```
//----------------------------------------Liberies including----------------------------------//

#include                                                <ax12.h>// Liberies for ax12 servo drive
#include <Wire.h>                                                // Liberies for I2C bus

//----------------------------------------Defining -------------------------------------------//

#define                         BUTTON0                         0// Defining the Input Button on input 0
#define                       SERVOCOUNT                        5// Defining how many servo drives there are uset

//----------------------------------------Position Array--------------------------------------//

int                 positions[11][5]                           =// Array to 11 defirent position
{
               {         412,612,412,612,512                  },// Pos 0  - Home Position

             {               55,480,928,368,512               },//  Pos 1   - before 1

             {               45,450,855,368,512               },// Pos 1  - before 2

             {               98,505,788,455,512               },// Pos 2  - pallet on

             {               98,505,788,455,100               },// Pos 3  - pallet taked

               {         949,636,664,656,100                  },// Pos 4  - pallet after

               {         821,800,457,570,100                  },// Pos 5  - half down *

               {         815,820,547,558,100                  },// Pos 6  - delivering ready *

               {         815,820,547,558,512                  },// Pos 7  - delivering *

               {         815,750,750,581,512                  },// Pos 8  - mod pos*

               {          815,700,512,582,512                  }// Pos 9  - half down on way up*
};

//----------------------------------------Variables-------------------------------------------//

int id;                                                           // defining "id" to Integer
int                                                          pos;// defining "pos" to Integer
int                                                        steps;// defining "steps" to Integer
int                                                          Bit;// defining "Bit" to Integer
int                                                        Place;// defining "Place" to Integer
int                                                       master;// defining "master" to Integer
int                                                       moving;// defining "moving" to Integer

//----------------------------------------Artix-M Board setup---------------------------------//

void setup()
{
  Serial.begin(9600);                                           // opens serial port, sets data rate to 9600 bps
  Wire.begin(8);                                                // join i2c bus (address optional for master)
  Wire.onReceive(receiveEvent);                                 // register event
  delay(200);                                                   // Wait 0.2sek
  Wire.onRequest(requestEvent);                                 // register event
  delay                                                  (3000);// Wait 3sek for display to be open
  Serial.println("##################################");         // Print
  Serial.println("Serial Communication Established.");          // Print
  Serial.println("##################################");         // Print
  Serial.println(" ");                                          // Print
  pinMode(BUTTON0, INPUT);                                      // Setpin mode 0 to input

  ax12SetRegister2(1,                    32,                    55);// Set speed to servo drive
  ax12SetRegister2(2,                    32,                    55);// Set speed to servo drive
  ax12SetRegister2(3,                    32,                    55);// Set speed to servo drive
  ax12SetRegister2(4,                    32,                    55);// Set speed to servo drive
  ax12SetRegister2(5,                   32,                   1023);// Set speed to servo drive

  ax12SetRegister2(1,                   34,                   1023);// Set Torq to servo drive
  ax12SetRegister2(2,                   34,                   1023);// Set Torq to servo drive
  ax12SetRegister2(3,                   34,                   1023);// Set Torq to servo drive
  ax12SetRegister2(4,                   34,                   1023);// Set Torq to servo drive
  ax12SetRegister2(5,                   34,                   1023);// Set Torq to servo drive

                         steps                =                0;// Set steps to 0
                          Bit                =                 0;// Set Bit to 0
                         Place                =                9;// Set Place to 9

}
```

```
//-------------------------------------------StepProgramming-------------------------------------//

void loop()
{
  delay(100);                                                     // Wait 0.1sek

  }
  //-----------------------------------------HomeStep-----------------------------------------//
  if            (steps                   ==                  0)// Se if Steps is equal to 0
  {
    Serial.println("Program in step 0");                           // Print

    Serial.println("Run arm to homing position");                  // Print
                                              ServoRunnigPos(0);// Set the function "ServoRunningPos" to read position 0 i position array

    Serial.println("Turn ready signal on");                        // Print
                                   Bit          =          1;// Set Bit to 1

    Serial.println("Set step to 1");                               // Print
                                  steps          =          1;// Set Steps to 1
    Serial.println("wait for signal");                             // Print
  }

  //-----------------------------------------Ready Step-----------------------------------------//
  if     (steps     ==     1     &&     master     ==     1)// Se if Steps is equal to 1 and master sending 1
  {
    Serial.println("Program in step 1");                           // Print

    Serial.println("Run arm to ready position 1");                 // Print
                                              ServoRunnigPos(1);// Set the function "ServoRunningPos" to read position 1 i position array

    Serial.println("Run arm to ready position 2");                 // Print
                                              ServoRunnigPos(2);// Set the function "ServoRunningPos" to read position 2 i position array

    Serial.println("Turn ready signal on");                        // Print
                                   Bit          =          2;// Set Bit to 2

    Serial.println("Set step to 2");                               // Print
    Serial.println("wait for signal");                             // Print
                                  steps          =          2;// Set Steps to 2
  }
```

```
//------------------------------Pallet on --> Pallet Grab -->-------------------------------//
if    (steps      ==      2       &&      master      ==      2)// Se if Steps is equal to 2 and master sending 2
{
  Serial.println("Program in step 2");                            // Print

  Serial.println("Run arm to pallet on position");                // Print
                                              ServoRunnigPos(3);// Set the function "ServoRunningPos" to read position 3 i position array

  Serial.println("Run arm to pallet grab");                       // Print
                                              ServoRunnigPos(4);// Set the function "ServoRunningPos" to read position 4 i position array

  Serial.println("Turn ready signal on");                         // Print
                                     Bit           =           3;// Set Bit to 3

  Serial.println("Set step to 3");                                // Print
  Serial.println("wait for signal");                              // Print
                                   steps           =           3;// Set Steps to 3
}

//-------------------------------------Pallet         vinkel-----------------------------------------//
if    (steps      ==      3       &&      master      ==      3)// Se if Steps is equal to 3 and master sending 3
{
  Serial.println("Program in step 3");                            // Print

  Serial.println("Run arm to vinkel position");                   // Print
                                              ServoRunnigPos(5);// Set the function "ServoRunningPos" to read position 5 i position array

  Serial.println("Turn ready signal on");                         // Print
                                     Bit           =           4;// Set Bit to 4

  Serial.println("Set step to 4");                                // Print
  Serial.println("wait for signal");                              // Print
                                   steps           =           4;// Set Setps to 4
}

//-------------------------------------Dilivepallet----------------------------------------//
if    (steps      ==      4       &&      master      ==      4)// Se if Steps is equal to 4 and master sending 4
{
  Serial.println("Program in step 4");                            // Print
  Serial.println("Run arm to half down position");          // Print
                                          ServoRunnigPos(6);// Set the function "ServoRunningPos" to read position 6 i position array
  delay(2000);                                              // Wait 2sek

  Serial.println("Run arm to dilivering ready position");   // Print
                                          ServoRunnigPos(7);// Set the function "ServoRunningPos" to read position 7 i position array
  delay(2000);                                              // Wait 2sek

  Serial.println("Run arm to dilivering position");         // Print
                                          ServoRunnigPos(8);// Set the function "ServoRunningPos" to read position 8 i position array
  delay(2000);                                              // Wait 2sek

  Serial.println("Run arm to away position");               // Print
                                          ServoRunnigPos(9);// Set the function "ServoRunningPos" to read position 9 i position array
  delay(2000);                                              // Wait 2sek

  Serial.println("Run arm to half down on way up position");// Print
                                         ServoRunnigPos(10);// Set the function "ServoRunningPos" to read position 10 i position array
  delay(2000);                                              // Wait 2sek

  Serial.println("Run arm to ready position");              // Print
                                          ServoRunnigPos(1);// Set the function "ServoRunningPos" to read position 1 i position array
  delay(2000);                                              // Wait 2sek

  Serial.println("Turn ready signal on");                   // Print
                                  Bit           =         5;// Set Bit to 5

  Serial.println("Set step to 1");                          // Print
  Serial.println("wait for signal");                        // Print
                                 steps          =         5;// Set Steps to 5
}

//------------------------------Wait to master is ready again----------------------------//
if    (steps      ==      5      &&      master      ==      0)// Se if Steps is equal to 5 and master sending 0
{
  Serial.println("Program in step 5");                      // Print

  Serial.println("Turn ready signal on");                   // Print
                                  Bit           =         1;// Set Bit to 1

  Serial.println("Set step to 1");                          // Print
```

```
    Serial.println("wait for signal");                              // Print
                                     steps           =          1;// Set Setps to 1
  }
}


//---------------------------Recive command from master---------------------------//

// function that executes whenever data is received from master
// this function is registered as an event, see setup()
void receiveEvent(int howMany) {
  while (1 <Wire.available()) { // loop through all but the last
    char c =Wire.read(); // receive byte as a character
    Serial.print(c);         // print the character
  }
  master =Wire.read();    // receive byte as an integer
  Serial.println(master);         // print the integer
}

//---------------------------Request command from master--------------------------//

// function that executes whenever data is requested by master
// this function is registered as an event, see setup()
void requestEvent() {
  Wire.write(Bit); // respond with message of 6 bytes
  // as expected by master
}

//-------------------------------------------Servo Running Pos-----------------------------------//

void                                        ServoRunnigPos(pos)// Servo Running Position function
{
  for    (id      =      0;      id      <=      4;      id++)// Setting the position for all servos except the gripper which will be set when the
  {
    delay(10);                                                // Wait 0.01sek
    ax12SetRegister2(id   +   1,   30,   positions[pos][id]);// Set position to servo register, and read positions from array
  }
  delay(100);                                                 // Wait 0.1sek
                                                    moving=1;// Set moving to 1
  while          (moving                  !=                 0)// The program will loop through this while loop until the robot is at its end positi
  {
    delay(100);                                                // Wait 0.1sek
     moving =ax12GetRegister(1,46,1)+                          // checking if the motors are running. If the result is == 0 no servos is moving
             ax12GetRegister(2,46,1)+                          // checking if the motors are running. If the result is == 0 no servos is moving
             ax12GetRegister(3,46,1)+                          // checking if the motors are running. If the result is == 0 no servos is moving
             ax12GetRegister(4,46,1)+                          // checking if the motors are running. If the result is == 0 no servos is moving
             ax12GetRegister(5,46,1);                          // checking if the motors are running. If the result is == 0 no servos is moving
  }
}
```