```
//The following code is intended for use in a two-stage compression system to
//read and monitor pressure at each stage, and initiated compression
//actuation through solenoids upon a TRUE or FALSE command from a Raspberry
//Pi


//this section is defining all the variables that are present in the code
  //define the transducer pins
    int trans100_1 = A0;  // Supply trans
    int trans100_2 = A1;  // Tank 1 60 psi
    int trans250 = A2;  //Tank 2 250 psi

  //initiate some integers for the readings for the delay construction
    //int tank1 = 0;  //Place for tank 1 read
    //int tank2 = 0;  //place for tank 2 read
    int in1=0; //place for supply read

  //initiate some floats for the pressure conversions for delay construction

    float p100 = 0; //place for tank 1 pressure
    float p250 = 0; //place for tank 2 pressure
    float pinput = 0;  //place for input pressure

  // initiate some floats for the tank states
    float p100s = 0;
    float p250s = 0;

  //initiate some floats for the the delayed reads
    float p100d = 0;  //place for tank1 2nd read
    float p250d = 0;  //place for tank2 2nd read
    float pinputd = 0; //place for input 2nd read

  //initiate some floats for the differences between reads
    float d100 = 0; //place for tank1 difference
```

```
    float d250 = 0; //place fot tank2 difference
    float dinput = 0; //place for input difference

  //Relay pins
    const int relay1= 8;
    const int relay2= 9;
    const int relay3= 10;
    const int relay4= 11;

  //time stuff
    unsigned long tstart=0;
    unsigned long tbetween = 10;        // time between individual readings
in loop
    unsigned long startmillis;
    const int between = 100;
    unsigned long ts = 0;
    unsigned long tb = 750;             // time for full stroke to occur

  //theshhold for pressure read difference
    float thresh = 0;         //only actuates change if difference falls to 0
    float thresh2 = 0.4;      // falls below 0.4

  // Define States of Stages
    int stage1state = 0;
    int stage2state = 0;

  // Define Transducer Offsets
    int offset100 = 10;
    int offset250 = 20;

  //RPi Conversation Variables
    int PiPin = 12;
```

```
    int PiValue;


//Setup section, assign pinmodes. Define beginning states of things.

void setup() {
  //initiate serial
    Serial.begin(9600);

  //Define the pinmodes.
    pinMode(relay1,OUTPUT);
    pinMode(relay2,OUTPUT);
    pinMode(relay3,OUTPUT);
    pinMode(relay4,OUTPUT);
    pinMode(PiPin,INPUT);

  //Set Relays to off
    digitalWrite(relay1,LOW);
    digitalWrite(relay2,LOW);
    digitalWrite(relay3,LOW);
    digitalWrite(relay4,LOW);
}

/*********************************************************
 * Void loop runs the whole time arduino is powered.
 *********************************************************/
void loop() {
PiValue = digitalRead(PiPin);

if(PiValue == 0){
      digitalWrite(relay1,LOW);
      digitalWrite(relay2,LOW);
```

```
      digitalWrite(relay3,LOW);
      digitalWrite(relay4,LOW);
}

else{
  //Read and calculate the current tank pressure
     in1 = inputcalc();
     p100s = tank1calc();
     p250s = tank2calc();

   // Run the side60 function while tank 1 is less than 60psi

/*****************************************************************
 *                 Stage 1 Compression (60psi)
 *****************************************************************/
      while (p100s < 60){
        if(millis() > tstart + tbetween && millis() > ts+tb){
          stage1();

      //Recalcalulate the pressure
          in1 = inputcalc();
          p100s = tank1calc();
          p250s = tank2calc();
          printpi();
          tstart = millis();
          PiValue = digitalRead(PiPin);
          }

          if (PiValue == 0){
            break;
     }
   }
```

```
/*****************************************************************
 *                  Stage 2 Compression (250 psi)
 *****************************************************************/
      while (p100s > 60 && p250s < 250){
        if(millis() > tstart + tbetween && millis() > ts +tb){
          stage2();

      //Recalcalulate the pressure
          in1 = inputcalc();
          p100s = tank1calc();
          p250s = tank2calc();
          printpi();

          tstart = millis();
        }
                  if (PiValue == 0){
            break;
     }
  }
}
}
/*****************************************************************
 *                       Loop End
 *****************************************************************/

 /*****************************************************************
 *                       FUNCTIONS
  *****************************************************************/
/*********************************************************************
 *                     Compression Stage Functions
 *********************************************************************/
//function to run 60 side.
```

```
void stage1(){
  diffin();
  if(dinput <= thresh2){

//state machine
    stage1state = stage1state + 1;
    ts = millis();
    if(stage1state > 1){
      stage1state = 0;
    }
  }

    if (stage1state == 0){
      digitalWrite(relay1,LOW);
      digitalWrite(relay2,LOW);
      digitalWrite(relay3,HIGH);
      digitalWrite(relay4,LOW);
    }

    else{
      digitalWrite(relay1,LOW);
      digitalWrite(relay2,LOW);
      digitalWrite(relay3,LOW);
      digitalWrite(relay4,HIGH);
    }
}

//function to run 250 side.
void stage2(){
  diff250();

  if(d250 < thresh2){
```

```
    //state machine
      stage2state = stage2state + 1;
      ts = millis();

      if(stage2state > 1){
          stage2state = 0;
      }
  }

    if (stage2state == 0){
      digitalWrite(relay1,HIGH);
      digitalWrite(relay2,LOW);
      digitalWrite(relay3,LOW);
      digitalWrite(relay4,LOW);
    }
    else{
      digitalWrite(relay1,LOW);
      digitalWrite(relay2,HIGH);
      digitalWrite(relay3,LOW);
      digitalWrite(relay4,LOW);
    }
}

/*****************************************************************
 *                    Pressure Functions
 *****************************************************************/
float inputcalc(){
  int input = 0;
  float pres = 0;

  input = analogRead(trans100_1);
  pres = 0.2723*input - 59.494 + offset100;
```

```
  return pres;
}

float tank1calc(){
   int tank = 0;
   float pres = 0;

  tank = analogRead(trans100_2);
  pres = 0.1091*tank - 23.682;
  return pres;
}

float tank2calc(){
  int tank = 0;
  float pres = 0;

  tank = analogRead(trans250);
  pres = 0.2723*tank - 59.494 + offset250;
  return pres;
}

/*************************************************************************
 *                          Difference Functions
 *************************************************************************/
float diffin(){
  // Get pressures
    p100 = tank1calc();
    p250 = tank2calc();
    pinput = inputcalc();

  //define the reading difference
    if (millis() > startmillis + between){
```

```
      startmillis = millis();
      p100d = tank1calc();
      p250d = tank2calc();
      pinputd = inputcalc();

  //define the difference between reading1 and reading2
    d100 = p100 - p100d;
    d250 = p250 - p250d;
    dinput = pinput - pinputd;

  //Make differences positive
    dinput = abs(dinput);
    d100 = abs(d100);
    d250 = abs(d250);

   return dinput;
    }
}

//function to read the 100 trans and calc the diff

float diff100(){
  // Get Pressures
    p100 = tank1calc();
    p250 = tank2calc();
    pinput = inputcalc();

  //define the reading difference
    if (millis() > startmillis + between){
      startmillis = millis();

      p100d = tank1calc();
```

```
      p250d = tank2calc();
      pinputd = inputcalc();

  //define the difference between reading1 and reading2
    d100 = p100 - p100d;
    d250 = p250 - p250d;
    dinput = pinput - pinputd;

  //Make differences positive
    dinput = abs(dinput);
    d100 = abs(d100);
    d250 = abs(d250);

   return d100;
    }
  }

//function to read the 250 trans and calc the diff
float diff250(){
  // Get pressures
    p100 = tank1calc();
    p250 = tank2calc();
    pinput = inputcalc();

  //define the reading difference
    if (millis() > startmillis + between){
      startmillis = millis();

      p100d = tank1calc();
      p250d = tank2calc();
      pinputd = inputcalc();
```

```
  //define the difference between reading1 and reading2
    d100 = p100 - p100d;
    d250 = p250 - p250d;
    dinput = pinput - pinputd;

  //Make differences positive
    dinput = abs(dinput);
    d100 = abs(d100);
    d250 = abs(d250);

   return d250;
    }
}

/*************************************************************
 *                    Printer Functions
 *************************************************************/
void printpi(){
    Serial.print(p100s);
    Serial.print(" , ");
    Serial.println(p250s);
    }
```