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TRIO MOTION TECHNOLOGY
A MEMBER OF THE ESTUN GROUP

Date: 16 April 2020

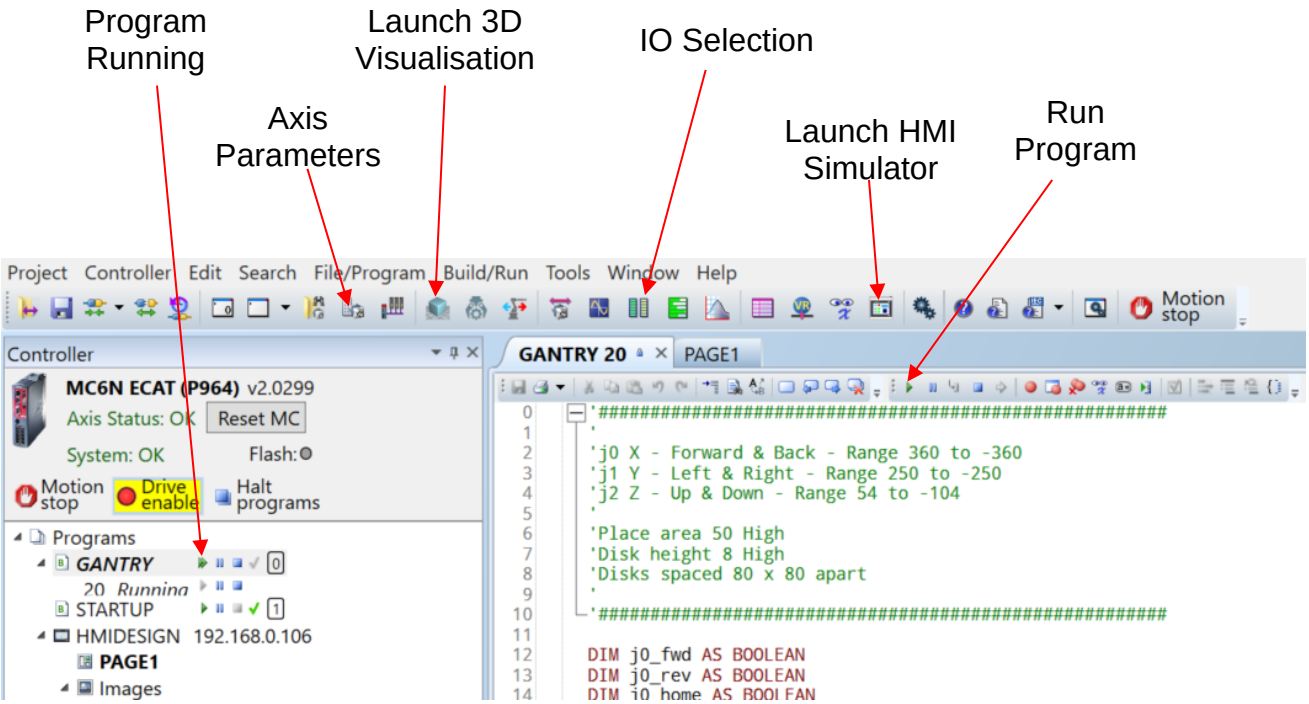
Subject: X Y Gantry – Pick & Place

General

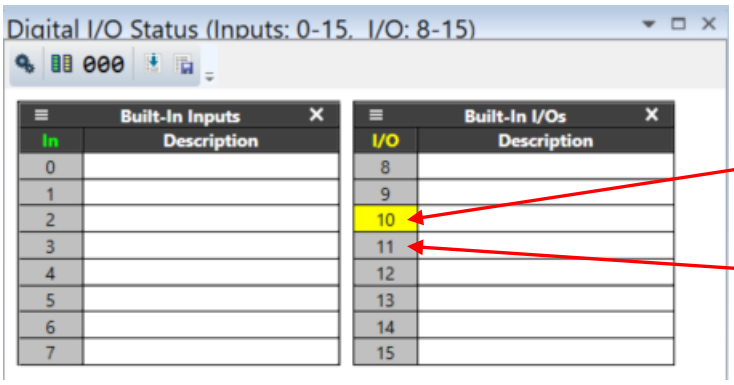
1. Overview

This document is to be used in conjunction with the associated video on "X Y Gantry – Pick & Place" with a Trio Controller. There is also a zipped version of the program available to go with this 3D Visualisation example package.

2. Main Options Selected During the Example



3. IO Status Window



Output 10:
"suction" Variable

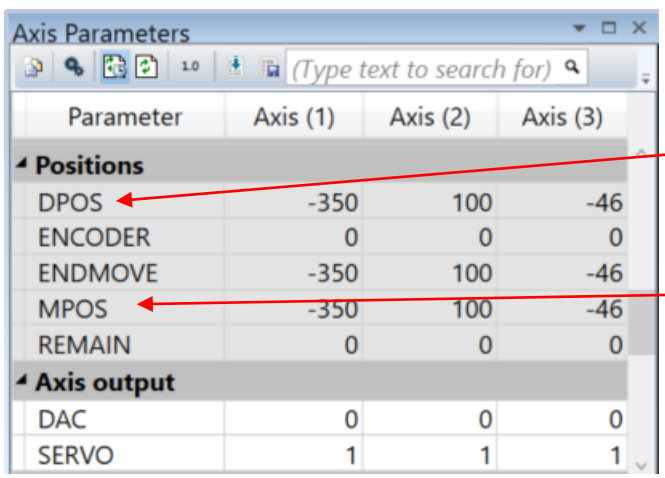
Output 11:
"air_pulse" Variable

4. Axis Parameters Window For Axis 1, 2 & 3

To view the Axes Parameters go to the "Controller Tree" section window, open the Axes group and select "**Show/Hide Axes…**" highlighted in blue text. Mouse click to launch the pop up window where you can select the Axes properties to display, in this case Axes 1,2 & 3. This is done by ticking the box of the Axes you want in the Use column. When finished selecting Axes click OK.

To view the Axis Parameters window click on the "**Axes parameters**" option which brings up the window showing the Axis Parameters of the axes selected.

An example section of the window is shown below



DPOS:
Demanded Axis Position

MPOS:
Measured Axis Position

Each axis has a limitation of movement and this has been set with the FS_LIMIT (Fwd) and RS_LIMIT (Rev) values in the STARTUP Trio basic program. These values can be viewed in the Axis Parameters window in the Limits section.

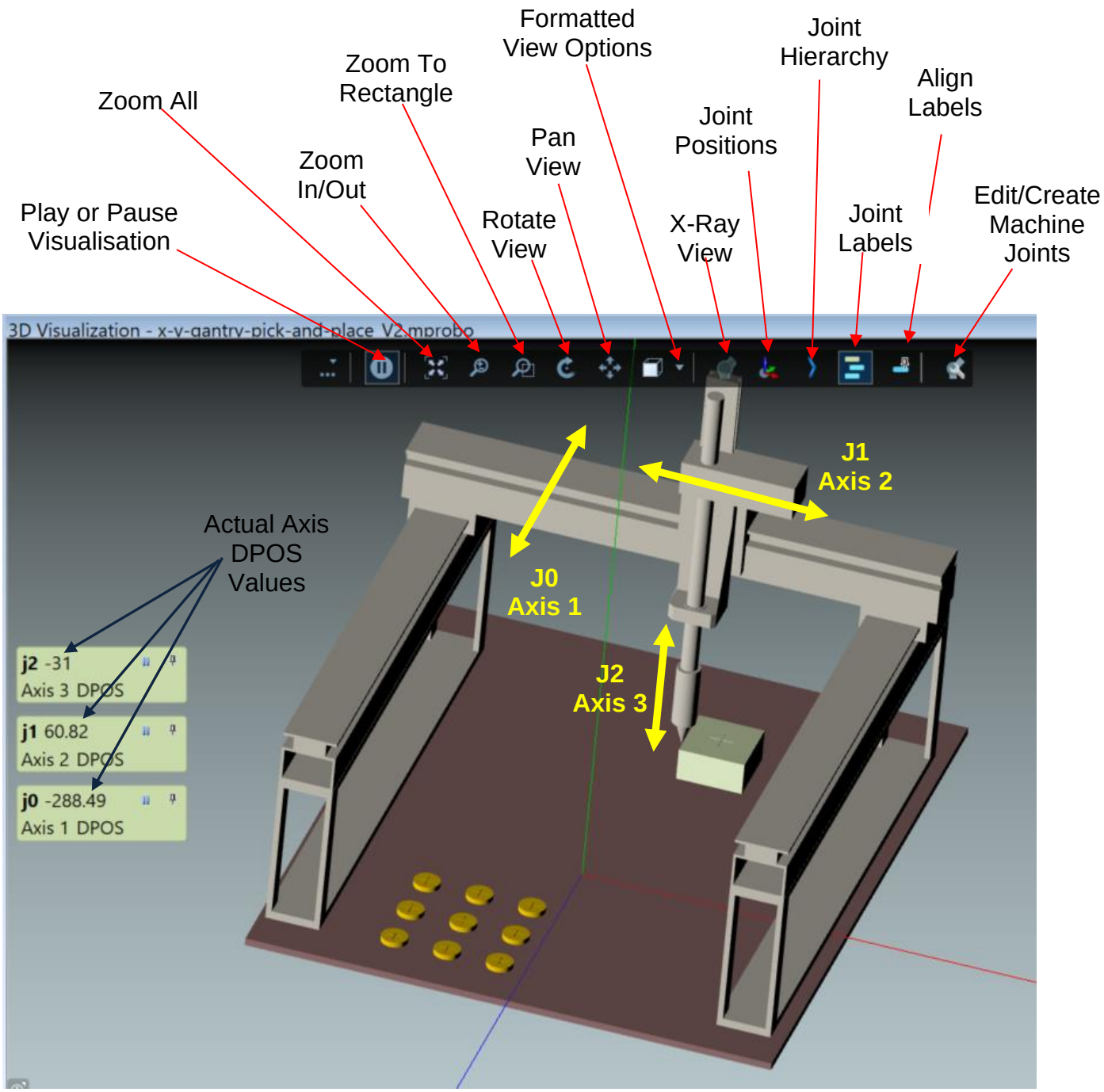
Axis 1 range is 360 to -360 units

Axis 1 range is 250 to -250 units

Axis 1 range is 54 to -104 units

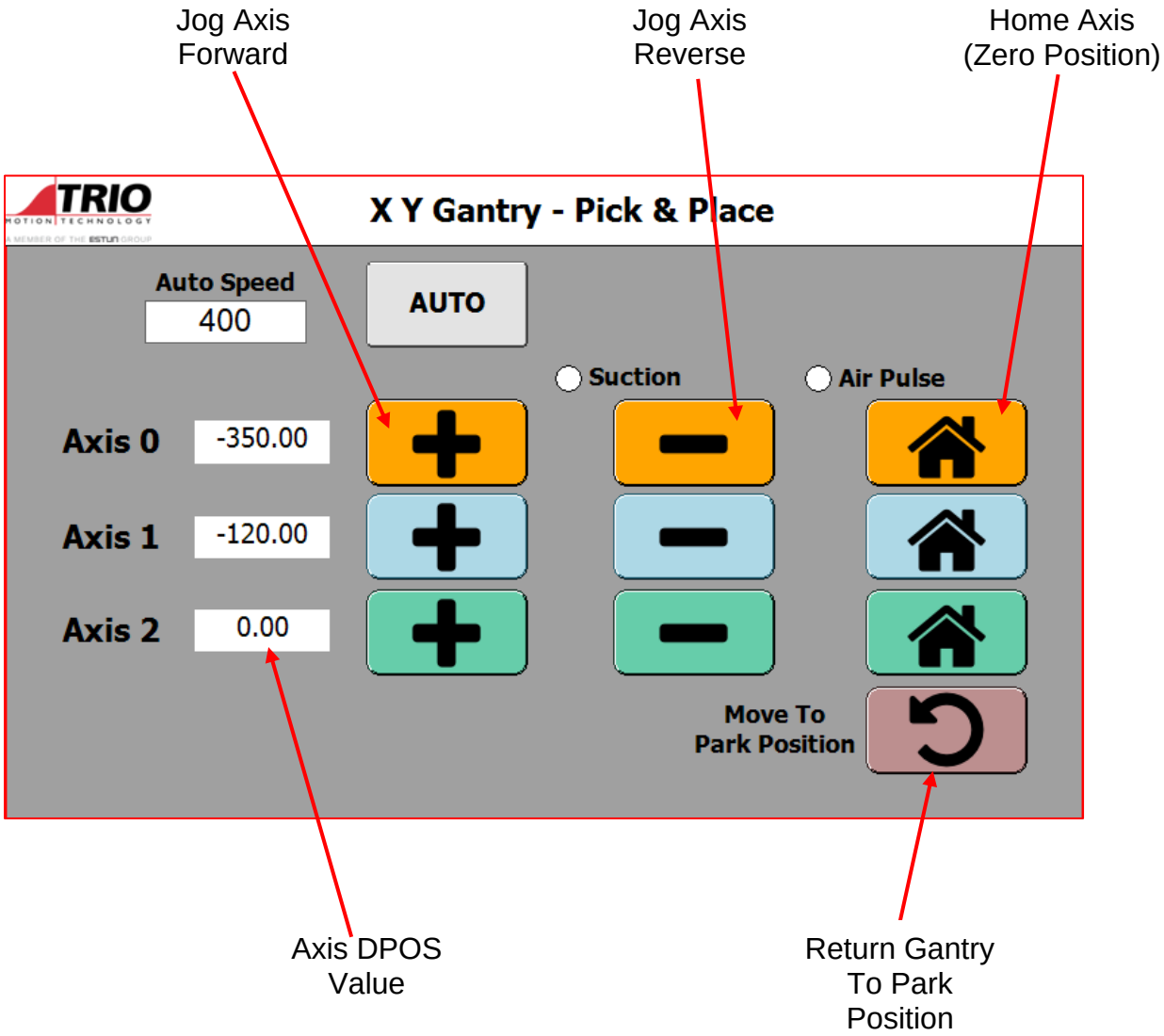
5. 3D Visualisation options

To view the 3d visualisation click on the button icon:

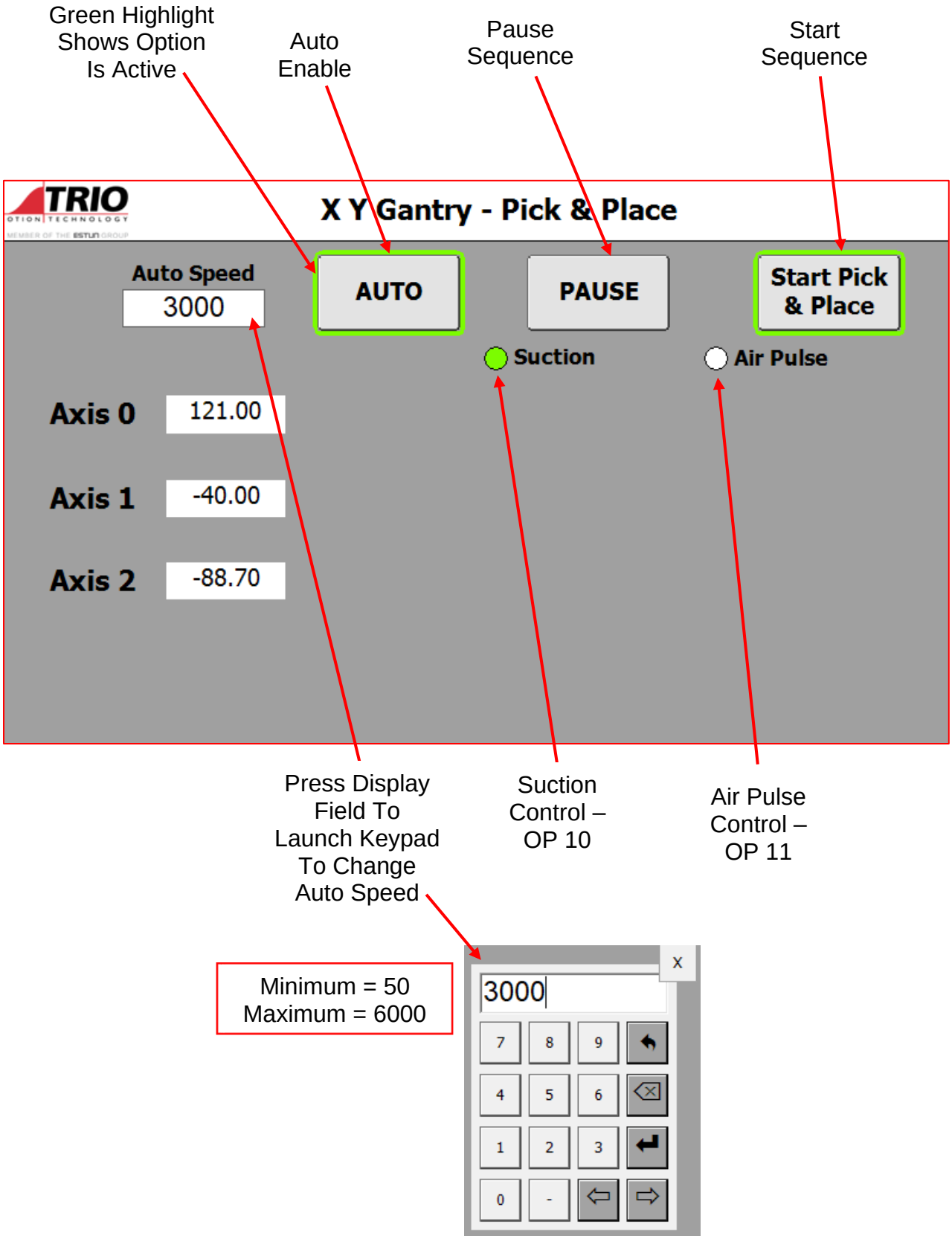


6. Uniplay HMI / HMI Simulator

1. Manual control options



2. Automatic Control Options



7. STARTUP Program Used

```
BASE(1)
UNITS = 100
SPEED = 400
ACCEL = 10000
DECEL = 10000
FS_LIMIT = 360
RS_LIMIT = -360

BASE(2)
UNITS = 100
SPEED = 400
ACCEL = 10000
DECEL = 10000
FS_LIMIT = 250
RS_LIMIT = -250

BASE(3)
UNITS = 100
SPEED = 400
ACCEL = 10000
DECEL = 10000
FS_LIMIT = 54
RS_LIMIT = -104

RUN "GANTRY", 2
```

8. GANTRY Program Used

Below is the Trio basic code that is used in the project. This may be useful for referencing.

```
'#######################################################
'
'j0 X - Forward & Back - Range 360 to -360
'j1 Y - Left & Right - Range 250 to -250
'j2 Z - Up & Down - Range 54 to -104
'
'Place area 50 High
'Disk height 8 High
'Disks spaced 80 x 80 apart
'
'#######################################################

DIM j0_fwd AS BOOLEAN
DIM j0_rev AS BOOLEAN
DIM j0_home AS BOOLEAN
DIM j1_fwd AS BOOLEAN
DIM j1_rev AS BOOLEAN
DIM j1_home AS BOOLEAN
DIM j2_fwd AS BOOLEAN
DIM j2_rev AS BOOLEAN
DIM j2_home AS BOOLEAN
DIM j3_fwd AS BOOLEAN
DIM j3_rev AS BOOLEAN
DIM j3_home AS BOOLEAN
DIM j4_fwd AS BOOLEAN
DIM j4_rev AS BOOLEAN
DIM j4_home AS BOOLEAN
DIM park AS BOOLEAN
DIM auto AS BOOLEAN
DIM pp_start AS BOOLEAN
DIM pause AS BOOLEAN
DIM speed_rate AS INTEGER
DIM home_speed AS FLOAT
DIM jog_speed AS FLOAT

DIM joint0 AS FLOAT
DIM joint1 AS FLOAT
DIM joint2 AS FLOAT

joint0=1
joint1=2
joint2=3

DIM suction, air_pulse AS INTEGER
suction = 10 ' vacuum valve
air_pulse = 11 ' air blast valve

auto=OFF
pp_start=OFF
speed_rate = 400
home_speed = 200
jog_speed = 200
```

```
WHILE TRUE

  WDOG=ON
  SERVO AXIS(joint0)=ON
  SERVO AXIS(joint1)=ON
  SERVO AXIS(joint2)=ON

decision:
  IF auto = 0 THEN
    GOTO manual
  ELSEIF auto = -1 THEN
    GOTO automatic
  ENDIF

manual:
  BASE(joint0)
  SPEED = jog_speed 'Set speed slower for jogging
  BASE(joint1)
  SPEED = jog_speed 'Set speed slower for jogging
  BASE(joint2)
  SPEED = jog_speed 'Set speed slower for jogging
  IF j0_fwd=-1 THEN
    MOVE(0.1) AXIS(joint0)
  ELSEIF j0_rev = -1 THEN
    MOVE(-0.1) AXIS(joint0)
  ELSEIF j0_home = -1 THEN
    MOVEABS(0) AXIS(joint0)
  ELSEIF j1_fwd = -1 THEN
    MOVE(0.1) AXIS(joint1)
  ELSEIF j1_rev = -1 THEN
    MOVE(-0.1) AXIS(joint1)
  ELSEIF j1_home = -1 THEN
    MOVEABS(0) AXIS(joint1)
  ELSEIF j2_fwd = -1 THEN
    MOVE(0.1) AXIS(joint2)
  ELSEIF j2_rev = -1 THEN
    MOVE(-0.1) AXIS(joint2)
  ELSEIF j2_home = -1 THEN
    MOVEABS(0) AXIS(joint2)
  ELSEIF park = -1 THEN
    BASE(joint0)
    SPEED AXIS(joint2) = home_speed
    MOVEABS(0) AXIS(joint2) ' raise the z first
    WAIT IDLE AXIS(joint2)

    SPEED = home_speed
    MOVEABS(-350.0, -120.0) ' XY move to home
    WAIT IDLE
    SPEED = speed_rate
  ELSE
    GOTO decision
  ENDIF

' Using MOVEPICK mode 0 to control the motion.
' MOVEPICK(mode, x, y, z, withdraw, overlap_control_A,
overlap_control_B , u, v, w ,withdraw_ctrl, xy_ctrl, app_ctrl)
' axes u,v,w not used so left at 0
```

```
automatic:
  BASE(joint0)
  SPEED = speed_rate 'Set Auto speed
  BASE(joint1)
  SPEED = speed_rate 'Set Auto speed
  BASE(joint2)
  SPEED = speed_rate 'Set Auto speed

  BASE(joint0,joint1,joint2) '(X, Y, Z)

  IF pp_start = -1 THEN

    MOVEABS(-351,-119,0) 'Move to Park Position if not in this position
    WAIT IDLE
    MOVEPICK(0,121,-200,-96,10,0.25,0.25,0,0,0,0.5,0.5,1.0)'Pick1
    GOSUB pickup
    WAIT UNTIL pause=OFF
    MOVEPICK(0,-350,100,-46,65,0.25,0.25,0,0,0,0.5,0.5,1.0)'Place 1
    GOSUB putdown
    WAIT UNTIL pause=OFF
    MOVEPICK(0,121,-120,-96,10,0.25,0.25,0,0,0,0.5,0.5,1.0)'Pick 2
    GOSUB pickup
    WAIT UNTIL pause=OFF
    MOVEPICK(0,-350,100,-46,65,0.25,0.25,0,0,0,0.5,0.5,1.0)'Place 2
    GOSUB putdown
    WAIT UNTIL pause=OFF
    MOVEPICK(0,121,-40,-96,10,0.25,0.25,0,0,0,0.5,0.5,1.0)'Pick 3
    GOSUB pickup
    WAIT UNTIL pause=OFF
    MOVEPICK(0,-350,100,-46,65,0.25,0.25,0,0,0,0.5,0.5,1.0)'Place 3
    GOSUB putdown
    WAIT UNTIL pause=OFF
    MOVEPICK(0,201,-200,-96,10,0.25,0.25,0,0,0,0.5,0.5,1.0)'Pick 4
    GOSUB pickup
    WAIT UNTIL pause=OFF
    MOVEPICK(0,-350,100,-46,65,0.25,0.25,0,0,0,0.5,0.5,1.0)'Place 4
    GOSUB putdown
    WAIT UNTIL pause=OFF
    MOVEPICK(0,201,-120,-96,10,0.25,0.25,0,0,0,0.5,0.5,1.0)'Pick 5
    GOSUB pickup
    WAIT UNTIL pause=OFF
    MOVEPICK(0,-350,100,-46,65,0.25,0.25,0,0,0,0.5,0.5,1.0)'Place 5
    GOSUB putdown
    WAIT UNTIL pause=OFF
    MOVEPICK(0,201,-40,-96,10,0.25,0.25,0,0,0,0.5,0.5,1.0)'Pick 6
    GOSUB pickup
    WAIT UNTIL pause=OFF
    MOVEPICK(0,-350,100,-46,65,0.25,0.25,0,0,0,0.5,0.5,1.0)'Place 6
    GOSUB putdown
    WAIT UNTIL pause=OFF
    MOVEPICK(0,281,-200,-96,10,0.25,0.25,0,0,0,0.5,0.5,1.0)'Pick 7
    GOSUB pickup
    WAIT UNTIL pause=OFF
    MOVEPICK(0,-350,100,-46,65,0.25,0.25,0,0,0,0.5,0.5,1.0)'Place 7
    GOSUB putdown
    WAIT UNTIL pause=OFF
    MOVEPICK(0,281,-120,-96,10,0.25,0.25,0,0,0,0.5,0.5,1.0)'Pick 8
    GOSUB pickup
```

```
    WAIT UNTIL pause=OFF
    MOVEPICK(0,-350,100,-46,65,0.25,0.25,0,0,0,0.5,0.5,1.0)'Place 8
    GOSUB putdown
    WAIT UNTIL pause=OFF
    MOVEPICK(0,281,-40,-96,10,0.25,0.25,0,0,0,0.5,0.5,1.0)'Pick 9
    GOSUB pickup
    WAIT UNTIL pause=OFF
    MOVEPICK(0,-350,100,-46,65,0.25,0.25,0,0,0,0.5,0.5,1.0)'Place 9
    GOSUB putdown
    WAIT UNTIL pause = OFF
    MOVEABS(0) AXIS(joint2) ' raise the Z
    WAIT IDLE AXIS(joint2)
    MOVEABS(-350, -120) 'Return to Park Position
    WAIT IDLE
    pp_start = OFF
    auto=OFF
    pause=OFF
    WA(500)
  ELSE
    GOTO decision
  ENDIF

WEND

' sub routines
pickup:
WAIT IDLE
OP(suction, ON)
WA(200) ' wait 200 msecs
RETURN

putdown:
WAIT IDLE
OP(suction, OFF)
WA(200)
TIMER(0, air_pulse, 1, 250) ' air blast to release the object
WA(400)
RETURN
```