```
/* Program: button Car Start
 * Revised: 2014
 *
 * Inputs:  push button  start
 *          Vehicle RPM Sensor
 *          keyfob input
 *
 * Outputs: Ignition Control Relay
 *          starter Control Relay
 *          power Control Relay
 *          light Relay
 */



 //EQUATES
 //Inputs
 int button = 2;                          //push button start ignal to pin 2
 int rpm_sens = 3;                         //Vehicle RPM sensor  to pin 3

 //Outputs
 int ign_relay = 5;                        //Ignition  Relay controlled by pin 5
 int starter_relay = 4;                     //Starter l Relay controlled by pin 4
 int arduino_power_relay = 6;                  //power realy to keep arduino on by pin 6
 int button_light = 7;                        //light on pin 7

 unsigned long start_time;          //Variable used to store the time
                                    // at which the starter is engaged
```

```
 //DEFINITIONS
void setup()
{
  pinMode(button, INPUT);   //Define pin inputs and outputs
  pinMode(rpm_sens, INPUT);

  pinMode(ign_relay, OUTPUT);
  pinMode(starter_relay, OUTPUT);
  pinMode(arduino_power_relay, OUTPUT);
  pinMode(button_light, OUTPUT);

 }

   //PROGRAM

 //Loop function: Wait for a start button  to be pushed

void loop()
{
    digitalWrite(button_light, HIGH);      // button light on

    if (digitalRead(button) == HIGH)     //Check if start button has been pushed
{
    begin();                        //Begin start sequence if start button was pushed
 }
    else
```

```
{
    loop();                         //Repeat this function until start button is pushed
 }
 }



   //Begin function: Turn on ignition and power relay

void begin()
{
  delay(300),                          //  delay
  digitalWrite(ign_relay, HIGH);              //Turn ignition ON

   w_start();                          //Go to w_sart funciton
 }

    // wait start see if start button pushed to sart engine

void w_start()
{
   if (digitalRead(button) == HIGH )       // check if sart button pushed is high
{
   start();                          //Begin start sequence if start button was pushed
 }
   else
{
```

```
   w_start();                    //Repeat this function until start button is pushed
 }
 }



    //Start function: Engage starter only if engine is not already running.
void start()
{
  if(digitalRead(rpm_sens) == LOW)          //Continue start sequence only if vehicle is not
running.
{
    delay(900);                       // delay
    digitalWrite(starter_relay, HIGH);        //Engage starter
    delay(100);                       // delay
    digitalWrite(arduino_power_relay, HIGH);    //turn power relay on
    start_time = millis();                //Capture the time at which the starter was engaged

    starter_engaged();                    //Go to Starter_engaged function
 }
  else
{

    engine_running();                     //Exit start sequence if already running
 }
 }

//Starter_engaged function: Disengage starter after vehicle is starter or turn off starter if
```

```
//vehicle has not started within 4 seconds.


void starter_engaged()

{


  if (digitalRead(rpm_sens) == HIGH)          //Continue if engine has started

{

   engine_running();                      //Go to disengage_starter after engine is running

 }

  else if ((start_time+4000) < millis())       //Test if 4 seconds has passed since the starter was engaged

{

    disengage_starter_timeout();              //Go to disengage_starter if engine has not started within 4 seconds of starter engagement

 }

  else

{

   starter_engaged();                      //Repeat this function if engine has not started or 4 seconds has not elapsed

 }

 }



       //Disengage_starter function: Disengage the starter.


void engine_running()

{

   digitalWrite(starter_relay, LOW);           //Disengage the starter

    digitalWrite(button_light,LOW);           // turn button light off
```

```
{
  delay(500);
   if (digitalRead(button) == HIGH)            //Check if start button was pushed pin2 high
{
    engine_off();                          //engine_off sequence if start button was pushed
 }
   else if (digitalRead(rpm_sens) == HIGH)     // if engine stalled

    engine_running();                      //Repeat this function until engine stalled

     else
{
   loop();                             // go to loop
 }
 }

 }
      //Disengage_starter_timeout function: Disengage the starter
      //(used after 4 seconds has elapsed without an engine start)

void disengage_starter_timeout()
{
  digitalWrite(starter_relay, LOW);                //Disengage the starter
  digitalWrite(ign_relay, LOW);              //Turn ignition OFF

   loop();                             //Exit start sequence and go to loop
 }
```

```
//Vehicle_off function: Turns the vechile off and starts the whole program over


void engine_off()
{
  digitalWrite(ign_relay, LOW);                    //Turn ignition OFF
  digitalWrite(button_light,LOW);                   // turn light off
  delay(1000),
  digitalWrite(arduino_power_relay,LOW);             // turn off power
  delay(5000),



  loop();                                 //Repeat program (look for start command)
 }
```