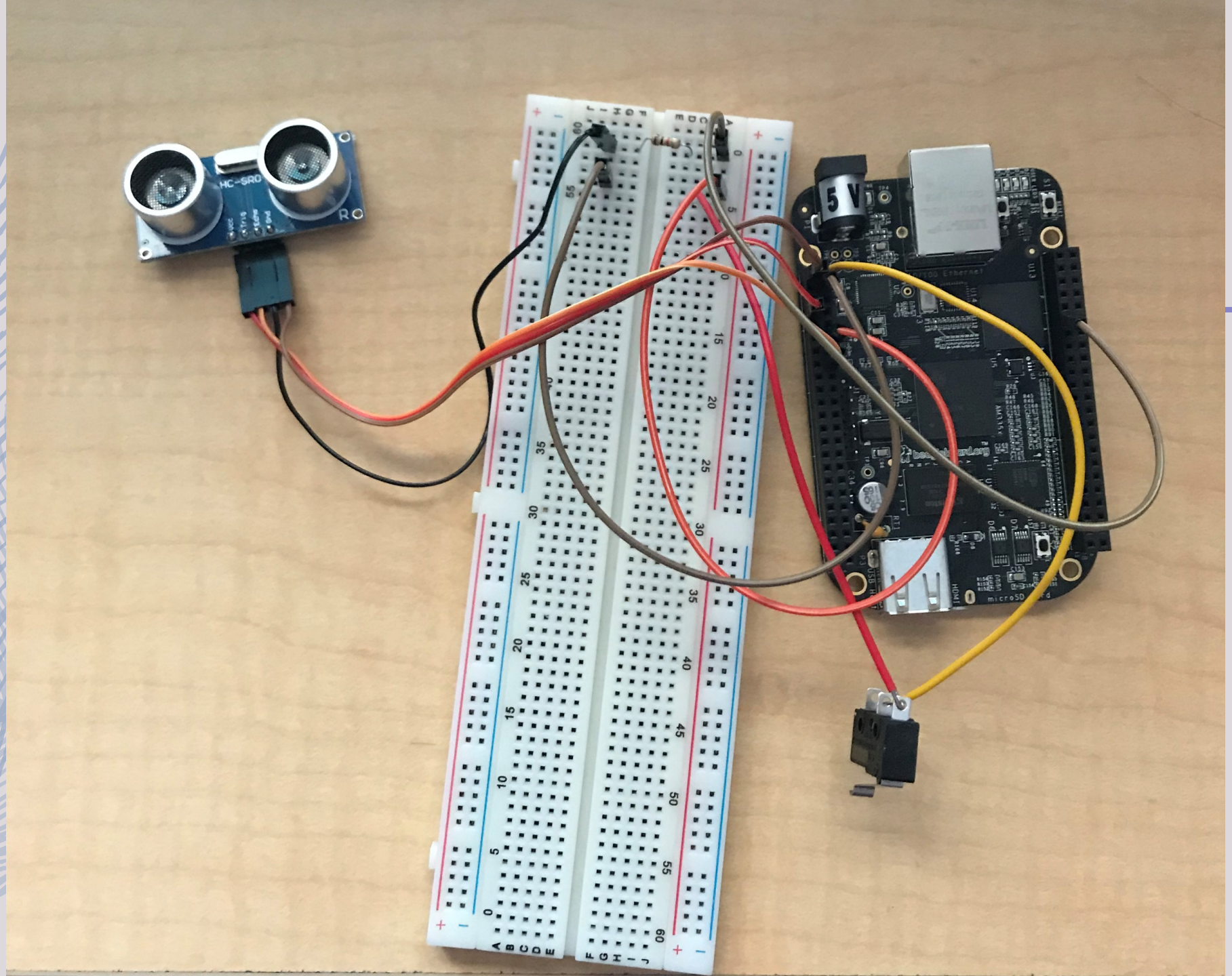
Breadboard

Wires



Resistors


GND
Echo
Trig
Vcc
P9_7
P9_16
P9_0
1K
P8_11
Breadboard
1 row, resister goes over gap
P9_4
1K
Switch
P9_1
P9_12
Ethernet
USB
P9
P8

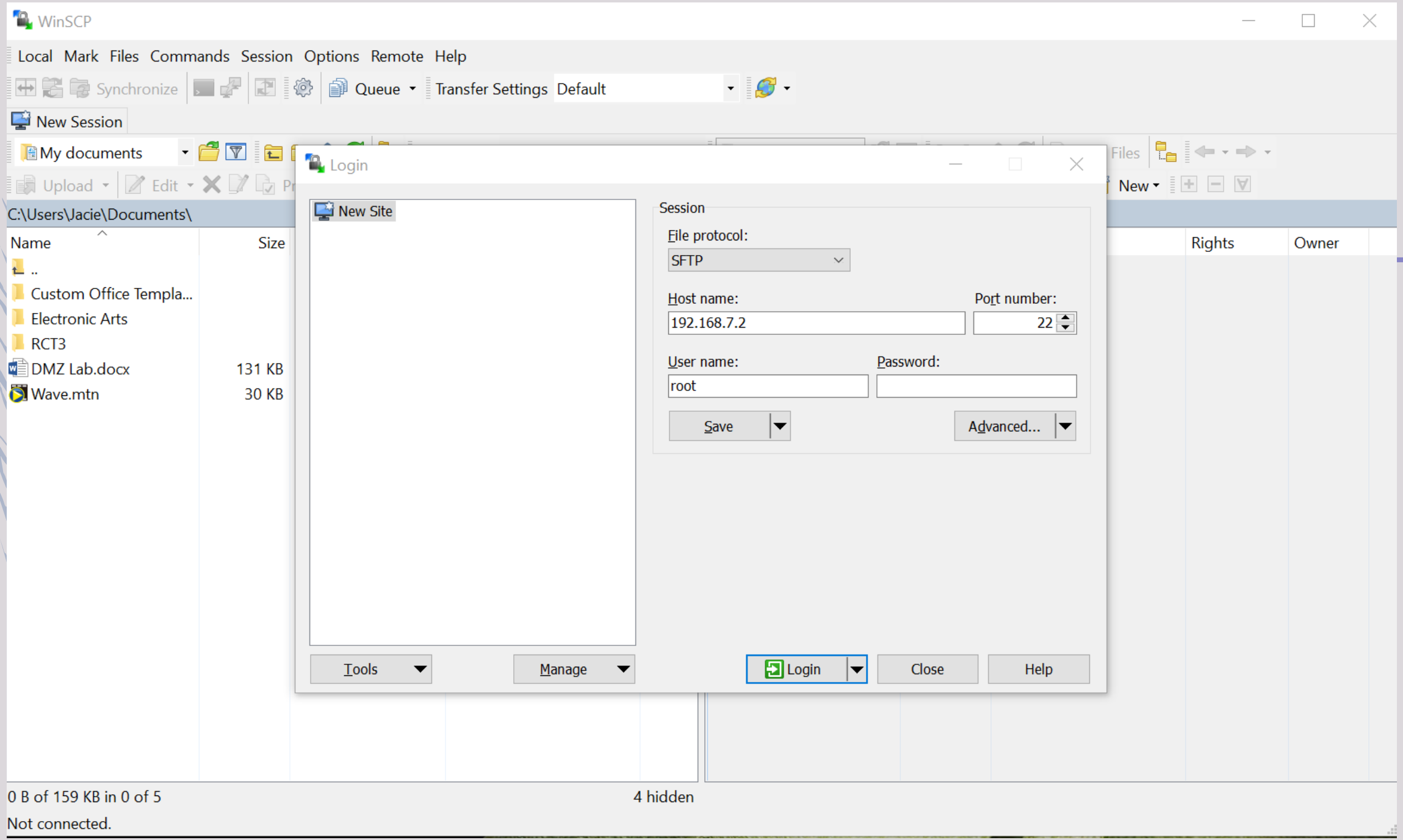

HC-SR0
5V

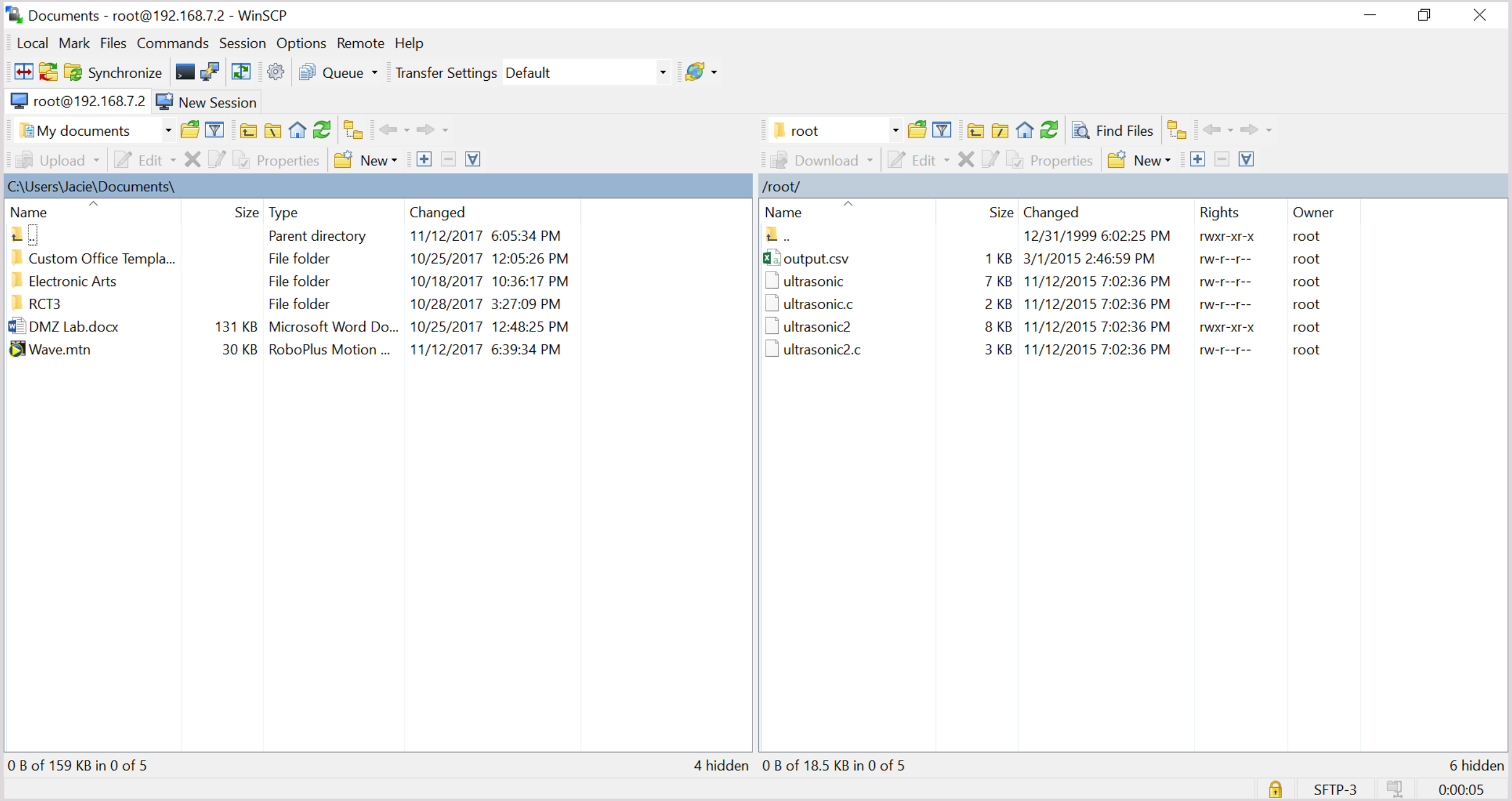
192.168.7.2 - PuTTY

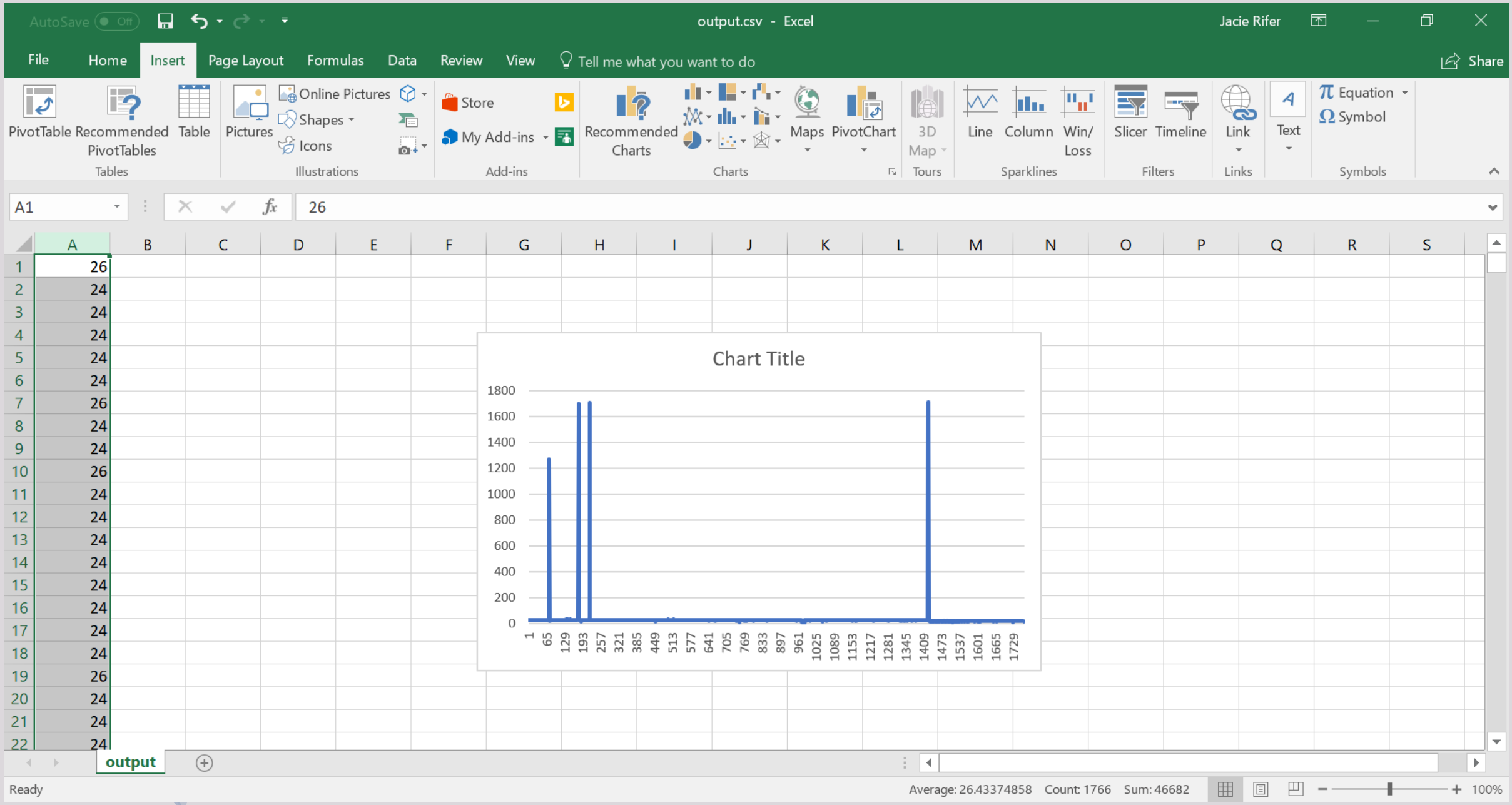
```
int main()
{
        FILE *pwm,*duty,*period,*polarity,*run,*gpi,*p45,*direction, *direction2, *gpi2;

        FILE *output;

        int value,i,count,enable;


        output = fopen("output.csv", "w");

        uint16_t input=0;
        uint8_t input_no=0,input_state=0;
        unsigned int duty_cycle =500000;
        pwm = fopen("/sys/devices/bone_capemgr.9/slots", "w");
        if(pwm == 0)
        {
                printf("Error opening slots\n");
                return 1;
        }
        fseek(pwm,0,SEEK_SET);
        fprintf(pwm,"am33xx_pwm");
        fflush(pwm);

        fprintf(pwm,"bone_pwm_P9_16");
        fflush(pwm);
        period = fopen("/sys/devices/ocp.3/pwm_test_P9_16.15/period", "w");
        if(period == 0)
        {
                printf("Error opening period\n");
                return 1;
        }
        fseek(period,0,SEEK_SET);
        fprintf(period,"%d",5000000);
        fflush(period);


        duty = fopen("/sys/devices/ocp.3/pwm_test_P9_16.15/duty", "w");
        if(duty == 0)
        {
                printf("Error opening duty\n");
                return 1;
```

192.168.7.2 - PuTTY

```
        while(1)
        {

                gpi2 = fopen("/sys/class/gpio/gpio60/value", "r");
                fseek(gpi2,0,SEEK_SET);
                fscanf(gpi2,"%d",&enable);
                fclose(gpi2);

                if(enable == 1)
                        continue;

                gpi = fopen("/sys/class/gpio/gpio45/value","r");
                fseek(gpi,0,SEEK_SET);
                fscanf(gpi,"%d",&value);
                fclose(gpi);

                if(value==1)
                {
                        count++;
                }
                else
                {
                        if(count!=0)
                        {
                                //printf("         Centimeters: %5d\n",count*2);
                                //                  printf("         Inches: %5d\n",count*5);
                                printf("%d\n",count*2);
                                fprintf(output, "%d\n", count*2);
                                fflush(output);

                                count=0;

                        }
                }


                //              printf("       value: %5d\n",value);
                //              for(i = 0; i<100000;i++);


        }
        fclose(output);
```


WinSCP
Local Mark Files Commands Session Options Remote Help
Synchronize
Queue
Transfer Settings Default
New Session
My documents
Upload
Edit
C:\Users\Jacie\Documents\
Name
Size
..
Custom Office Templa...
Electronic Arts
RCT3
DMZ Lab.docx
131 KB
Wave.mtn
30 KB
Rights
Owner
New
Login
New Site
Session
File protocol:
SFTP
Host name:
192.168.7.2
Port number:
22
User name:
root
Password:
Save
Advanced...
Tools
Manage
Login
Close
Help
0 B of 159 KB in 0 of 5
4 hidden
Not connected.


Documents - root@192.168.7.2 - WinSCP
Local Mark Files Commands Session Options Remote Help
Synchronize
Queue
Transfer Settings Default
root@192.168.7.2
New Session
My documents
Upload
Edit
Properties
New
root
Find Files
Download
Edit
Properties
New
C:\Users\Jacie\Documents\
Name Size Type Changed
.. Parent directory 11/12/2017 6:05:34 PM
Custom Office Templa... File folder 10/25/2017 12:05:26 PM
Electronic Arts File folder 10/18/2017 10:36:17 PM
RCT3 File folder 10/28/2017 3:27:09 PM
DMZ Lab.docx 131 KB Microsoft Word Do... 10/25/2017 12:48:25 PM
Wave.mtn 30 KB RoboPlus Motion ... 11/12/2017 6:39:34 PM
/root/
Name Size Changed Rights Owner
.. 12/31/1999 6:02:25 PM rwxr-xr-x root
output.csv 1 KB 3/1/2015 2:46:59 PM rw-r--r-- root
ultrasonic 7 KB 11/12/2015 7:02:36 PM rw-r--r-- root
ultrasonic.c 2 KB 11/12/2015 7:02:36 PM rw-r--r-- root
ultrasonic2 8 KB 11/12/2015 7:02:36 PM rwxr-xr-x root
ultrasonic2.c 3 KB 11/12/2015 7:02:36 PM rw-r--r-- root
0 B of 159 KB in 0 of 5
4 hidden
0 B of 18.5 KB in 0 of 5
6 hidden
SFTP-3
0:00:05


output.csv - Excel
Jacie Rifer
File
Home
Insert
Page Layout
Formulas
Data
Review
View
Tell me what you want to do
Share
PivotTable
Recommended PivotTables
Table
Pictures
Online Pictures
Shapes
Icons
Store
My Add-ins
Recommended Charts
Maps
PivotChart
3D Map
Line
Column
Win/ Loss
Slicer
Timeline
Link
Text
Equation
Symbol
Tables
Illustrations
Add-ins
Charts
Tours
Sparklines
Filters
Links
Symbols
A1
26
Chart Title
1800
1600
1400
1200
1000
800
600
400
200
0
1
65
129
193
257
321
385
449
513
577
641
705
769
833
897
961
1025
1089
1153
1217
1281
1345
1409
1473
1537
1601
1665
1729
output
Ready
Average: 26.43374858
Count: 1766
Sum: 46682
100%

Building The Robot

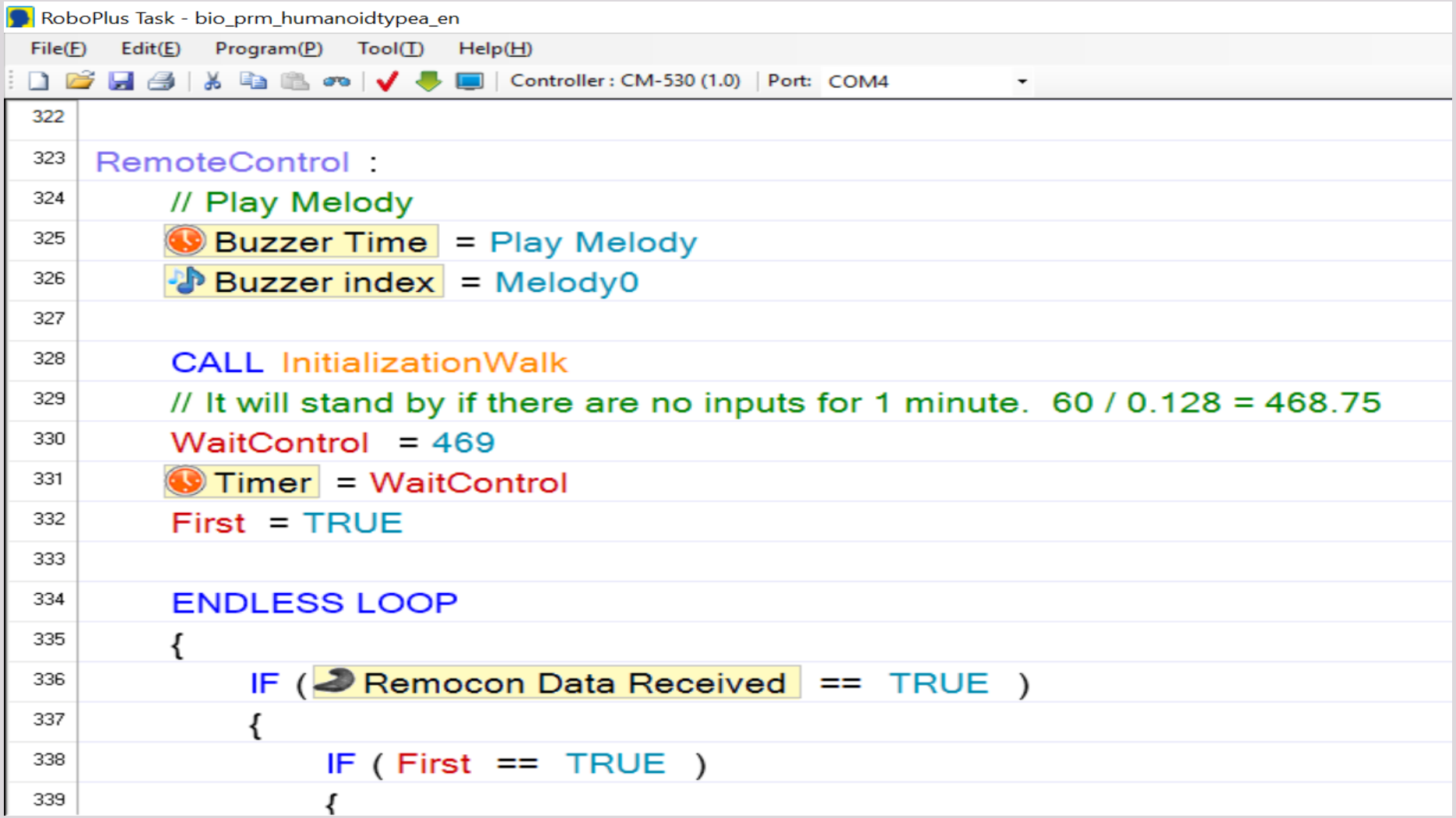
Parts


ROBOTIS
Rit
STANDARD
ROLLER CHAIN
BIOLOID PREMIUM Kit
Quick Start
RoboPlus

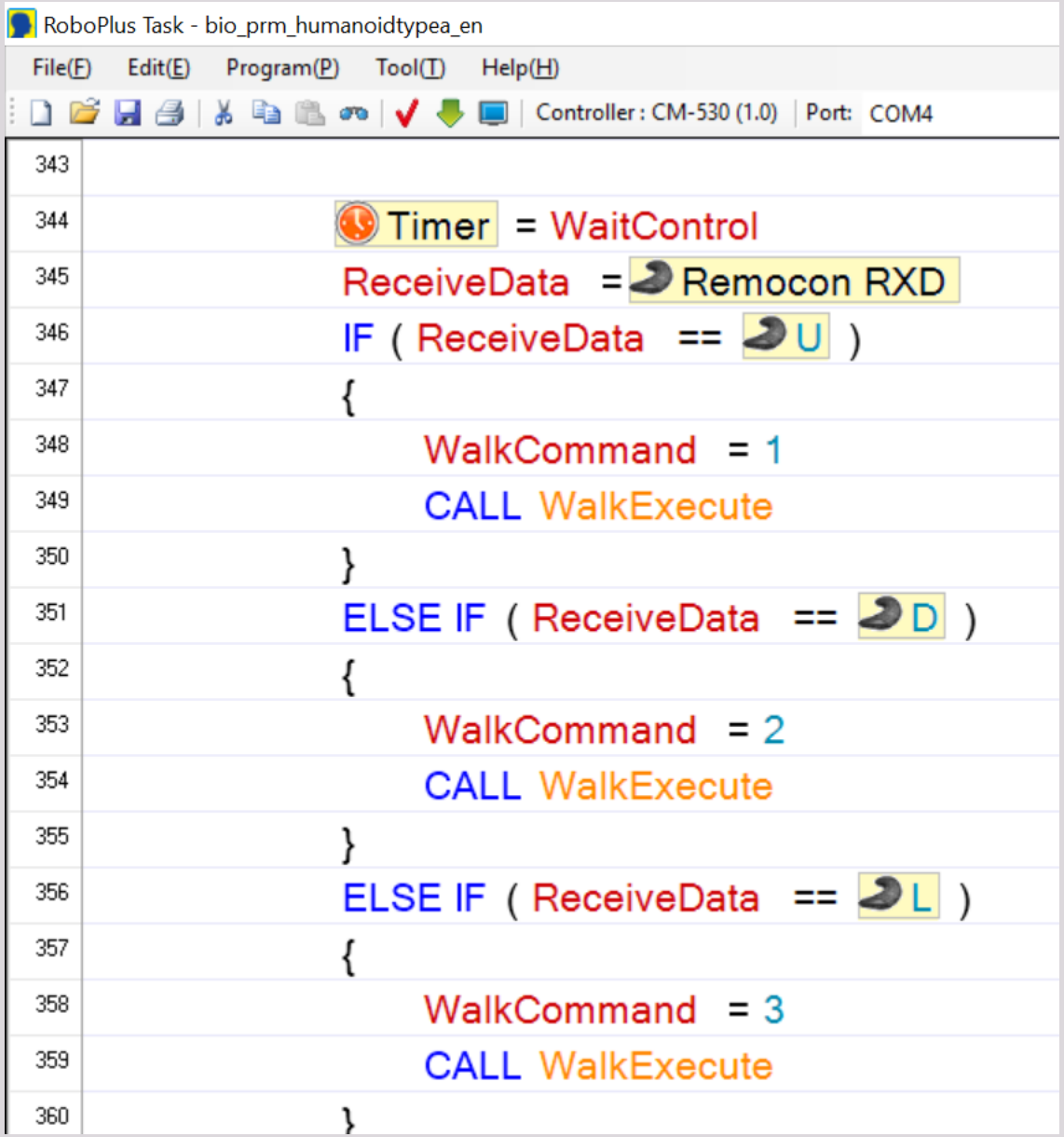
Controls

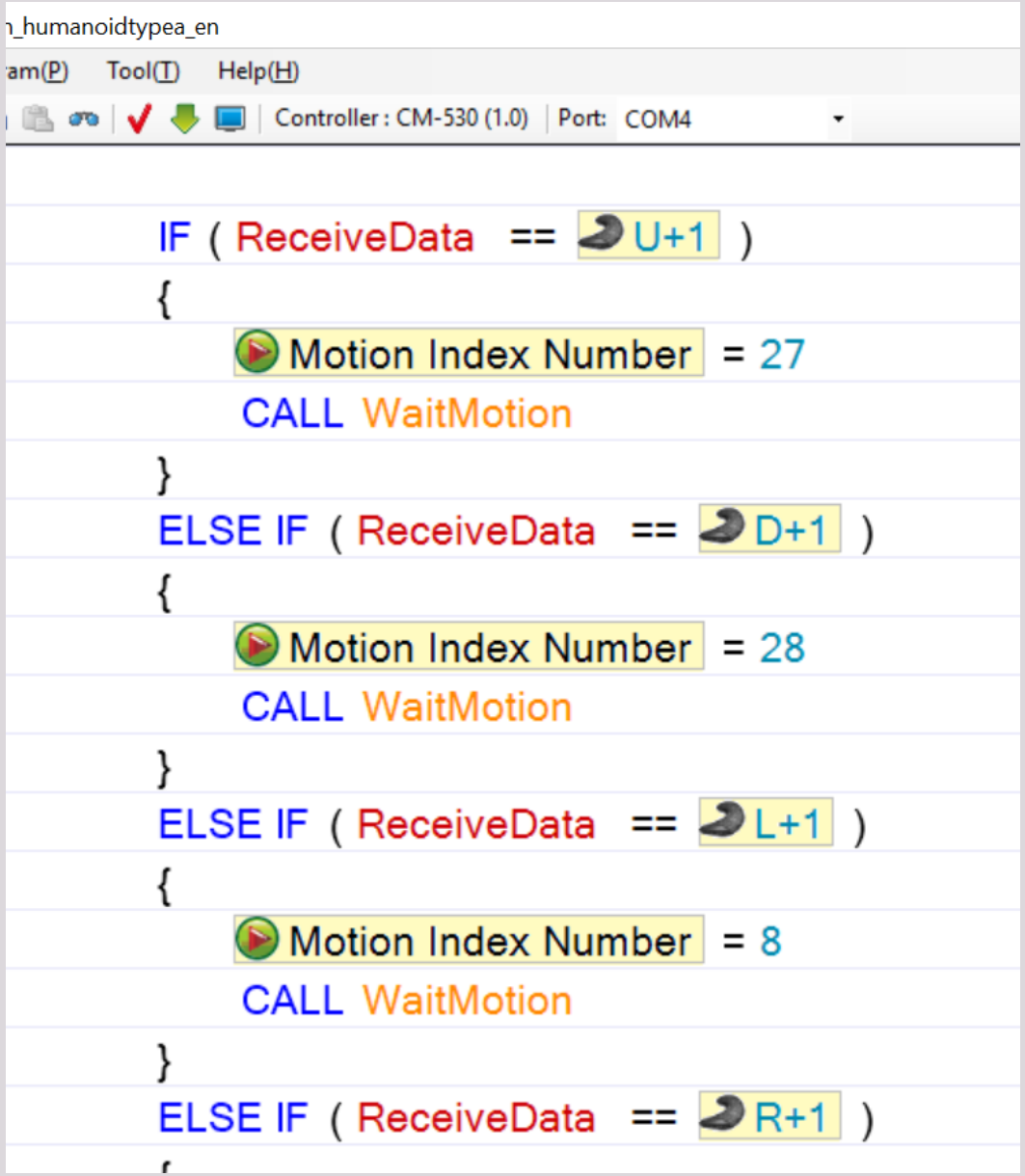
Button	Move
U	Forward
D	Backward
L	Turn Left
R	Turn Right
1 + L	Push-up
1 + R	Handstand
2 + U	Pound Chest
2 + D	Scratch Head
2 + L	Cheer
2 + R	Bow

Programming the Robot

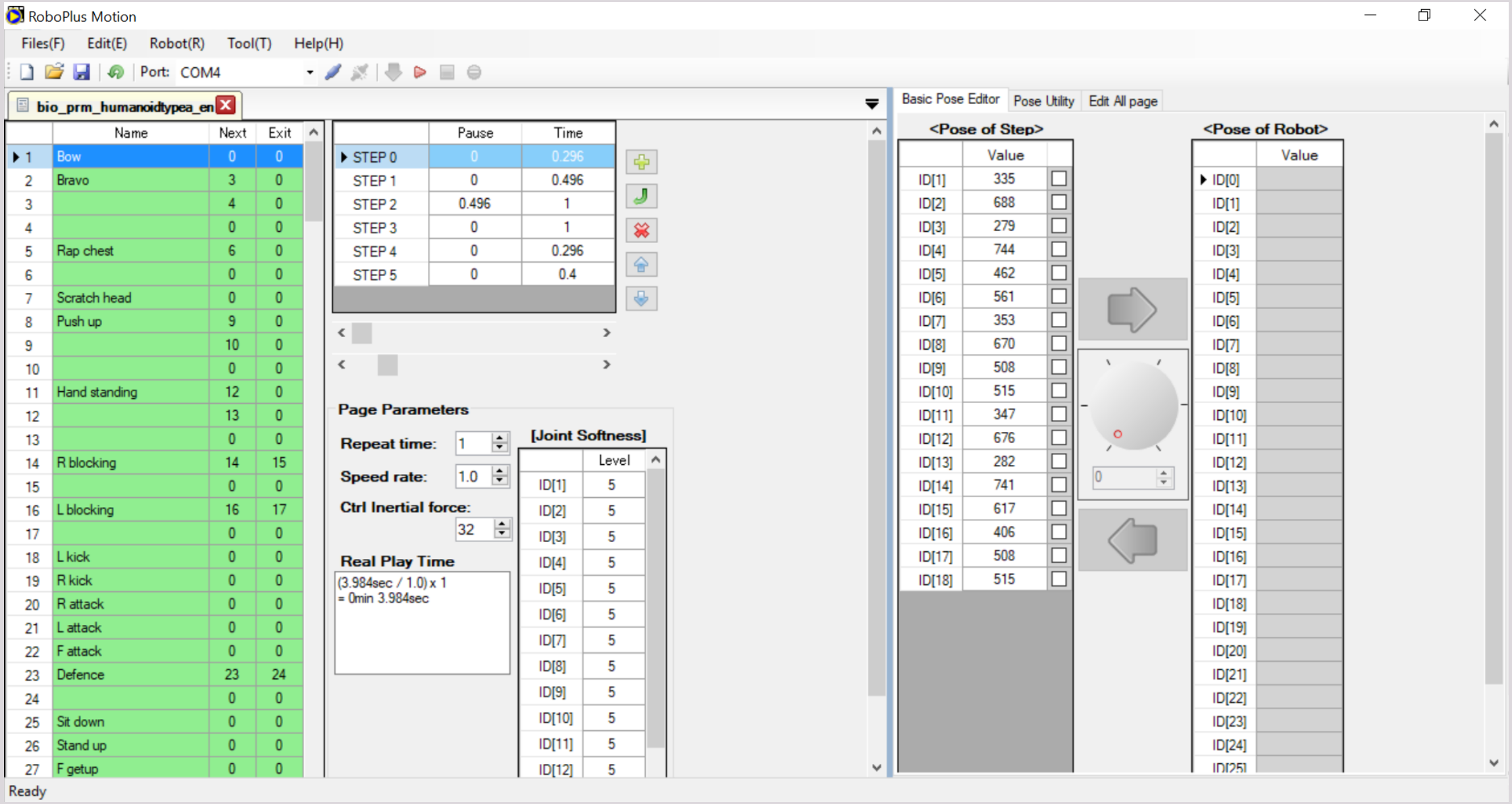


Programming the Robot





Programming Motions



Programming Motions