4 Axis Motion Control Development Platform Manual

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4 Axis Development Platform

- Four-axis motion control development platform is specially designed for Motion Control study and real time implementation of the same.
- It meets the requirements in technique development and real time testing.
- Also, it helps in teaching various kinds of motion control systems.

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- Building logic with inputs and outputs
- Study of position , velocity and acceleration
- Development of automation software
- Explanation and setting of PID control parameters
- Single axis control
- Simultaneous axis control
- Interpolation-linear and circular
- Study of S-curve and T-curve
- Plotting preview graphs of position ,acceleration and velocity. Actual verses generated.

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Experiments of 4 axis development platform.

Tools and Software Required: 4 axis Development Platform Hardware Setup,GT commander Software and MCE Studio Software.

For installation of software refer the below links:

GT Commander:
https://drive.google.com/drive/folders/1r6fm1GnkV23eN_Bydb3iDWRirbbkRsju?usp=sharing

MCE Studio:
https://drive.google.com/drive/folders/1sWkjBwLTK1pbS55mPsPbC8sL6-7vHn1s?usp=sharing

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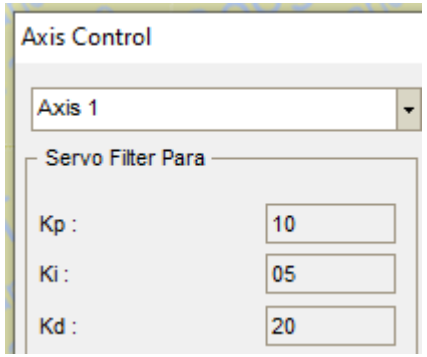
- Experiment no 1 : Testing of 4 axis development platform

Tools and Software Required: Development Platform Hardware setup and GT commander Software.

Open the GT Commander Software.

- Select Individual axis control menu:

- For axis 1 and axis 2 use P = 10 , I = 5 , D=20;



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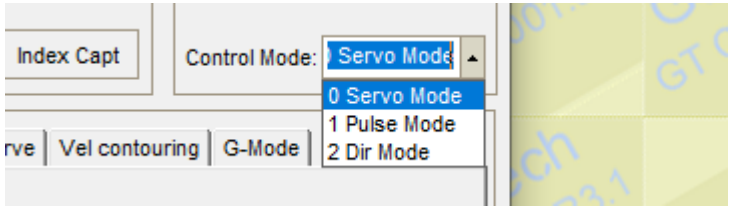
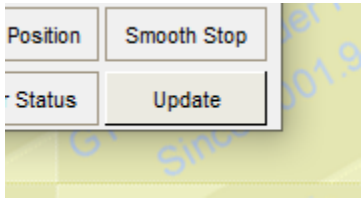
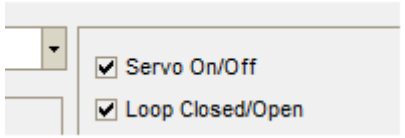
- Control mode=0 servo mode.



- Update it



- Click on servo on



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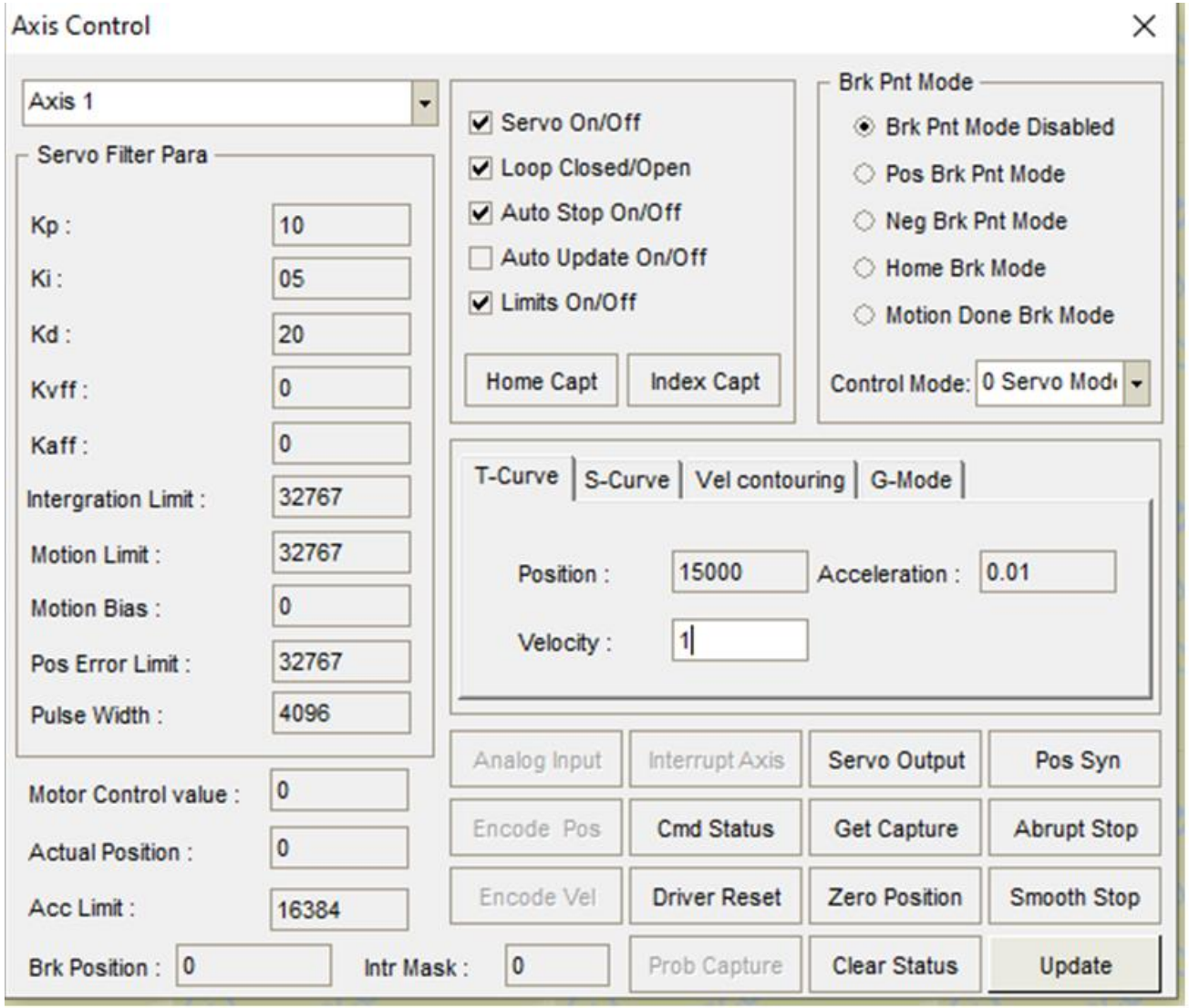
- Give position=15000, acceleration=0.01 , velocity=1



- Update it
- Then the motor will start running.

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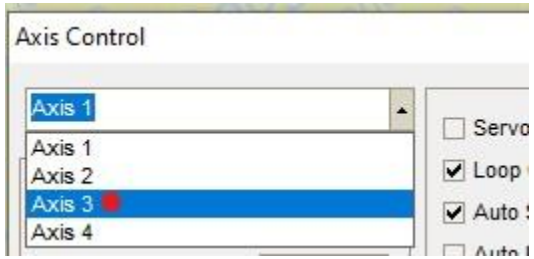
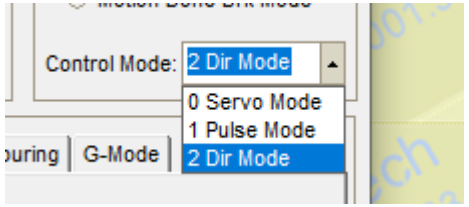
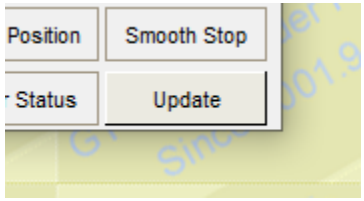
- Further
  - For axis 3 and axis 4 don’t use pid ;



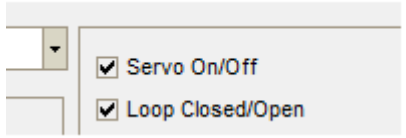
  - Control mode= dir mode



  - Update it



  - Click on servo on



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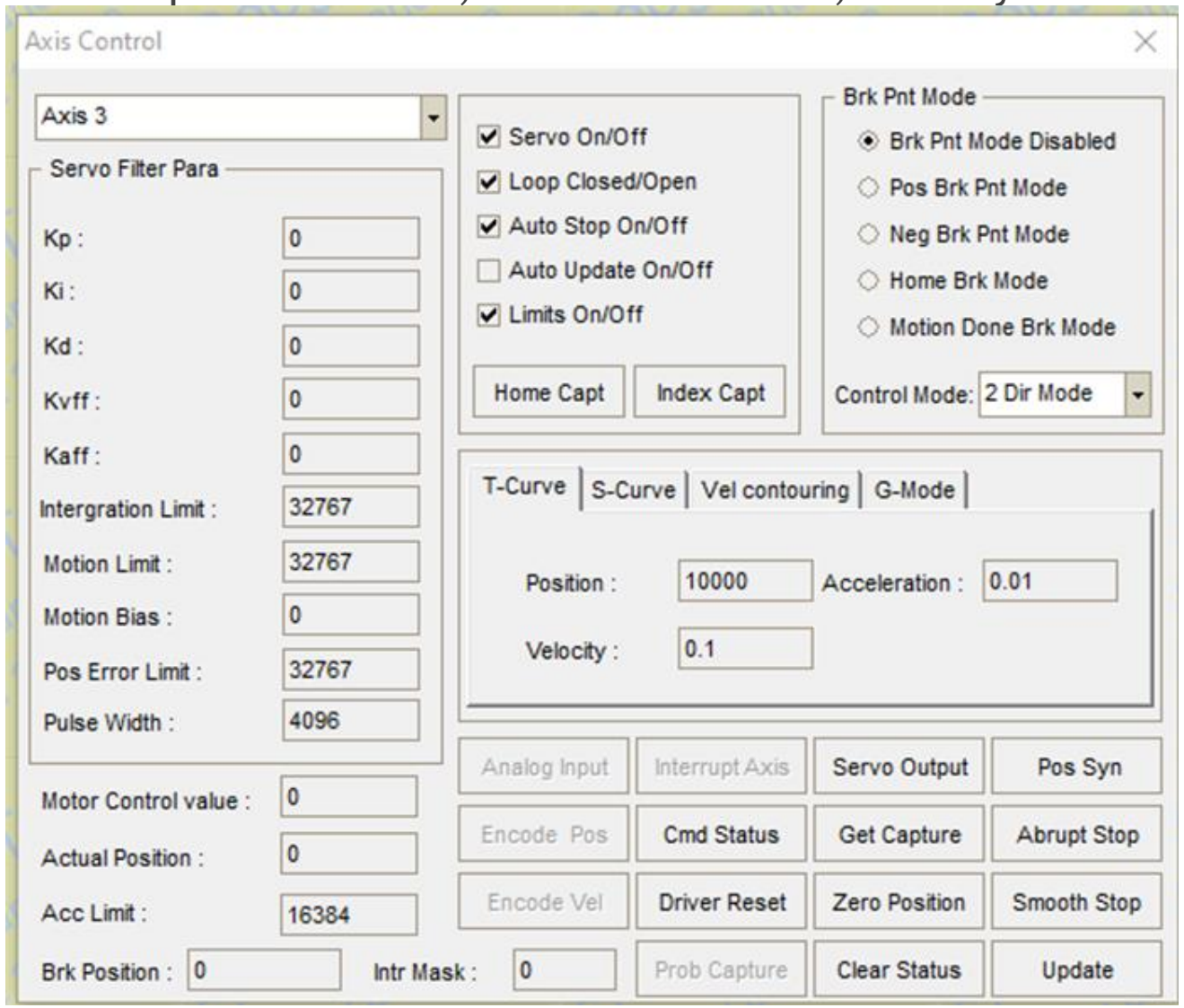
- Give position=10000, acceleration=0.01, velocity=0.1



- Update it
- Then the motor will start running.

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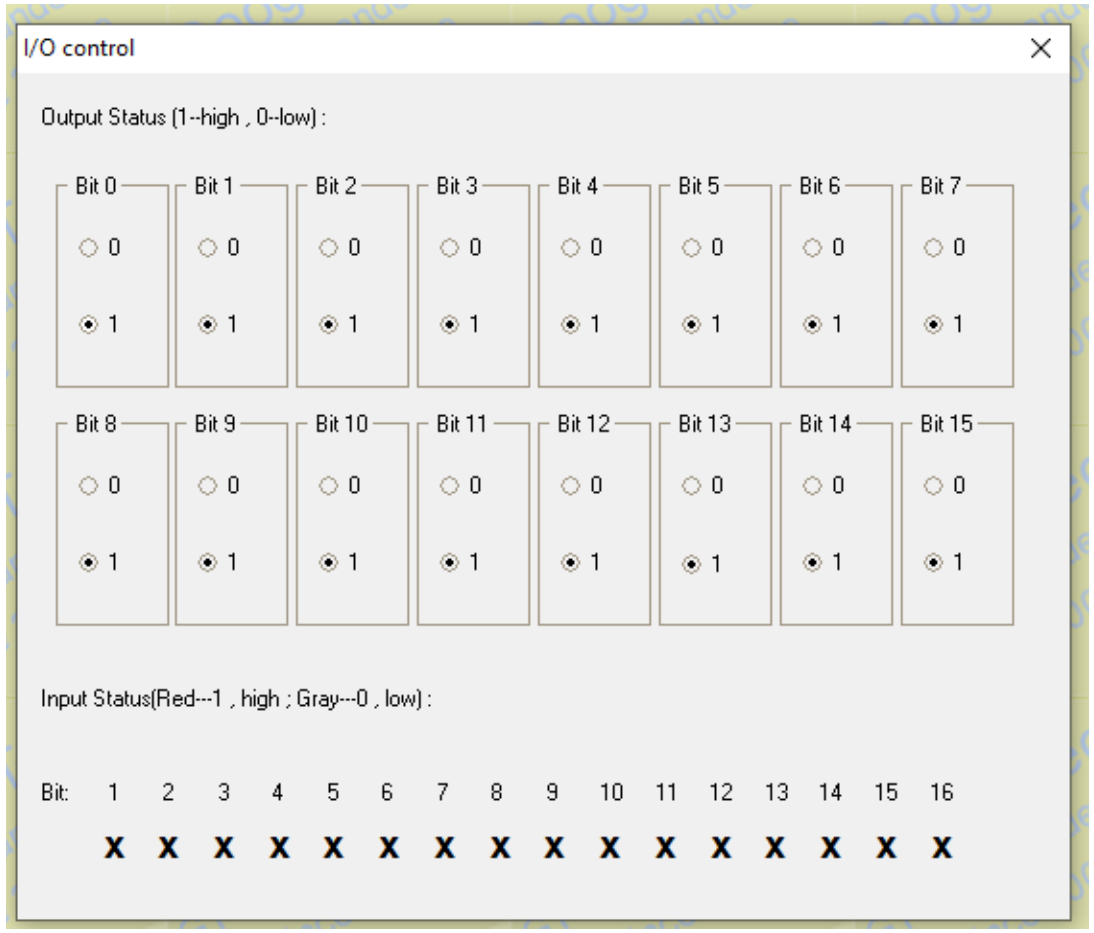
Further Check the inputs in IO status menu

By manually making input knob on and off , you should get signal on the dashboard of IO screen.



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- Experiment no 2: Setting up PPR for Each Motor and rotating all motors for desired resolution.
- Tools and Software Required: Development Platform Hardware setup and GT commander Software.

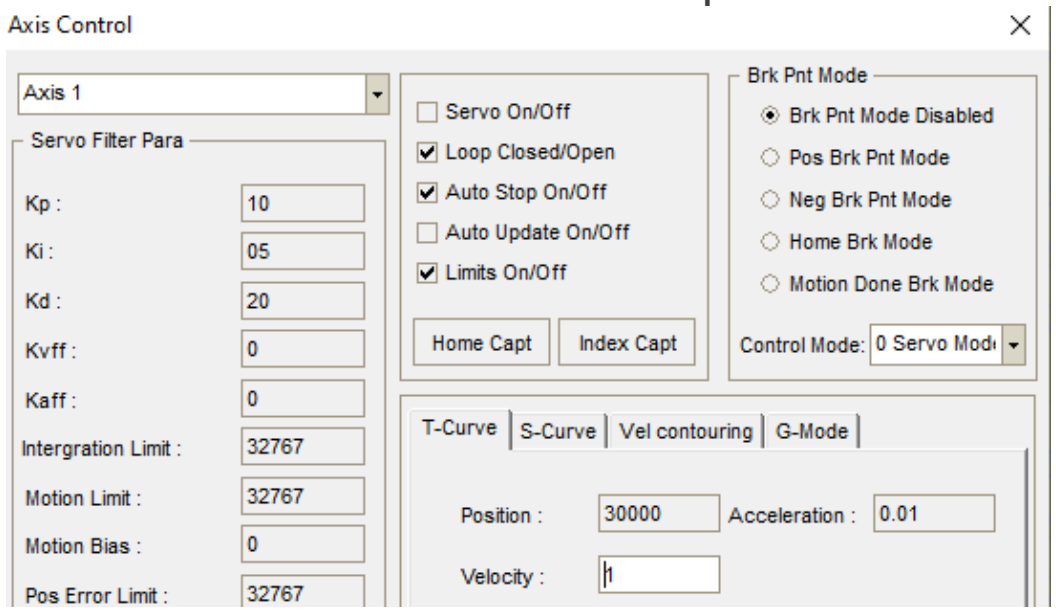
PPR Found out for :

Axis 1= 10000 pulses, Axis 2=10000 pulses, Axis 3 =1600 pulses, Axis 4 = 4000 pulses

Position = PPR * Revolutions

Example1: If we want to rotate axis 1 motor for 3 revolutions, Find the position value.

Ans = ppr of first axis * rev =10000*3 =30000 pulses.



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Eg2: if we want to rotate axis 3 motor for 4 revolutions find position value

Ans = ppr of third axis * rev =1600*4 =6400 pulses.

Eg3: if we want to rotate axis 4 motor for 8 revolutions find position value

Ans = ppr of fourth axis * 8 =4000*8 =32000 pulses.

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Experiment 2 Exercise:

Exercise1: If we want to rotate axis 2 motor for 1.5(1 and a half) revolutions, Find the position value.

Exercise2: If we want to rotate axis 3 motor for 5 revolutions, Find the position value.

Exercise3: If we want to rotate axis 4 motor for 2.5(2 and a half) revolutions in clockwise and anticlockwise direction, Find the position value.

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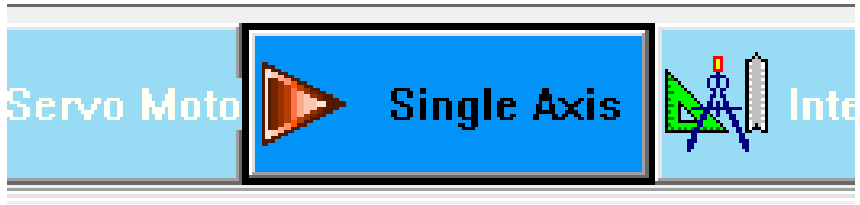
Experiment no 3: Single Axis control Experiment

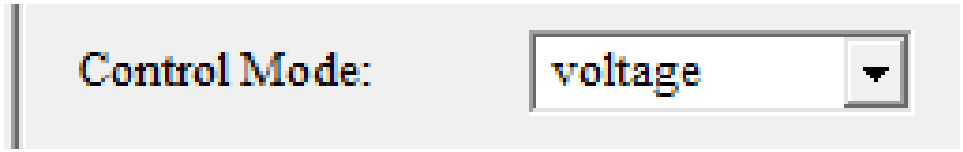
- S-curve and T-curve
- Tools and Software Required: Development Platform Hardware setup and MCE Studio

Select Single Axis Mode in MCE Studio



Select Motor from 1-4

Set mode – Pulse / Voltage



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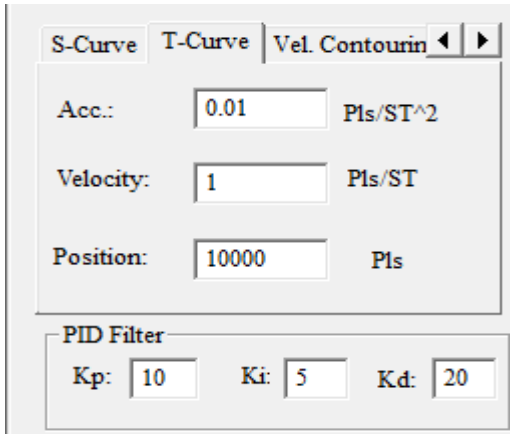
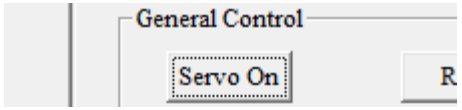
Set S-curve or T-curve



Click on Servo On



Click On Run

Then The Graphs will be Generated

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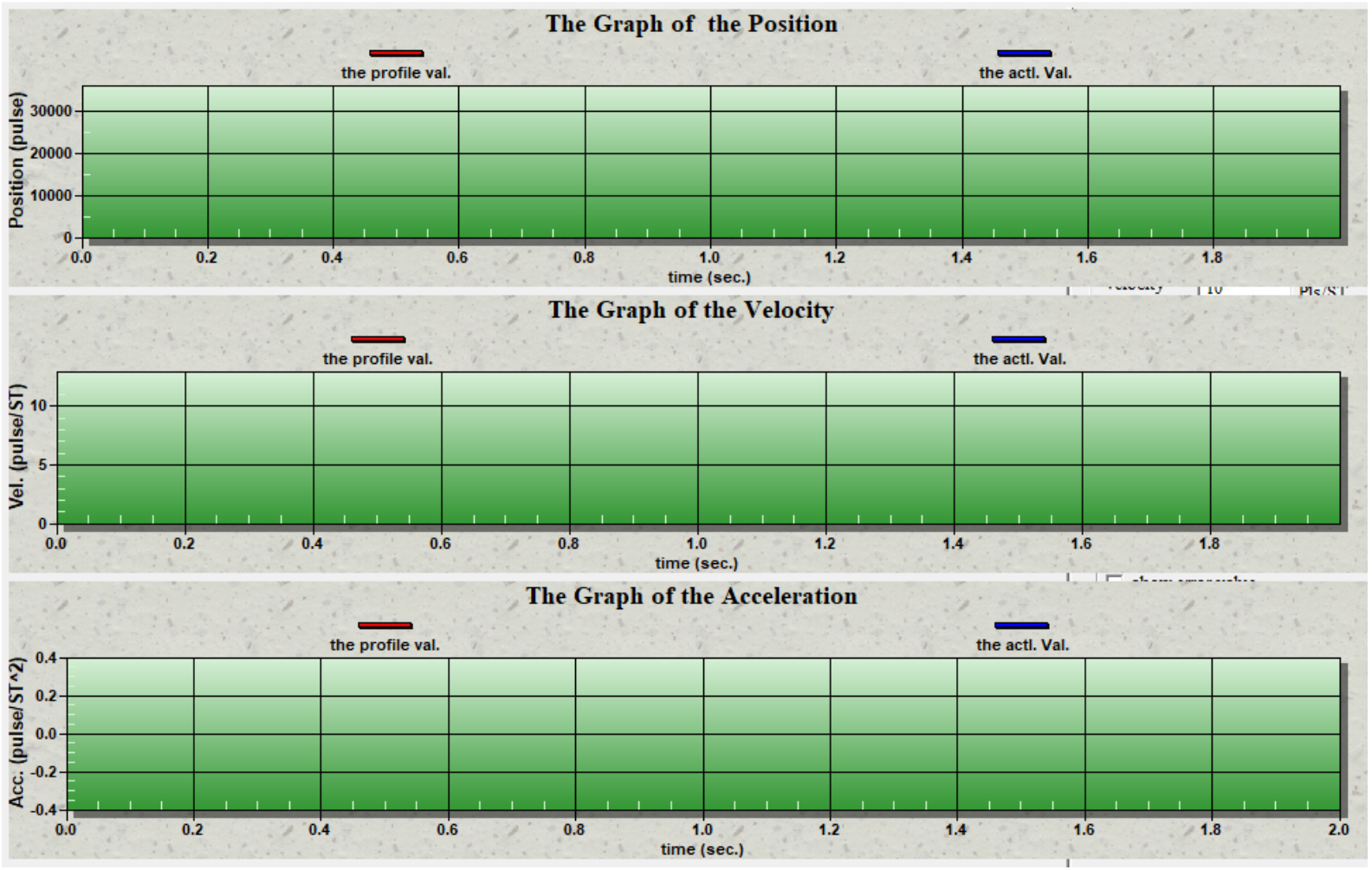
Plot Graph of Position vs Time

Plot Graph of Acceleration vs Time

Plot Graph of Velocity vs time

Googol MCE_Single Axis Experiment Module



Preview the full graph and take screen shot if required.

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- Experiment no 4: Simultaneous Control for 2 motors(Linear Interpolation)

Tools and Software Required: Development Platform Hardware setup and MEC Studio Software.

Before conduction of practical ensure parameters are set correctly.

Password for the Para. Settings is *googol* in lowercase(small letters)

Select two axis(x and y) 1and2 or 3and4

Select Linear Interpolation

And give start point and end point

Servo On

Run

Verify the graphical representation.

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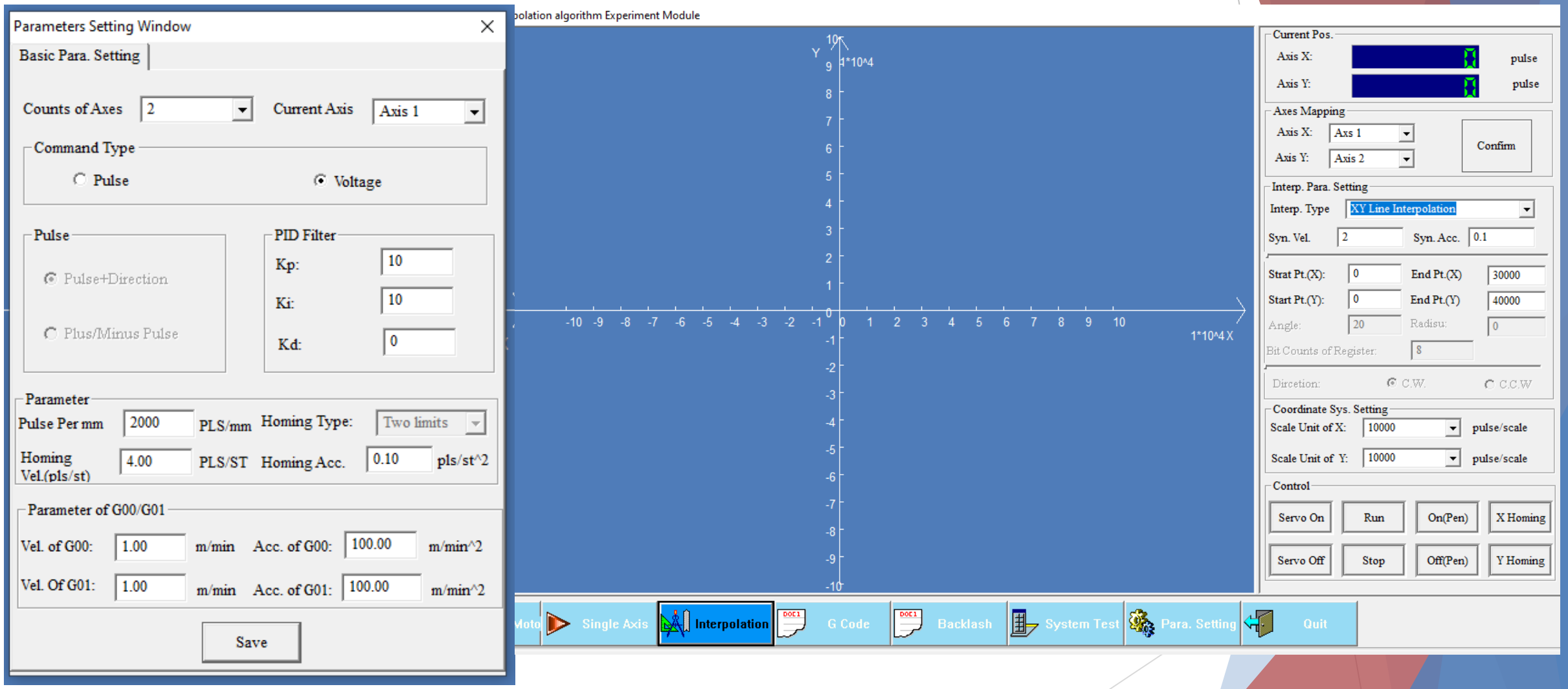

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- Experiment no 5: Simultaneous Control for 2 motors (Circular Interpolation)

Tools and Software Required: Development Platform Hardware setup and MEC Studio Software.

Before conduction of practical ensure parameters are set correctly.

Select two axis(x and y) 1and2 or 3and4

Select circular Interpolation(End Pt./Radius)

And give start point and end point and required parameters

Servo On

Run

Verify the graphical representation.

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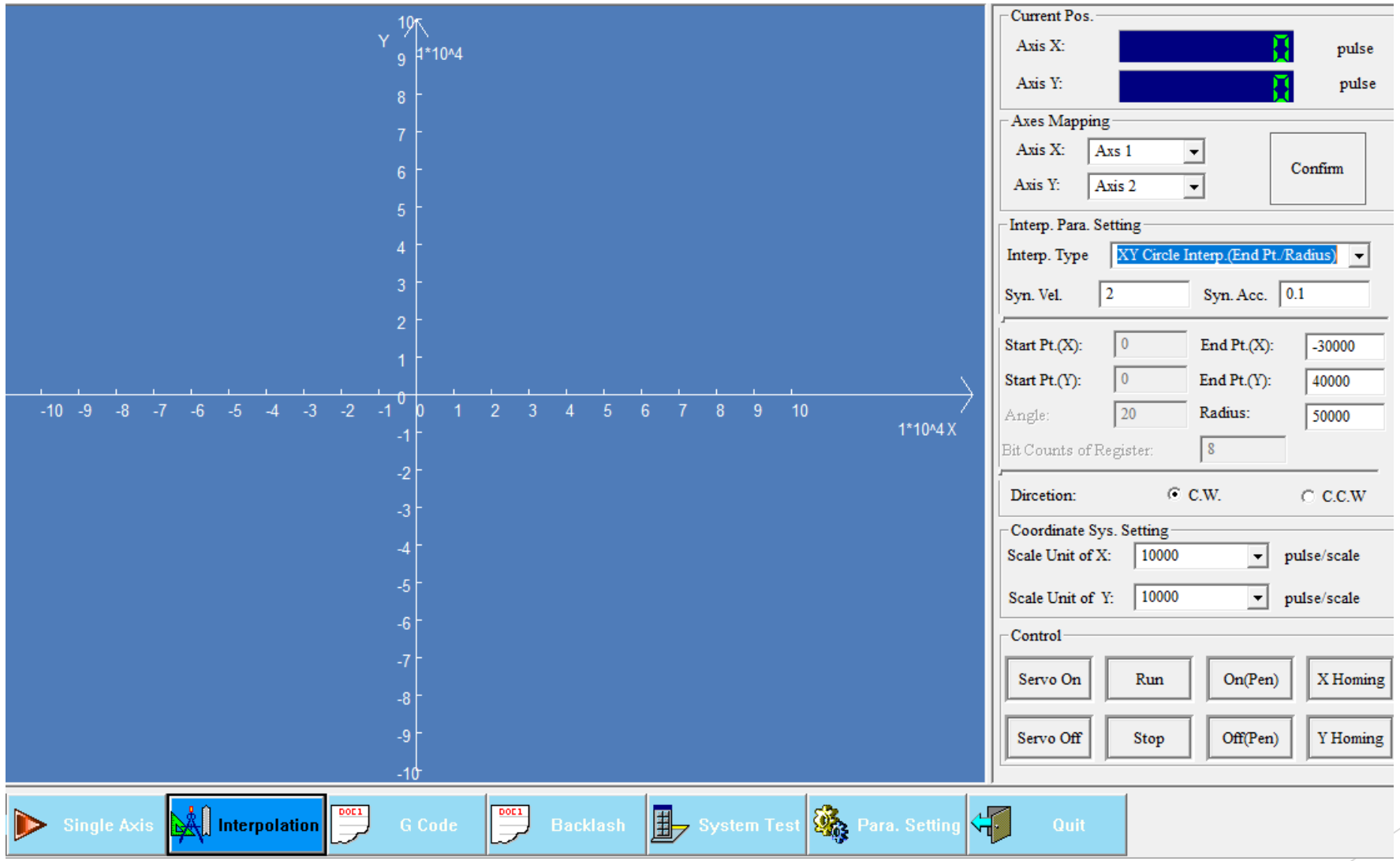
on algorithm Experiment Module



Current Pos.
Axis X: pulse
Axis Y: pulse

Axes Mapping
Axis X: Axs 1
Axis Y: Axis 2
Confirm

Interp. Para. Setting
Interp. Type: XY Circle Interp.(End Pt./Radius)
Syn. Vel. 2 Syn. Acc. 0.1
Start Pt.(X): 0 End Pt.(X): -30000
Start Pt.(Y): 0 End Pt.(Y): 40000
Angle: 20 Radius: 50000
Bit Counts of Register: 8
Dircetion: C.W. C.C.W

Coordinate Sys. Setting
Scale Unit of X: 10000 pulse/scale
Scale Unit of Y: 10000 pulse/scale

Control
Servo On | Run | On(Pen) | X Homing
Servo Off | Stop | Off(Pen) | Y Homing

Single Axis | Interpolation | G Code | Backlash | System Test | Para. Setting | Quit

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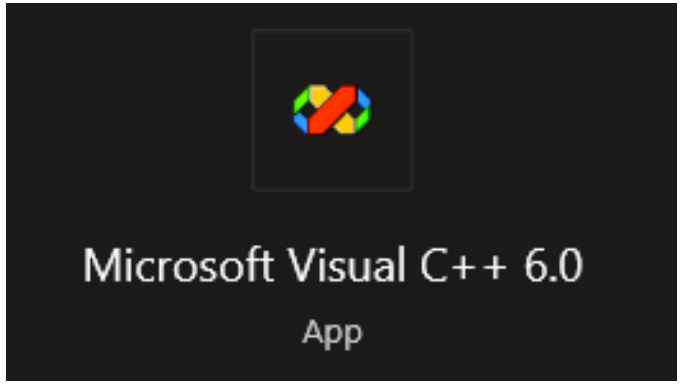
4 Axis Motion Control Development Platform with visual C++ :

- STEPS:

1)Open “Microsoft Visual C++”Application.



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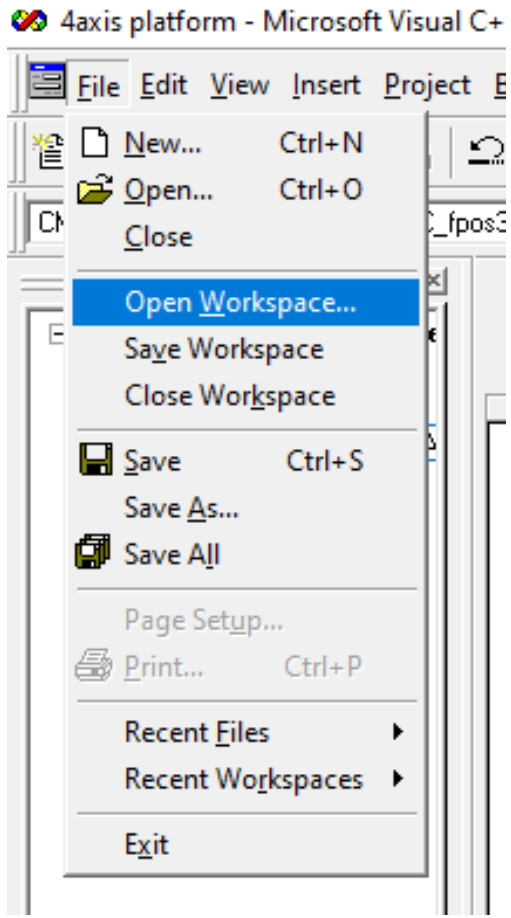
2)Click on the “File” Menu in the Toolbar and Click on “Open Workspace”.



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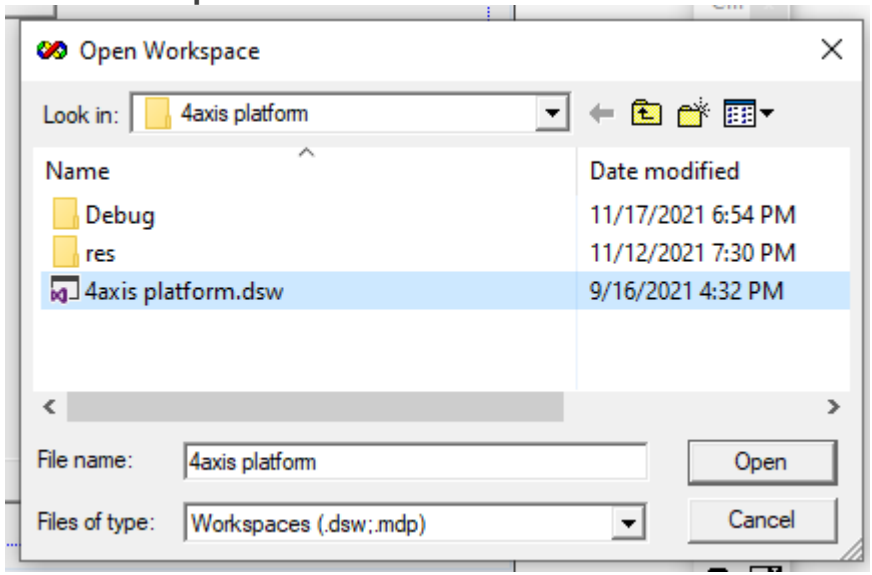
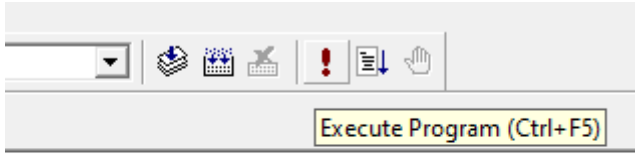
3)Browse to the location of ”4axis platform” folder,then click on”4axis platform.dsw”,then click on ”Open”.



4)Click on the “Execute Program” option located on the right side of Toolbar,it is Denoted by “Red Colour Exclamation Mark”



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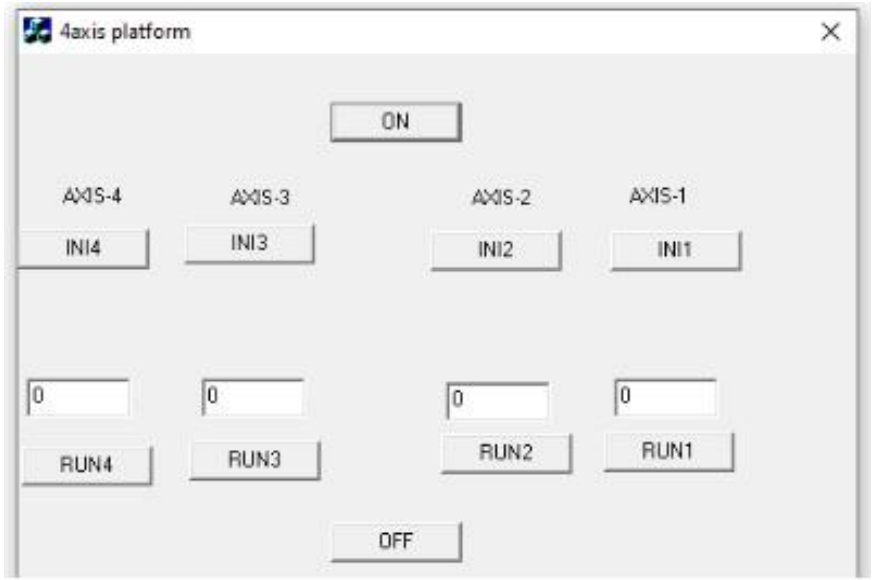
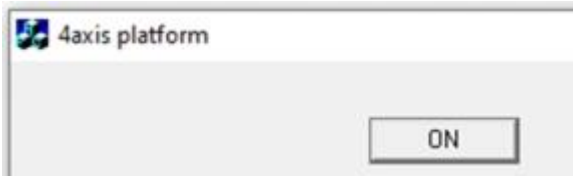
5)After that the Below Scree will Appear.



6)Click on the On button to Turn on the GT-400 Controller.



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7)Click on “INI4” to Initialize ”Motor 4”.

8)Type the Position Value(example:1000,-1000,-5000,etc.) in the edit box below the initialize(INI4) button.

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9)Click on the run button,so that the motor starts Running.

10)If you want to Run another Motor(example-Motor2),Click on the respective initialize button(INI2).

11) Type the Position Value in the edit box below the initialize(INI2) button.

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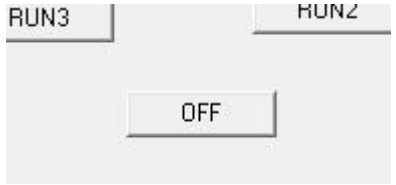
12) Click on the run button,so that the motor-2 starts Running.

13)To Switch OFF all the Motors and Controller,Simply Click on the “OFF” button.



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Google drive Link for 4 Axis Motion Control Development Platform

- Folder of all videos, photos and study and reference material related to 4 Axis Motion Control Development Platform: https://drive.google.com/drive/folders/1pO4o91-jD6U0Di0byat0Csh9jsq4OT-S?usp=sharing
- Servo Motor and Driver pdf: https://drive.google.com/file/d/1Pw8kSOs_HX28N9Y1JnNmpv7CCcimEfOq/view?usp=sharing
- Stepper Motor and Driver pdf: https://drive.google.com/file/d/16SMyUXlNzmUVUH0cJF8SbpTLrnFWmmeb/view?usp=sharing
- BLDC Motor and Driver pdf: https://drive.google.com/file/d/1CL0sQ7hgIyml0YOn7mxLXdMgy5KbtJAf/view?usp=sharing
- MCE Studio Manual: https://drive.google.com/file/d/1aKHr_2Fz5UDAqsQBD77KIzuzKDskJvEB/view?usp=sharing
- GT User Manual: https://drive.google.com/file/d/1H2wVFMHD40s1zMGG30FujyNdjDp554On/view?usp=sharing
- GT Programming Manual: https://drive.google.com/file/d/14SOzTa3nWfiscxIHVPRBfFkgdBv95ywB/view?usp=sharing
- Simulink User Manual: https://drive.google.com/file/d/1bxKOkPze-cplieGvi0nCX3tesLfwZ8Yv/view?usp=sharing