eCylinder eRotary

Quick Start Reference Guide

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ROBOHAND SLA DOCUMENTATION

Please use the SLA CD for the following installation.

MAIN PROGRAM

Install operations software by clicking setup.exe.
You can run sla software without having actual hardware in virtual mode.
Once loaded, the user name and password are both sla

FOLDERS ON CD

APPLICATION_MOVIES	SLA software demo movies
eCylinder MECHANICAL	eCylinder Mechanical drawings & repair manuals
eCylinder_WIRING	WIRING DIAGRAMS
EXAMPLE_PROGRAMS	EXAMPLE SLA PROGRAM
SLA MECHANICAL	SLA Mechanical drawings & repair manuals
SLA WIRING	SLA WIRING CONFIGURATIONS
SoftwareDemoMovies	SOFTWARE DEMONSTRATIONS
WebHelp	BROWSER BASED HELP FILE. SEE BELOW.
CE_TEST_SLA_eCylinder.pdf	CE certification of SLA & eCylinder
setup.exe	MAIN SLA PROGRAMMING PACKAGE
SLA_software_manual.pdf	SOFTWARE PROGRAMMING MANUAL
SLA_Sales_Catalog.pdf	SALES CATALOG
SLA_QUICK_START.pdf	SLA QUICK START GUIDE

HELP FILE HINTS

Create a folder on your computer called C:\SLA or similar.
Drag the entire contents of this CD to this folder.
Locate the following files. Right click and create shortcut.

SOFTWARE DOCUMENTATION---WEBHELP\INDEX.HTM
SOFTWARE MOVIE DEMO------\SoftwareDemoMovies\slaMovies.html

PLC PROGRAMMING---
WebHelp\Programming\Binary_Coded_Decimal_Programs_(BCD).htm

PC PROGRAMMING
WebHelp\Programming\Multi_Motor_Programs_(MMP).htm

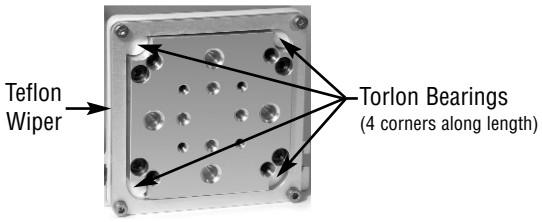
SLIDE STAND ALONE PROGRAM---
WebHelp\Programming\Smart_Motor_Programs_(SMP).htm
Run these shortcuts for movies and documetation.

Log onto www.robohandsla.com for even more extensive documentation.
You should register to gain extended access.

NEW

Precision Handling Performance for Offset Loads

See Cable Detail on Pages 4-5



- Designed for offset loads
- Low cost
- Fully servoed built-in control
- Completely integrates with SLA System for single- or multi-axis combinations

Mechanical

- Multiple speed and force ranges available
- No outriggers required to support offset loads
- Multiple mounting methods
- Smaller installation footprint than other comparable products
- DirectConnect™ mounting pattern

Controls

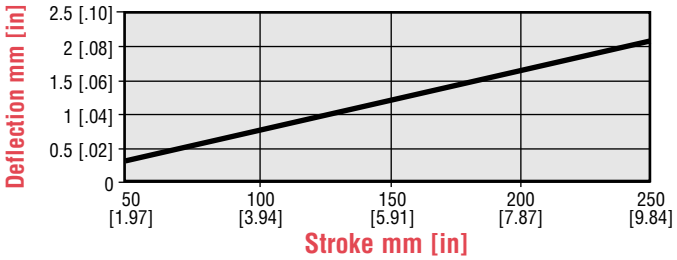
- Free PC programming software
- Absolute position sensor – no homing required!
- Operates over RS-232 for PC control
- Additional discrete I/0 for movement to distinct positions or incremental cam action
- Ten 24VDC sourcing .3 amp outputs / Twelve 24VDC sourcing inputs
- Same output power and speed as comparably sized pneumatic units
- Uses external 24VDC for IO and control
- 48VDC at 3 amps for motor. Option allows 24VDC motor operation.

EC65 – eCylinder™

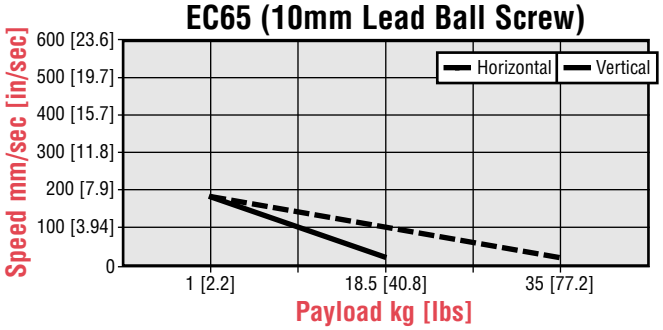
EC65 Specifications						
Stroke	mm	50	100	150	200	250
Rated Motor Power	W	72				
Repeatability	mm [in]	+/- .025 [.001]				
Weight	KG [lb]	2.7 [5.9]	3 [6.6]	3.4 [7.4]	3.7 [8.1]	4 [8.8]
Motor *48VDC at 3 amps for motor. Option allows 24VDC motor operation*	48V	Stepper				
Linear Position Sensor		Absolute				
		Horizontal	**Vertical**			
Max. Speed	mm/sec [in/sec]	85 [3.35]	83 [3.3]			
Max. Payload	KG [lb]	35 [77]	18.5 [41]			
Max. Pitch Moment	N-M [in-lb]	13 [116]	7 [62]			
Max. Yaw/Roll Moment	N-M [in-lb]	11 [96]	7 [62]			
Rated Thrust	N [lb]	343 [77]	182 [41]			
Max. Thrust	N [lb]	378 [85]	200 [45]			
Brake Holding Force	N [lb]	300 [67]	300 [67]			
Cycle Time*	Sec	1.5	1.5			
		Horizontal	**Vertical**			
Max. Speed	mm/sec [in/sec]	173 [6.8]	165 [6.5]			
Max. Payload	KG [lb]	28 [62]	10.1 [22.3]			
Max. Pitch Moment	N-M [in-lb]	10.5 [93]	3.8 [34]			
Max. Yaw/Roll Moment	N-M [in-lb]	8.8 [77.5]	3.8 [34]			
Rated Thrust	N [lb]	276 [62]	99 [22.3]			
Max. Thrust	N [lb]	303 [68]	116 [25]			
Brake Holding Force	N [lb]	187 [42]	187 [42]			
Cycle Time*	Sec	.9	.9			
		Horizontal	**Vertical**			
Max. Speed	mm/sec [in/sec]	430 [16.9]	380 [15]			
Max. Payload	KG [lb]	9.2 [20.3]	2.2 [4.9]			
Max. Pitch Moment	N-M [in-lb]	3.4 [30.5]	1 [9]			
Max. Yaw/Roll Moment	N-M [in-lb]	2.9 [25.4]	1 [9]			
Rated Thrust	N [lb]	90.2 [20.3]	22.2 [5]			
Max. Thrust	N [lb]	98 [22]	26.7 [6]			
Brake Holding Force	N [lb]	93 [21]	93 [21]			
Cycle Time*	Sec	.7	.7			

*100 mm travel @ 10% payload

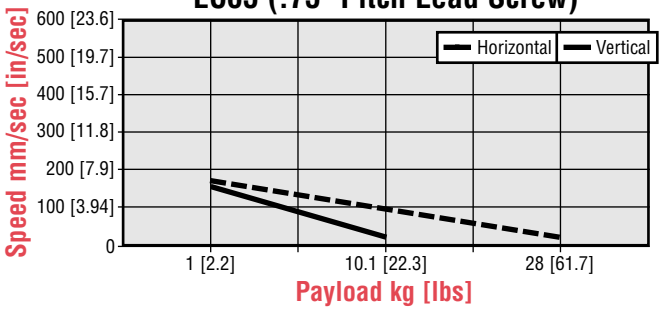
EC65 Deflection at 35 kg [77 lb] Payload



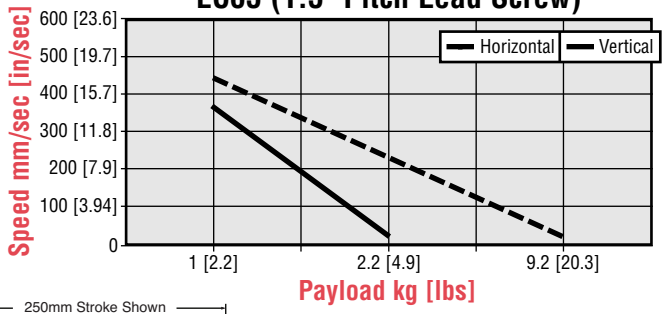
EC65 (10mm Lead Ball Screw)

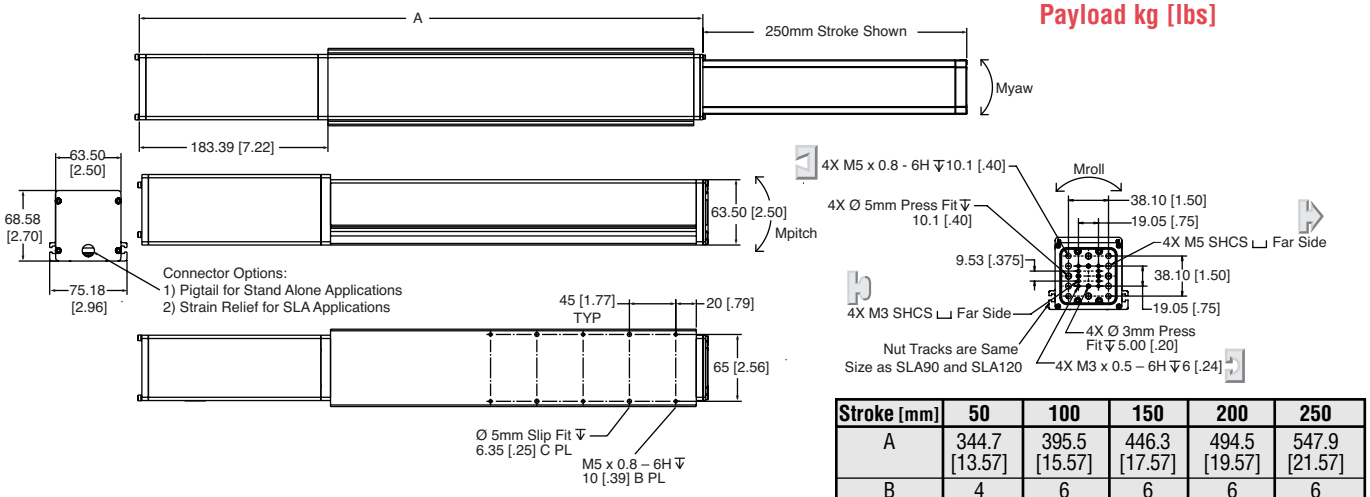


EC65 (.75" Pitch Lead Screw)



EC65 (1.5" Pitch Lead Screw)





Stroke [mm]	50	100	150	200	250
A	344.7 [13.57]	395.5 [15.57]	446.3 [17.57]	494.5 [19.57]	547.9 [21.57]
B	4	6	6	6	6
C	2	4	4	4	4

For more information call us at: 800-259-9890 or 972-726-7300 Fax: 972-726-9034 Email: tech-sla@robohand.com www.robohandsla.com

EC90 Specifications

Stroke	mm	50	100	150	200	250
Rated Motor Power	W	120				
Repeatability	mm [in]	+/- .025 [.001]				
Weight	KG [lb]	5.9 [13]	6.4 [14.1]	7 [15.4]	7.6 [16.8]	8 . 2 [18.1]
Motor *48VDC at 3 amps for motor. Option allows 24VDC motor operation*	48V	Stepper				
Linear Position Sensor		Absolute				

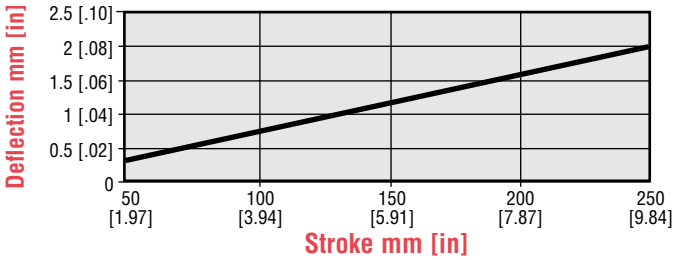
		Horizontal	Vertical
Max. Speed	mm/sec [in/sec]	145 [5.7]	135 [5.3]
Max. Payload	KG [lb]	50.5 [111]	25.9 [57]
Max. Pitch Moment	N-M [in-lb]	18.9 [167]	9.7 [85.5]
Max. Yaw/Roll Moment	N-M [in-lb]	15.6 [139]	9.7 [85.5]
Rated Thrust	N [lb]	494 [111]	254 [57]
Max. Thrust	N [lb]	543 [122]	280 [63]
Brake Holding Force	N [lb]	300 [67]	300 [67]
Cycle Time*	Sec	1.3	1.3

		Horizontal	Vertical
Max. Speed	mm/sec [in/sec]	240 [9.4]	220 [8.7]
Max. Payload	KG [lb]	41 [90.4]	21 [46.3]
Max. Pitch Moment	N-M [in-lb]	15.4 [136]	7.9 [69.5]
Max. Yaw/Roll Moment	N-M [in-lb]	12.8 [113]	7.9 [69.5]
Rated Thrust	N [lb]	405 [91]	209 [47]
Max. Thrust	N [lb]	445 [100]	231 [52]
Brake Holding Force	N [lb]	187 [42]	187 [42]
Cycle Time*	Sec	.9	.9

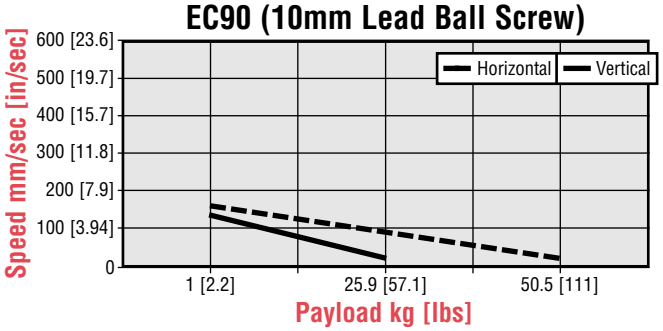
		Horizontal	Vertical
Max. Speed	mm/sec [in/sec]	615 [24.2]	510 [20.1]
Max. Payload	KG [lb]	14.7 [32.4]	3.2 [7.1]
Max. Pitch Moment	N-M [in-lb]	5.5 [48.6]	1.2 [11]
Max. Yaw/Roll Moment	N-M [in-lb]	4.6 [40.5]	1.2 [11]
Rated Thrust	N [lb]	147 [33]	31.6 [7.1]
Max. Thrust	N [lb]	165 [36]	35.6 [8]
Brake Holding Force	N [lb]	93 [21]	93 [21]
Cycle Time*	Sec	.7	.7

*100 mm travel @ 10% payload

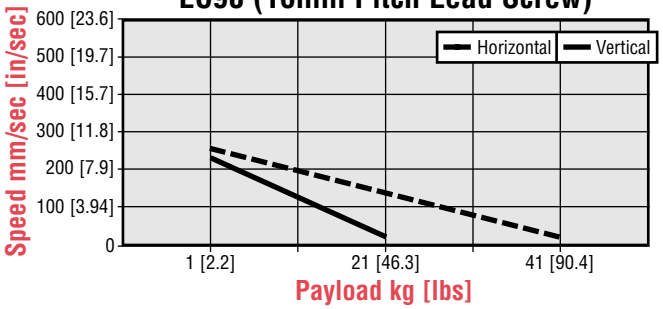
EC90 Deflection at 50 kg [111 lb] Payload



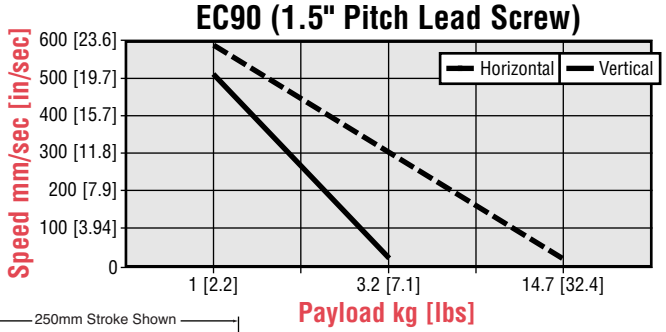
EC90 (10mm Lead Ball Screw)



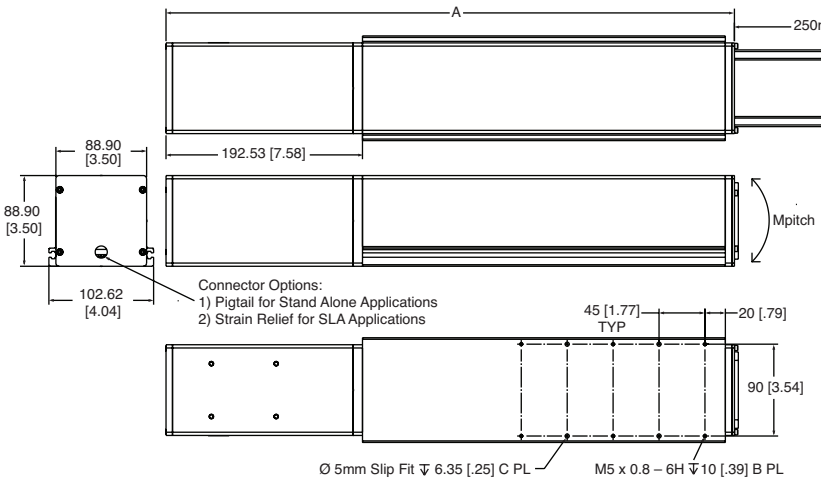
EC90 (16mm Pitch Lead Screw)

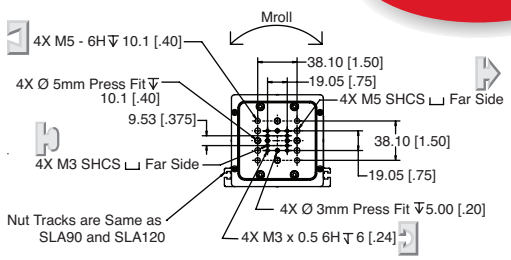


EC90 (1.5" Pitch Lead Screw)



See Pages 25 - 27 for Ordering Instructions

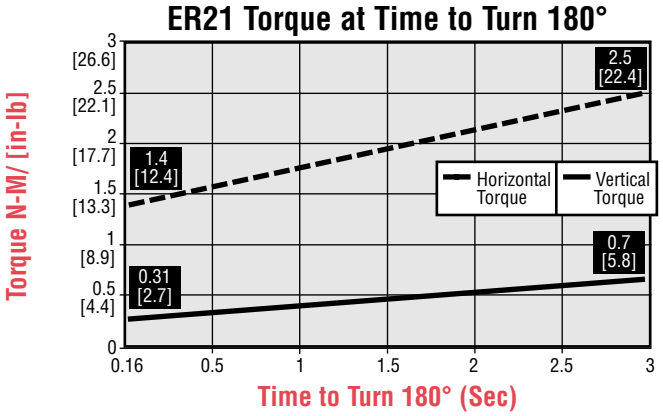


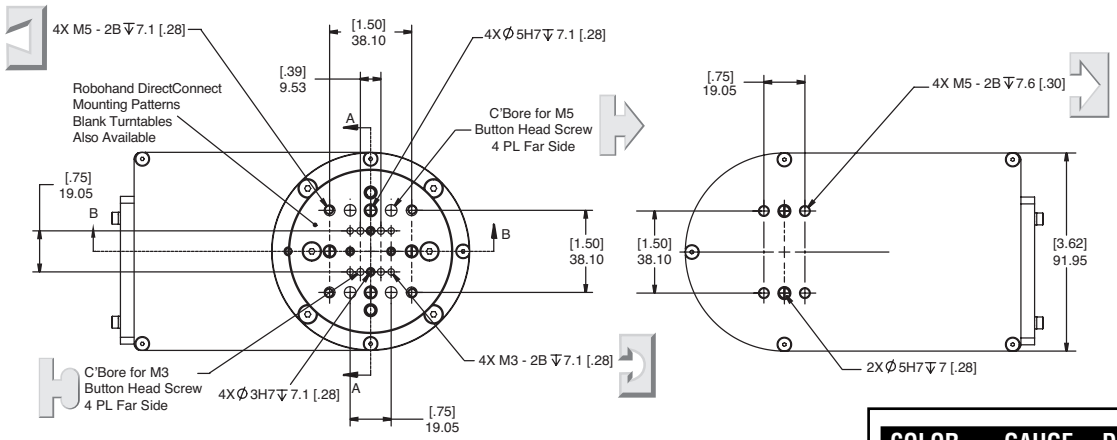


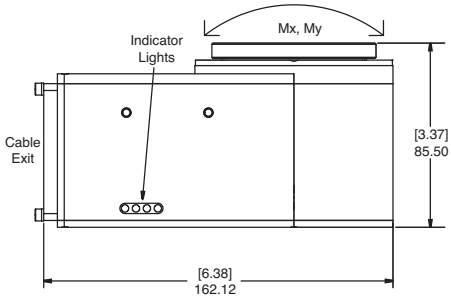
Stroke [mm]	50	100	150	200	250
A	357.6 [14.08]	408.4 [16.08]	459.2 [18.08]	510.0 [20.08]	560.8 [22.08]
B	4	6	6	6	6
C	2	4	4	4	4

ER21 – eRotary™

ER21 Specifications		Horizontal	Vertical
Max. Speed	RPM	183	151
Max. 180° Move Time	SEC	0.17	0.17
Torque at Max. RPM	N-M [in-lb]	1.4 [12.4]	.31 [2.7]
Torque at Min. RPM	N-M [in-lb]	2.5 [22.4]	.7 [5.8]
Payload	KG [lb]	11.3 [25]	6.8 [15]
Mx, My	N-M [in-lb]	8.5 [75]	6.8 [60]
Weight	KG [lb]	1.7 [3.7]	1.7 [3.7]
Rated Motor Power	W	72	
Motor (5:1 belt drive)	48V	Stepper	
Repeatability	DEG	+/- .02	
Rotary Position Sensor		Absolute	
Brake Holding Torque	N-M [in-lb]	.45 [4]	
12 Input 24 VDC – Source 10 Output 24 VDC – Source .2A			





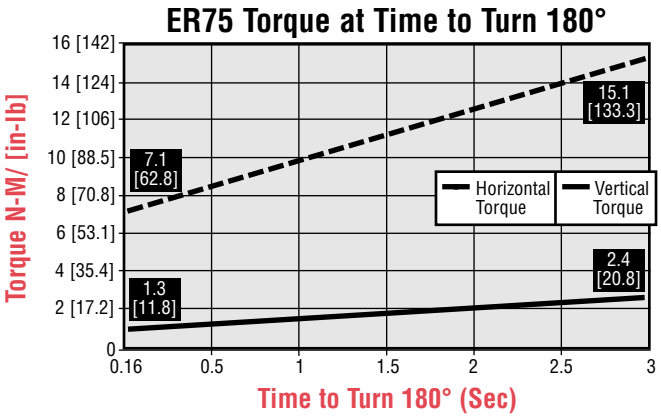


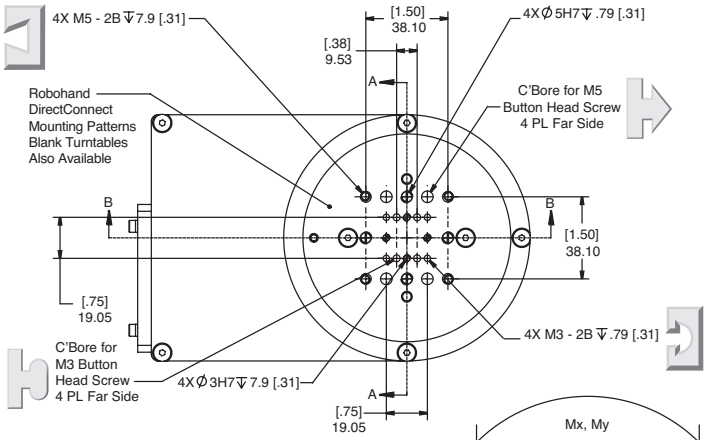
COLOR	GAUGE	DESCR	J9	P2
RED	18	48 power	30.31	P2-1 P2-2
BLK	18	48 com	28.29	P2-3 P2-4
wht*	24	Tx	25	P2-5
blu*	24	Rx	26	P2-6
blk*	24	Com	27	P2-7
SHIELD*	shield	shield	34	P2-8
				P1
BROWN	20	24 power	1	P1-1
BLUE	20	24 com	2	P1-2
white	24	IN 1	3	P1-3
yellow	24	IN 2	4	P1-4
green	24	IN 3	5	P1-5
blue	24	IN 4	6	P1-6
orange	24	IN 5	7	P1-7
red	24	IN 6	8	P1-8
brown	24	IN 7	9	P1-9
violet	24	IN 8	10	P1-10
gray	24	IN 9	11	P1-11
black	24	IN 10	12	P1-12
white/blk	24	IN 11	13	P1-13
yellow/blk	24	IN 12	14	P1-14
orange/blk	24	OUT 1	15	P1-15
red/blk	24	OUT 2	16	P1-16
gray/blk	24	OUT 3	17	P1-17
green/wht	24	OUT 4	18	P1-18
blue/wht	24	OUT 5	19	P1-19
orange/wht	24	OUT 6	20	P1-20
red/wht	24	OUT 7	21	P1-21
brown/wht	24	OUT 8	22	P1-22
violet/wht	24	OUT 9	23	P1-23
black/wht	24	OUT 10	24	P1-24

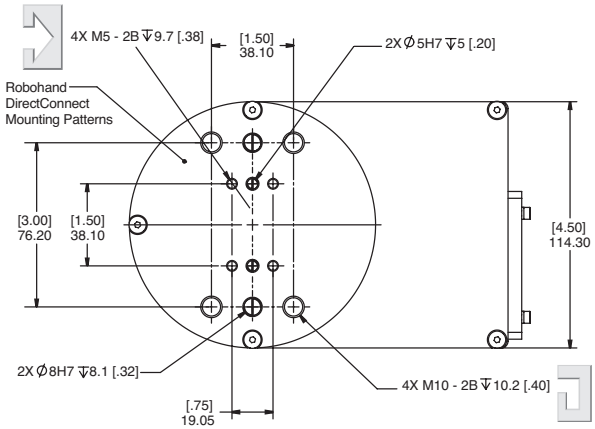
See Pages 25 - 27 for Ordering Instructions

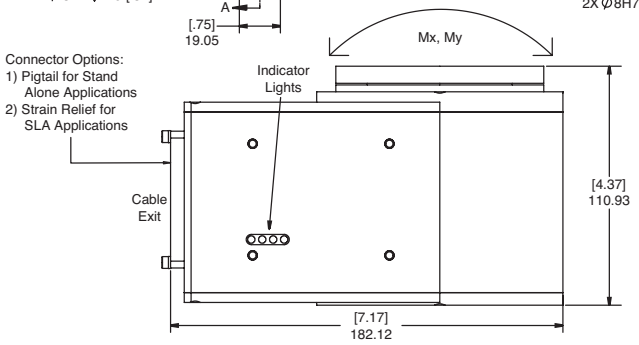
eCYLINDER™ eROTARY™ Cable Assembly Details

ER75 Specifications		Horizontal	Vertical
Max. Speed	RPM	190	178
Max. 180° Move Time	SEC	0.17	0.17
Torque at Max. RPM	N-M [in-lb]	7.1 [62.8]	1.3 [11.8]
Torque at Min. RPM	N-M [in-lb]	15.1 [133.3]	2.4 [20.8]
Payload	KG [lb]	22.7 [50]	13.6 [30]
Mx, My	N-M [in-lb]	11.3 [100]	8.5 [75]
Weight	KG [lb]	3.2 [7.1]	3.2 [7.1]
Rated Motor Power	W	120	
Motor (5:1 belt drive)	48V	Stepper	
Repeatability	DEG	+/- .02	
Rotary Position Sensor		Absolute	
Brake Holding Torque	N-M [in-lb]	.45 [4]	
12 Input 24 VDC – Source 10 Output 24 VDC – Source .2A			









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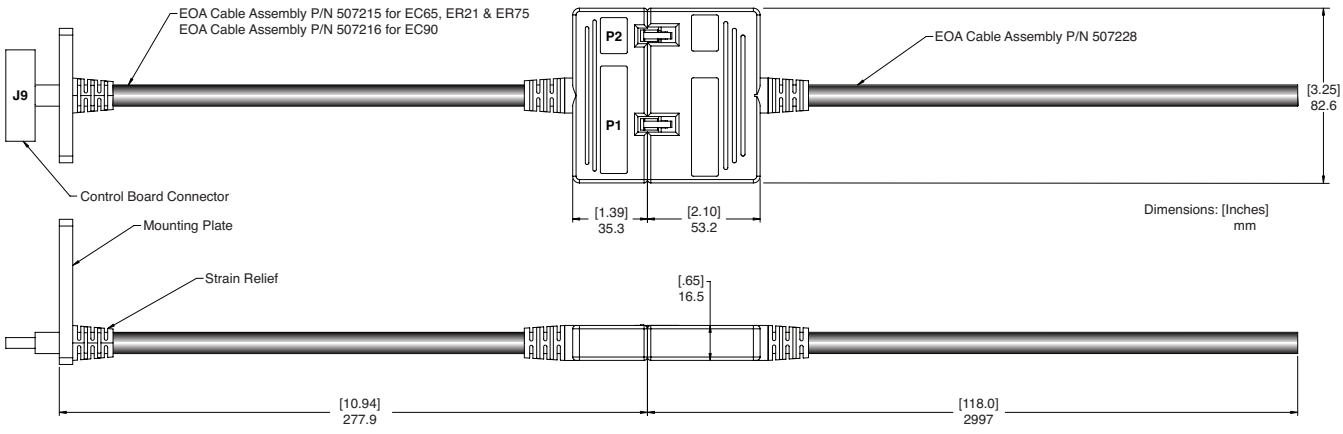


Installing SLA OS Software

To install the software:

1. Close all programs including any copy of SLA OS Software.
2. If you have a previous copy of the software installed, uninstall it before installing the new version. (note: Older versions (before v1.2) require backing up of database located in "C:\Program Files\Robohand\SLA\data\data.mdb" in a safe location.) To uninstall the previous version, open Control Panel, click on 'Add or Remove Programs', click on 'SLA Operating Software' and follow the instructions for removing the software.
3. Double click on the installation setup.exe file. The installation wizard will lead through the steps for installation.
4. If you had to backup the database in earlier step, copy the database back in the original location.
5. Once the software is installed, it will create shortcuts on the Desktop as well as create additional menu items in the program menu accessible from standard Windows Start menu.

Quick Start

Quick Introduction to Configuration of SLA OS

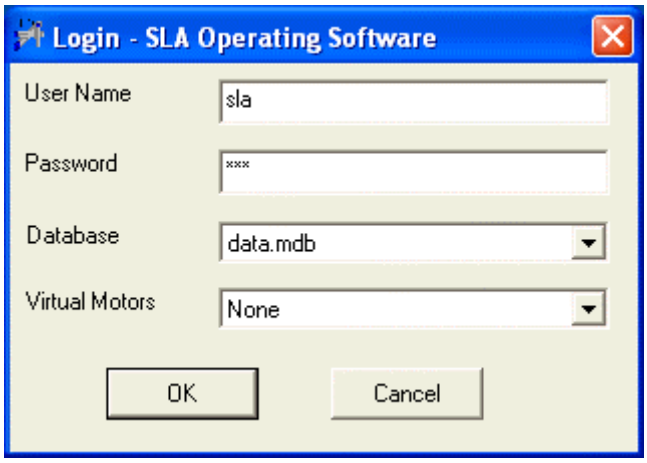
This section is designed for a quick introduction to the SLA OS by showing how easy it is to write useful programs to get the results you want. It shows examples of three different types of programs:

1. **Multi Motor Program (MMP)** - can handle most applications with its inbuilt library of highly sophisticated commands. It runs from the (optional) SLA Control Unit.
2. **Smart Motor Program (SMP)** - runs in the motors (doesn't require SLA Control Unit) and can handle many of the less complex tasks.
3. **Binary Coded Decimal Program (BCD)** - type of simplified SMP program where PLC based controls can be used to send BCD numbers to the motors to go to pre programmed locations.

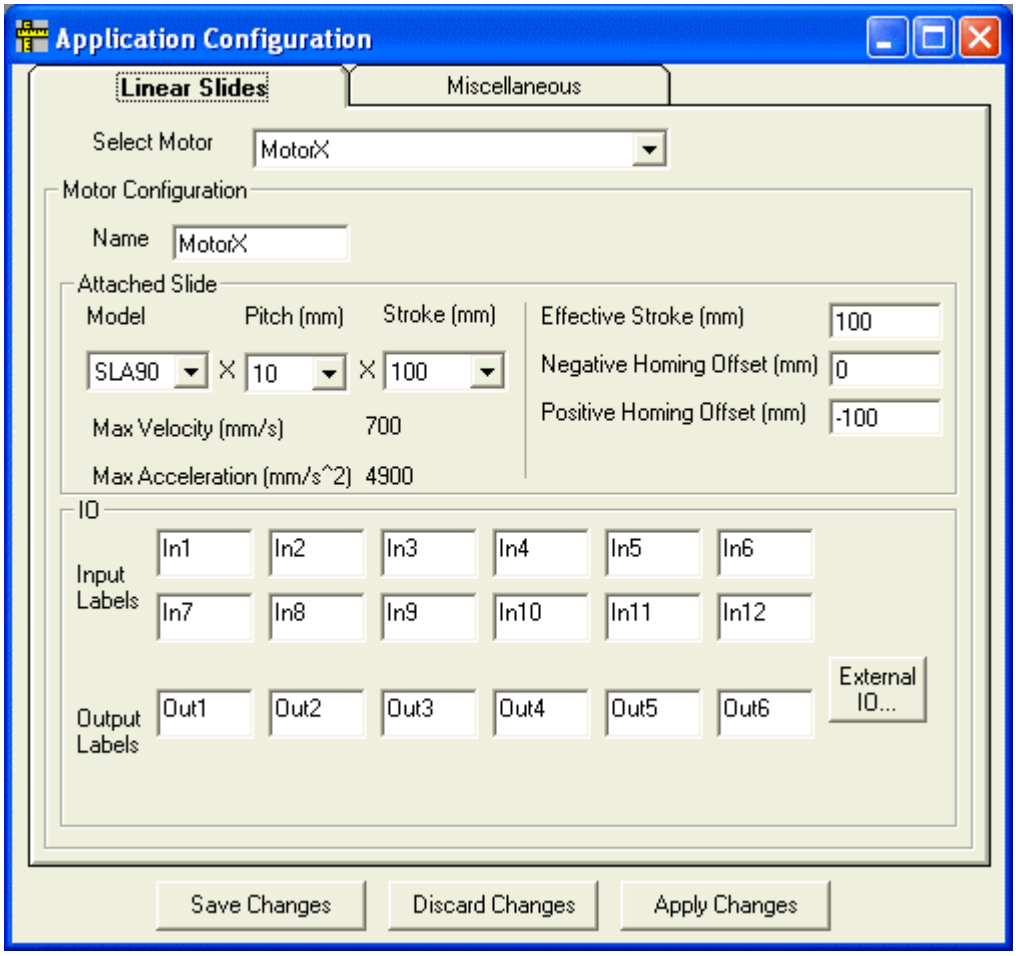
Before a program can be written the SLA OS software must be configured to match the settings of the slides configuration.

Quick Configuration

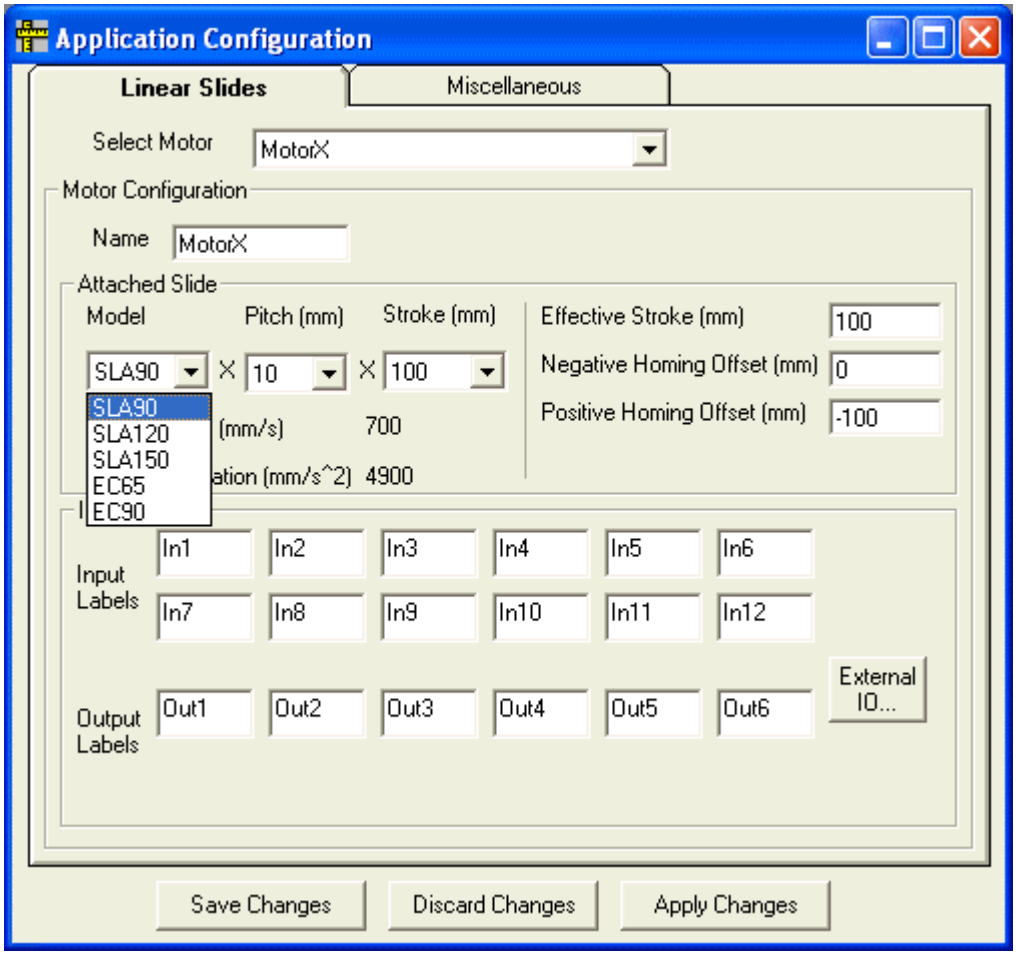
Once the SLA OS software is installed (it already comes pre-installed if you also ordered the SLA Control Unit), login with the user and password both as "sla" (in lowercase).



Click on the Configuration icon in the toolbar to open the following configuration screen.



Select the correct slide models and stroke lengths for each of the motors by clicking on the appropriate drop down combobox and saving the settings.



Once the system is configured, the following three sections show how to quickly write programs using the three mentioned program types.

1. **Multi Motor Program (MMP) Quick Start**
2. **Smart Motor Program (SMP) Quick Start**
3. **Binary Coded Decimal Program (BCD) Quick Start**

Later in the manual many of the advanced features will be discussed in more details to fully harness the power of SLA OS.

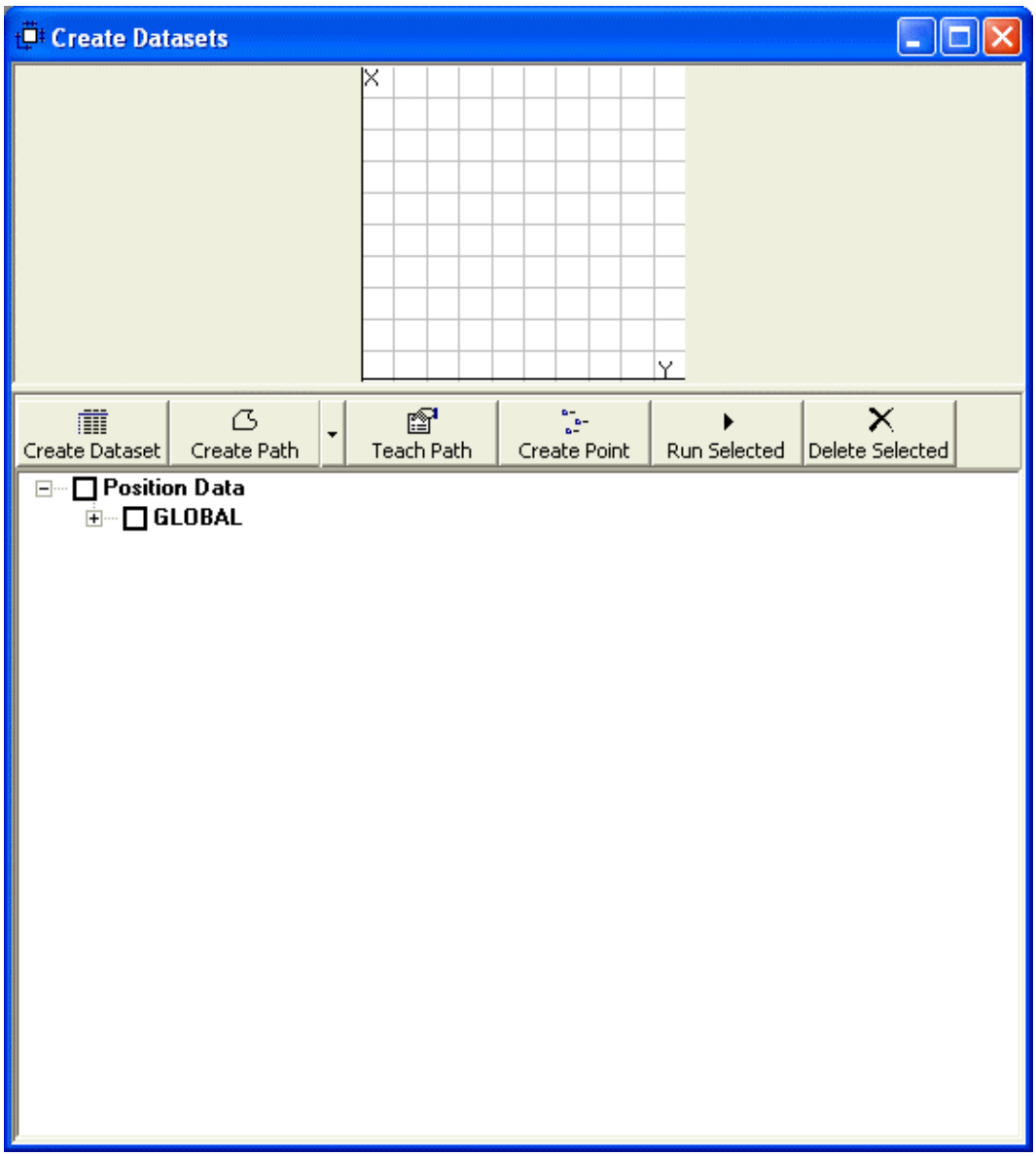
Quick Introduction to Multi Motor Programming with SLA OS

This section is designed for a quick introduction to Multi Motor Programming with SLA OS by writing a simple Multi Motor Program (MMP) for dispensing along a square shape of 60 mm side with rounded corners of radius 5 mm. The three main steps are

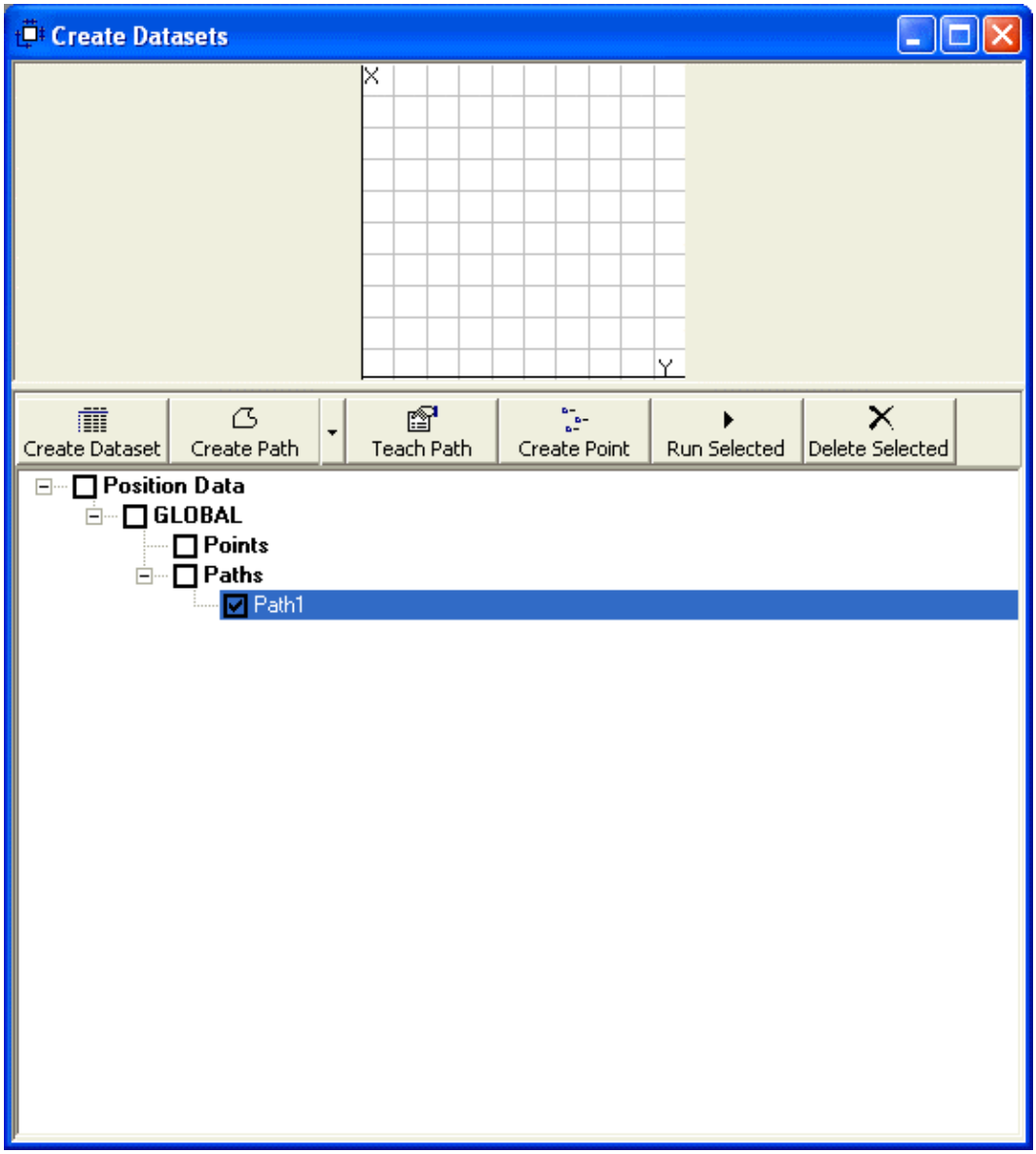
1. Position Data Creation
2. Programming
3. Results

Quick Position Data Creation

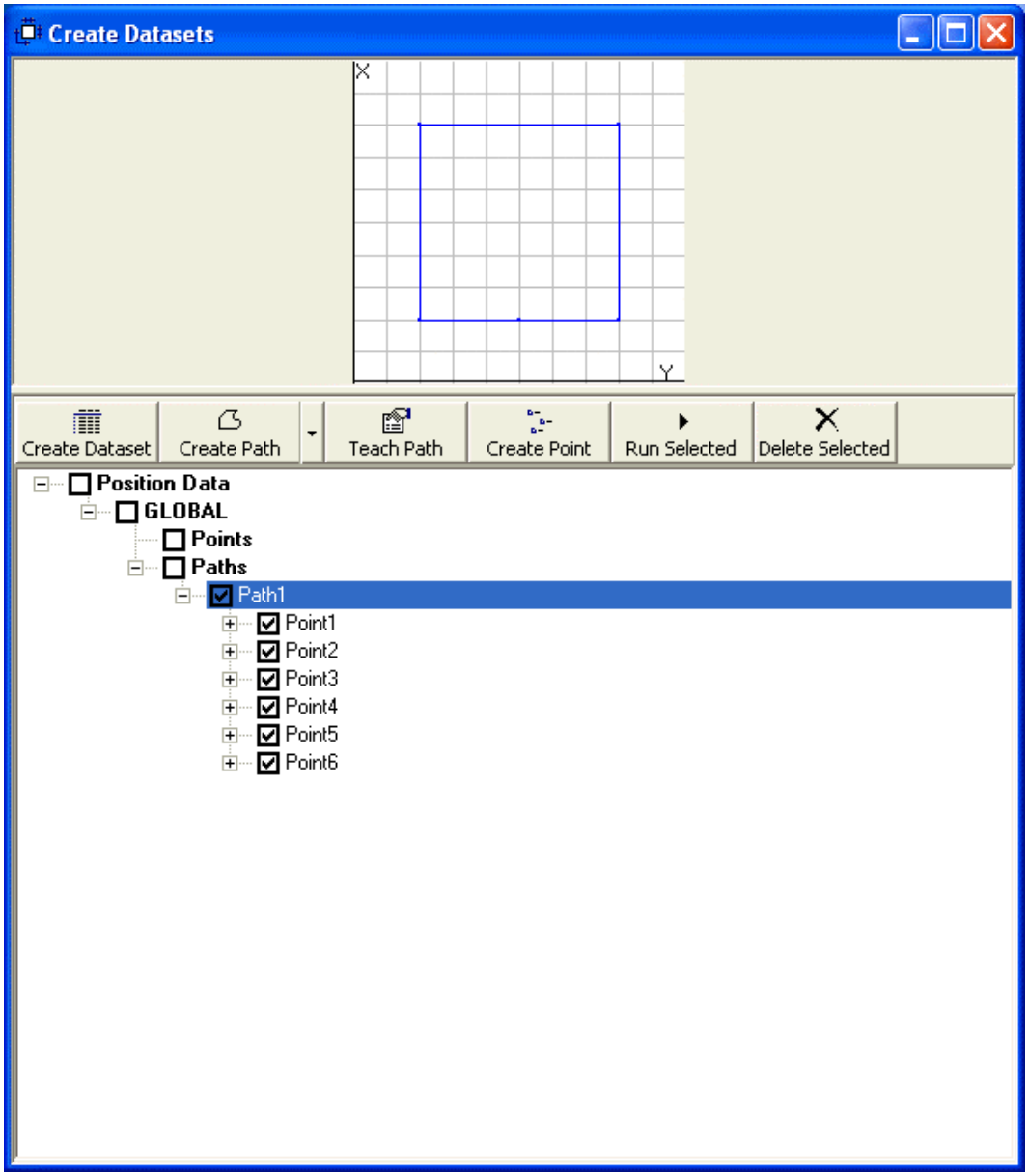
Click on the Datasets icon in the toolbar to open 'Create Datasets' screen.



Click on the 'Create Path' icon in the screen to create a new path for dispensing.

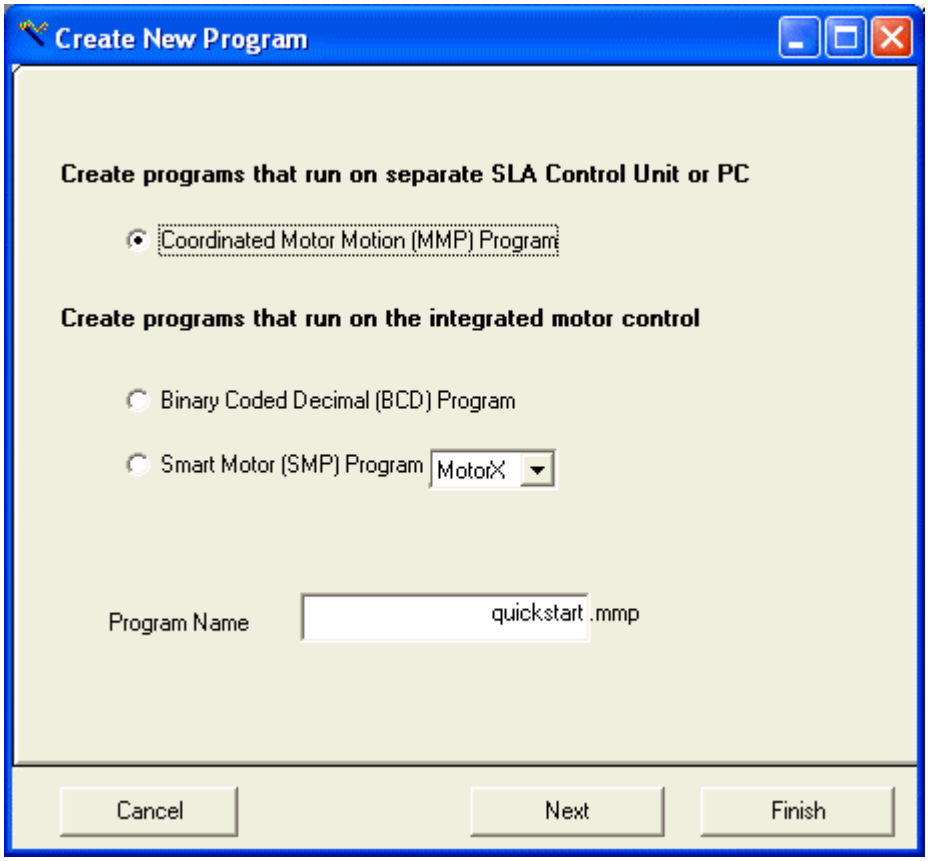


With the mouse, create the desired path as shown below. The six point square includes starting from the center of a side and selecting all four corners and back to the original center point to create six points as shown below.

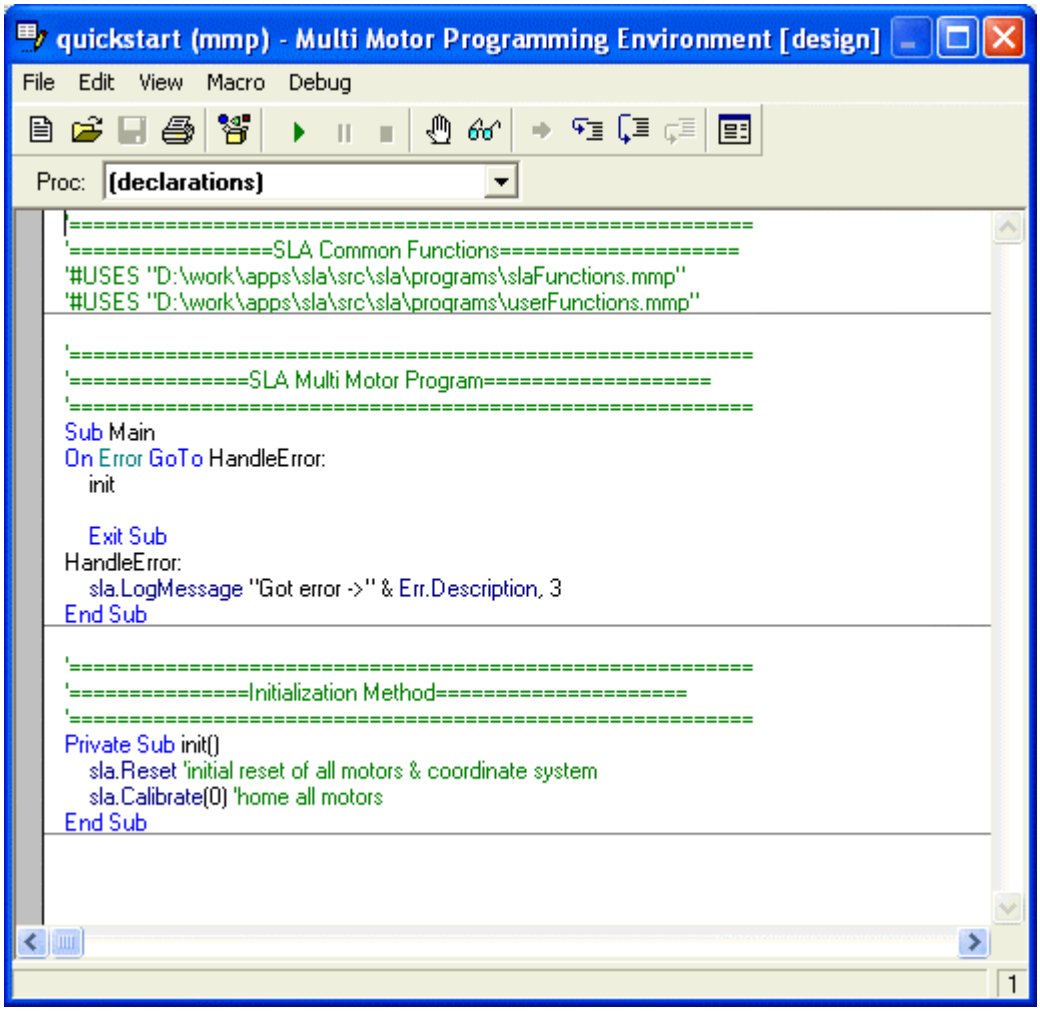


Quick Programming

Open a 'New Program...' dialog by clicking on File menu or pressing Ctrl+N (Control and N together). By default, the MMP program is selected. Type the name of the new program in 'Program Name' textbox and click 'Create Program' button.

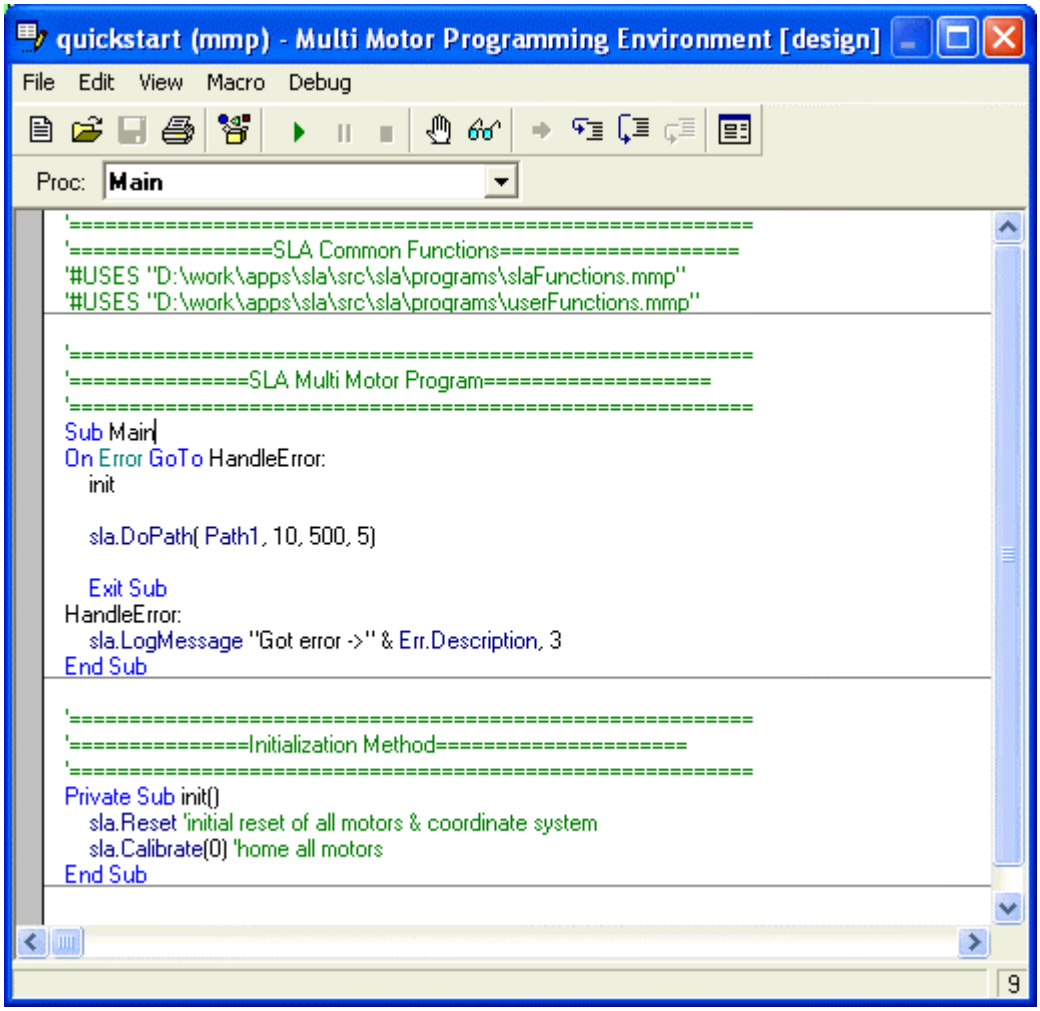


This will bring up the MMP Programming Environment with the template of the program already created as shown below.



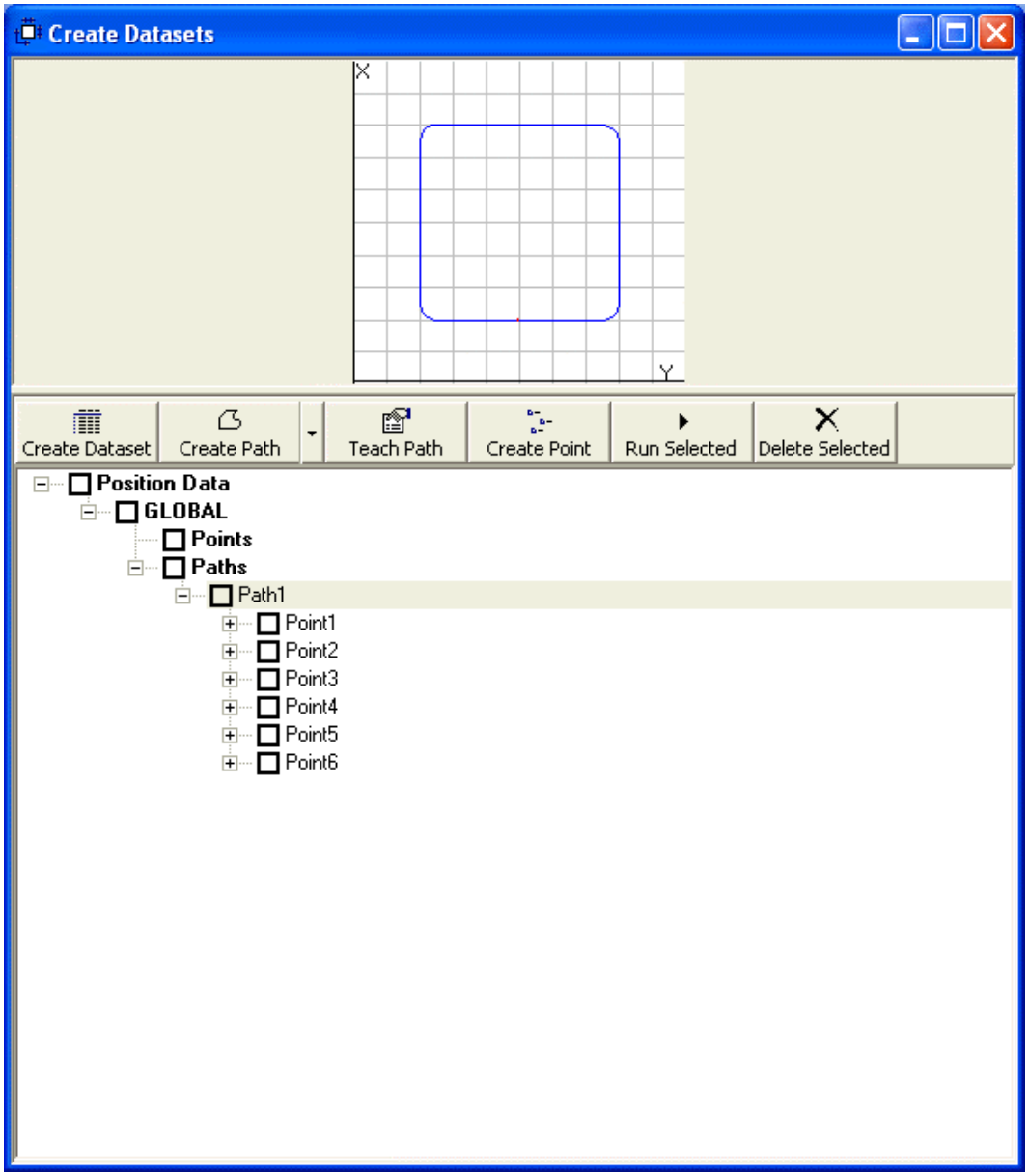
Just after the 'init' call to calibrate the system, add the following line to make the slide follow the square path (Path1) just created. Note that as soon as you start typing 'sla.' the autocomplete feature of the environment displays all the possible completion. At this point it is a matter of selecting from the options and filling in the arguments. The following command will make slide follow the Path1 with 10 mm/sec. speed and acceleration of 500 mm/sec.^2. Note, how easy it is to add the rounding of 5 mm for the corners.

```
sla.DoPath( Path1, 10, 500, 5)
```



Quick Results

Select the 'Monitor All' and 'Visual Trace' checkboxes on the main window to follow the movement of the slides on the Dataset screen. Click the Start button on the MMP Programming Environment to run the program to see the following successful result.


Create Datasets
X
Y
Create Dataset
Create Path
Teach Path
Create Point
Run Selected
Delete Selected
Position Data
GLOBAL
Points
Paths
Path1
Point1
Point2
Point3
Point4
Point5
Point6

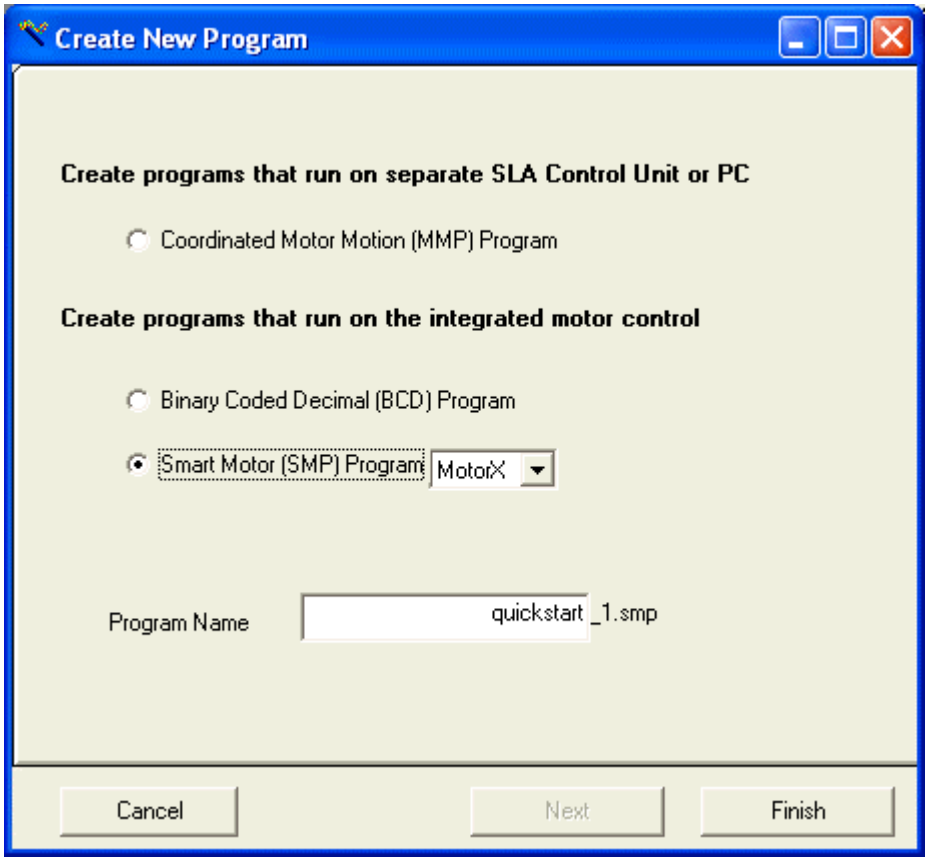
Quick Introduction to Smart Motor Programming with SLA OS

This section is designed for a quick introduction to Smart Motor Programming with SLA OS by writing a simple Smart Motor Program (SMP) for creating a constant velocity motion of for MotorX in positive direction. The two main steps are

1. Programming
2. Results

Quick Programming

Open a 'New Program...' dialog by clicking on File menu or pressing Ctrl+N (Control and N together). Select the SMP program type and enter the name of the new program in 'Program Name' textbox. Note that by default, MotorX is selected. Click 'Create Program' button.



This will bring up the SMP Programming Environment with the template of the program already created as shown below which includes the instructions for downloading tuning parameters and homing the motor at the start of the program.

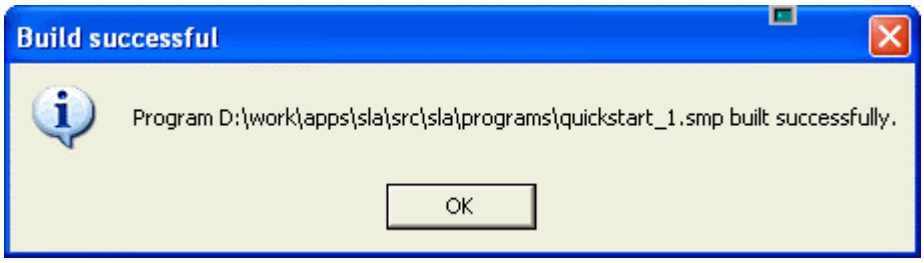
Between the section indicated for user code, add the following lines to make the slide move in the positive X direction with 1000000 Smart Motor Unit speed and 100 Smart Motor Unit acceleration. The command MV defines the velocity mode for motion and the command G starts the motion.

```
MV
A = 100
V = 1000000
G
```

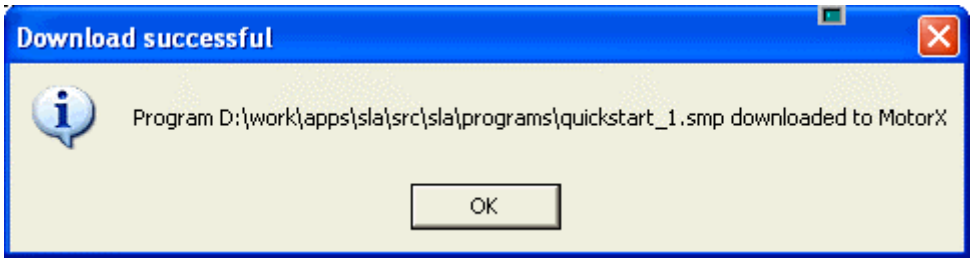

D:\work\apps\sla\src\sla\programs\quickstart_1.smp*
Motor:
MotorX
'==
'===============SLA Initialization=========================
'=== variables used
'=== d = directionHoming
'=== y = (reserved)
'==
F=2 'right handed screw
'Tuning values for MotorX
KP=150
KI=28
KD=600
KL=20
KS=1
KV=0
KA=0
KG=0
F 'load the Tuning values
'home the motor first
d = -1 'direction of homing
GOSUB0 'call homing subroutine
'==
'===============SLA Main Program============================
'==
'vvvvvv---user code starts below this line---vvvvv
MV
A = 100
V = 1000000
G
'^^^^^^---user code ends above this line---^^^^^^
END
'==
'===============SLA Homing Subroutine======================
'=== variables used
'=== o = origin
'=== p = position
'=== i = index
'=== z = homeFlag
'==
CO   'home current motor
  z=0 'motor is not homed yet

Quick Results

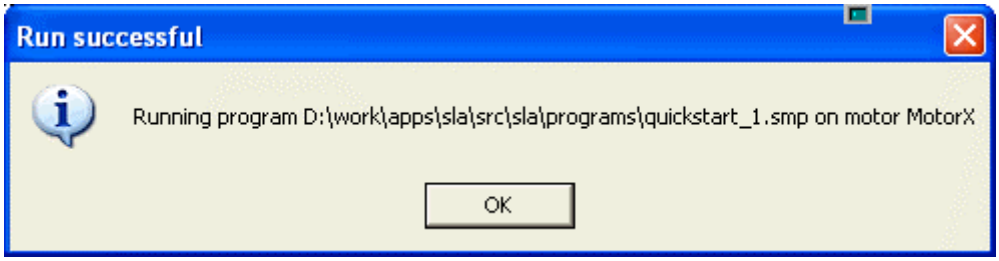
Before you can run the program, first build the program by clicking on the 'Build the Smart Motor Program' button in the toolbar. You should see the following confirmation to make sure that the program compiles successfully.



Next step is to download the compiled program to motor. Click on the 'Transfer Program from PC to Motor' button in the toolbar. You should see the following confirmation dialog box.



Now, to run the program, click on the 'Run' button. This will result in the downloaded programs running in the destination MotorX. By default, the generated programs run the homing routine initially. This behavior can be changed by modifying the program and rebuilding and downloading again.



The slide will move in the positive X direction and come to stop at the limit switch at the end of the slide.

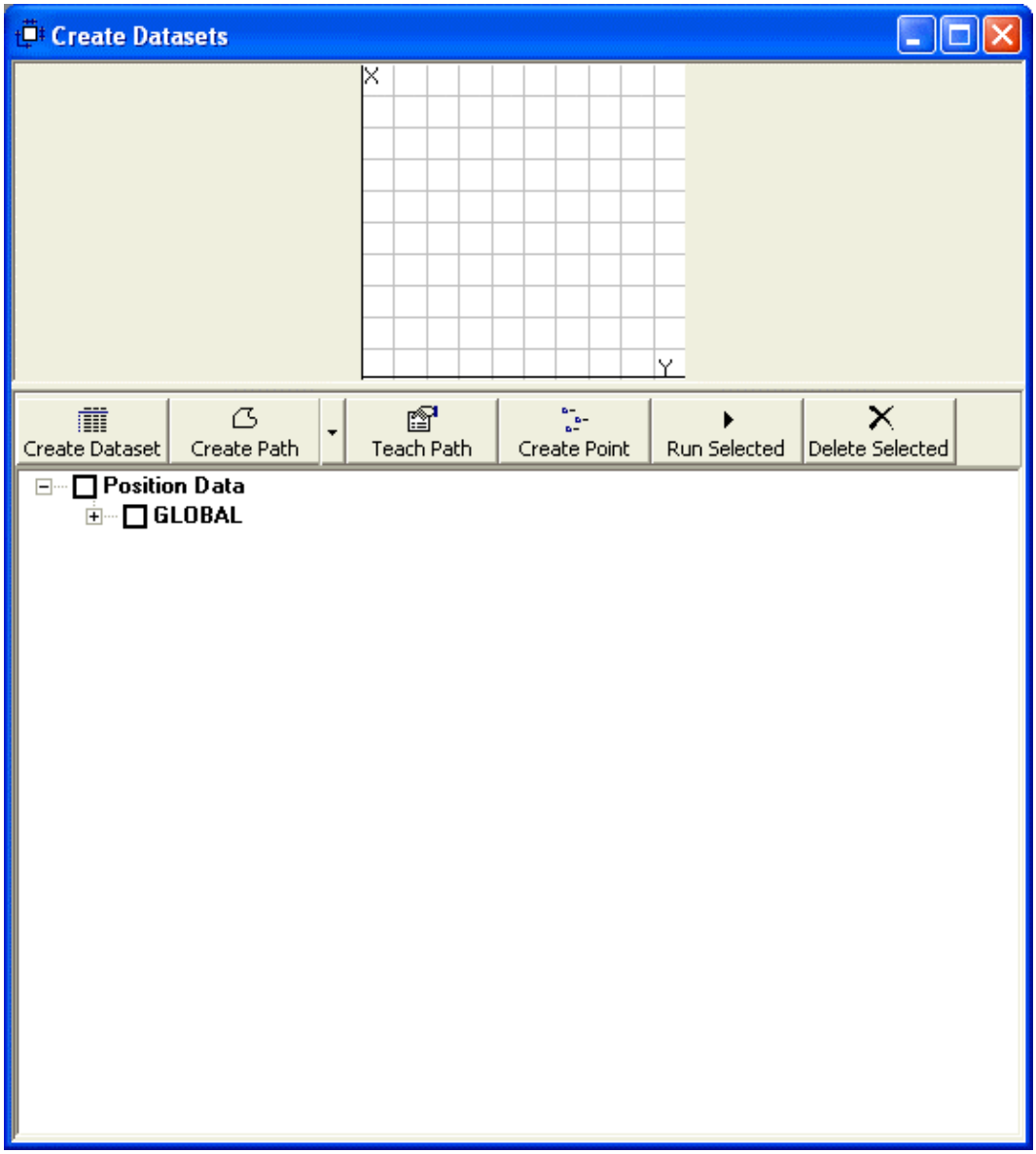
Quick Introduction to Binary Coded Decimal Programming with SLA OS

This section is designed for a quick introduction to Binary Coded Decimal Programming with SLA OS by writing a simple Binary Coded Decimal Program (BCD) for generating series of positions to move The three main steps are

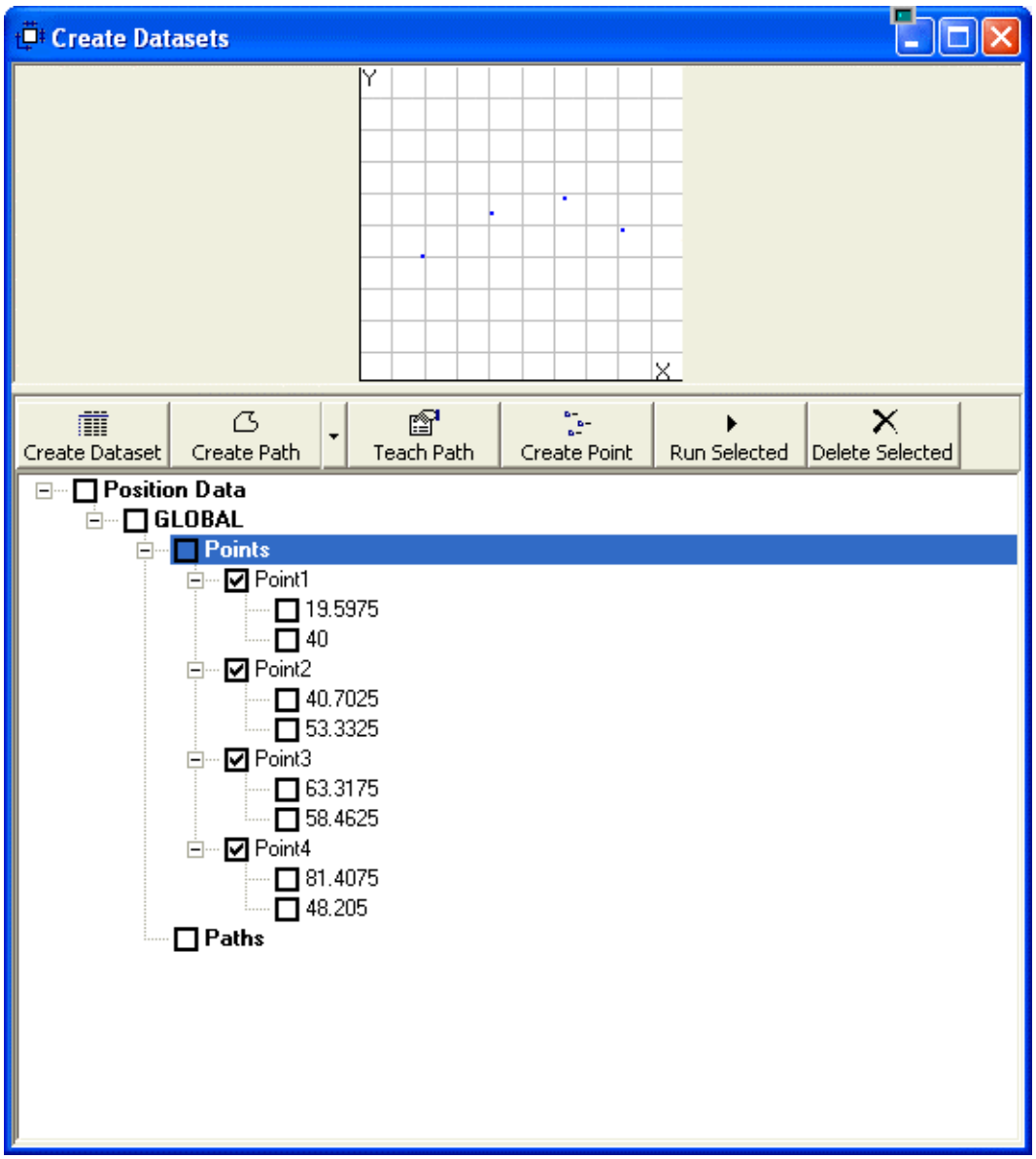
1. Position Data Creation
2. Programming
3. Results

Quick Position Data Creation

Click on the Datasets icon in the toolbar to open 'Create Datasets' screen.

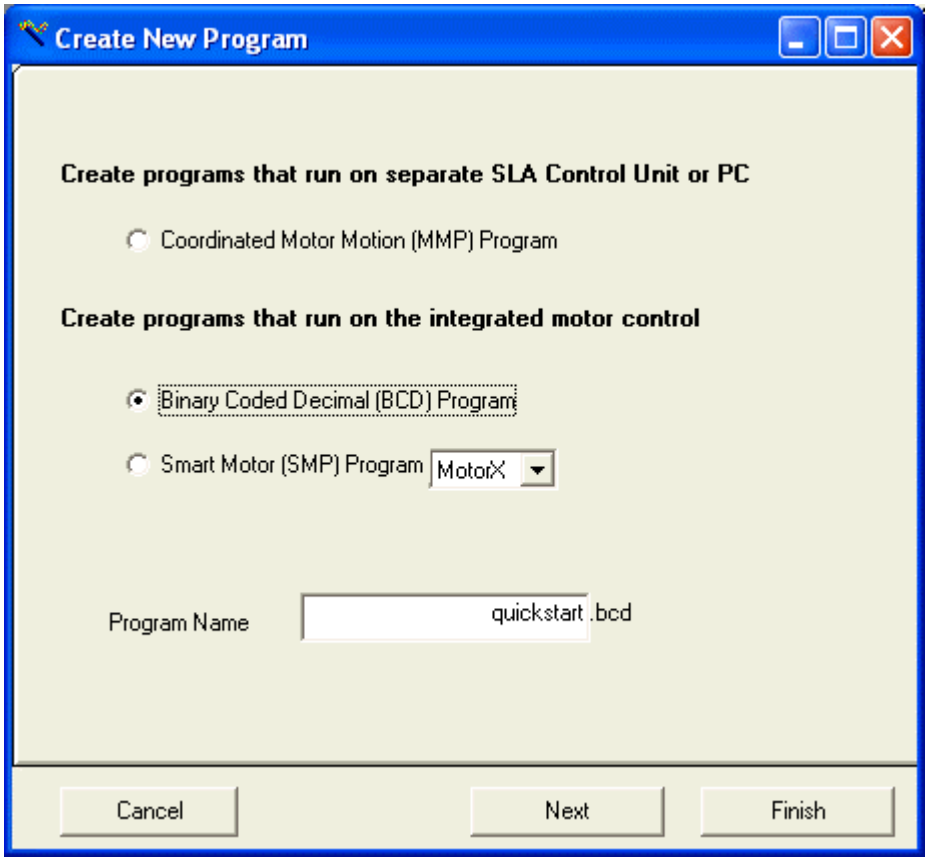


With the mouse, click on the screen to create the positions corresponding to the BCD input. With each click, a new point is added to the Points node as shown below. Since this is just for the test purpose, the exact locations of the points don't matter.

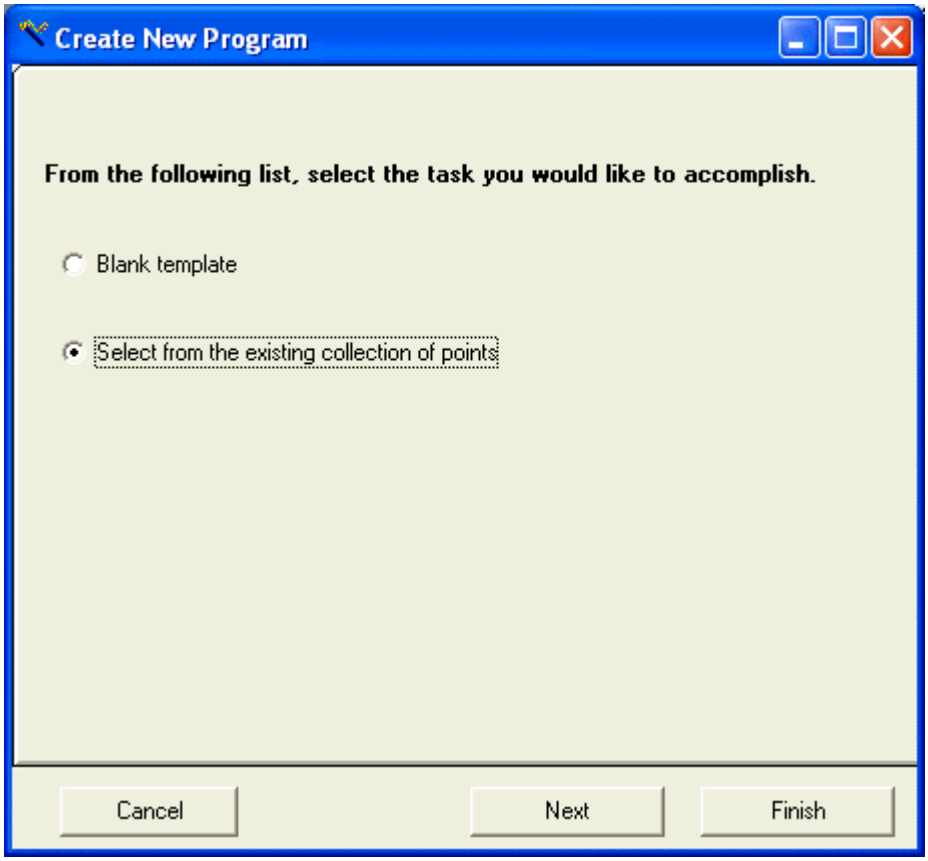


Quick Programming

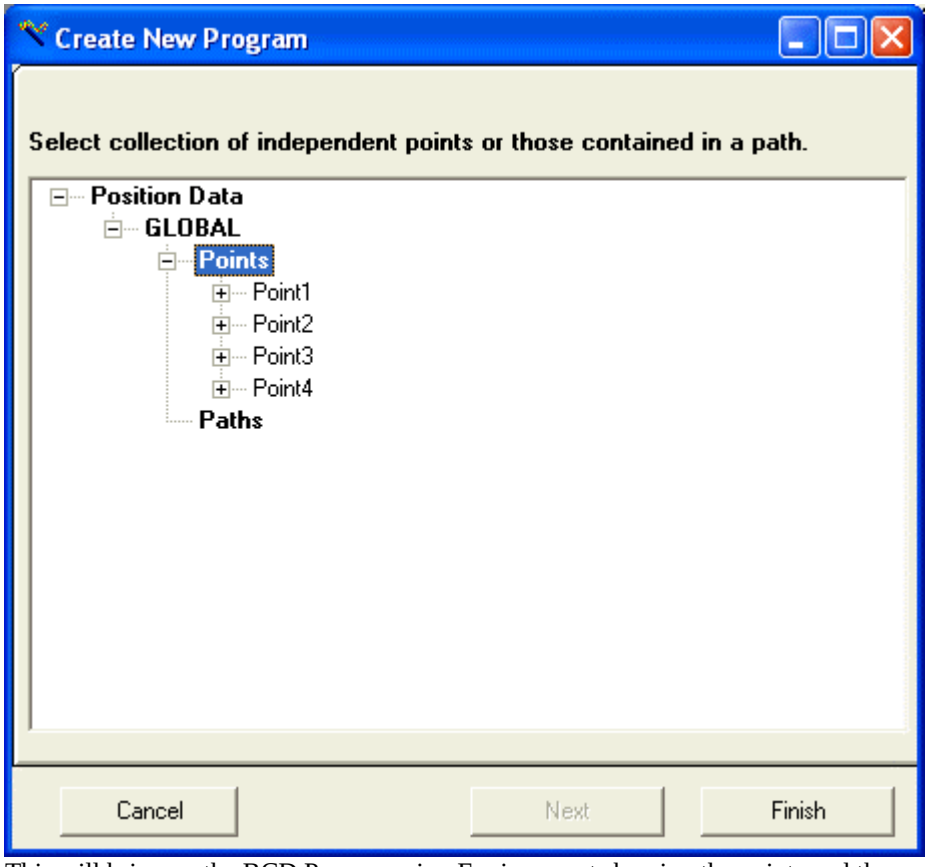
Open a 'New Program...' dialog by clicking on File menu or pressing Ctrl+N (Control and N together). Select the BCD program type and enter the name of the new program in 'Program Name' textbox. Click 'Next' button.



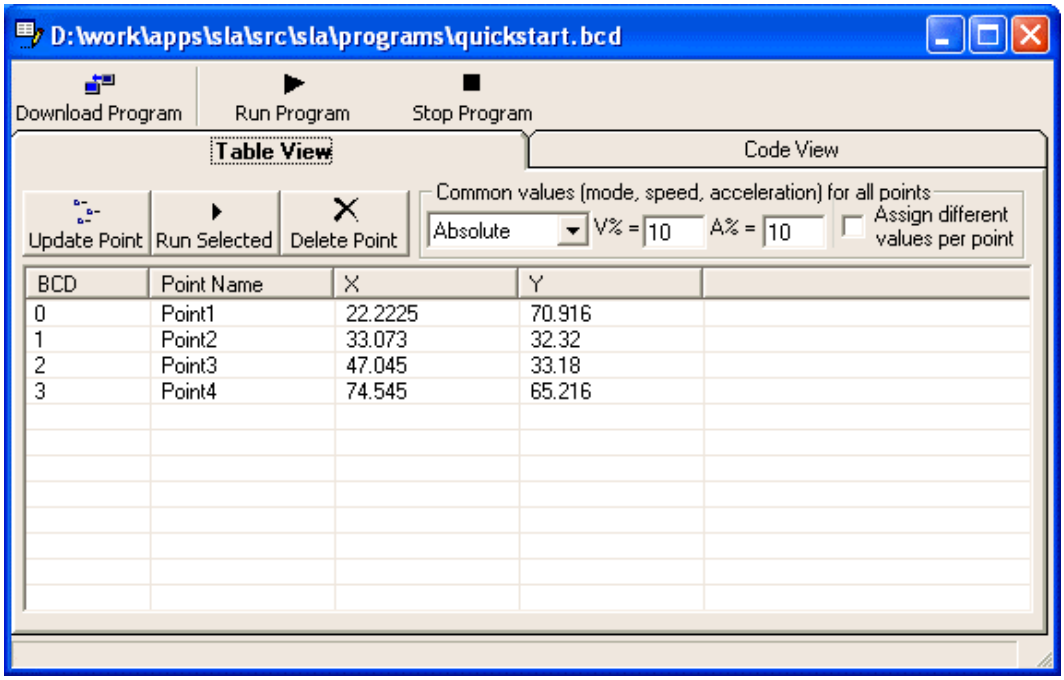
In the task selection window, you can select different ways to create a BCD program. Select the second option for creating a BCD program from existing data.



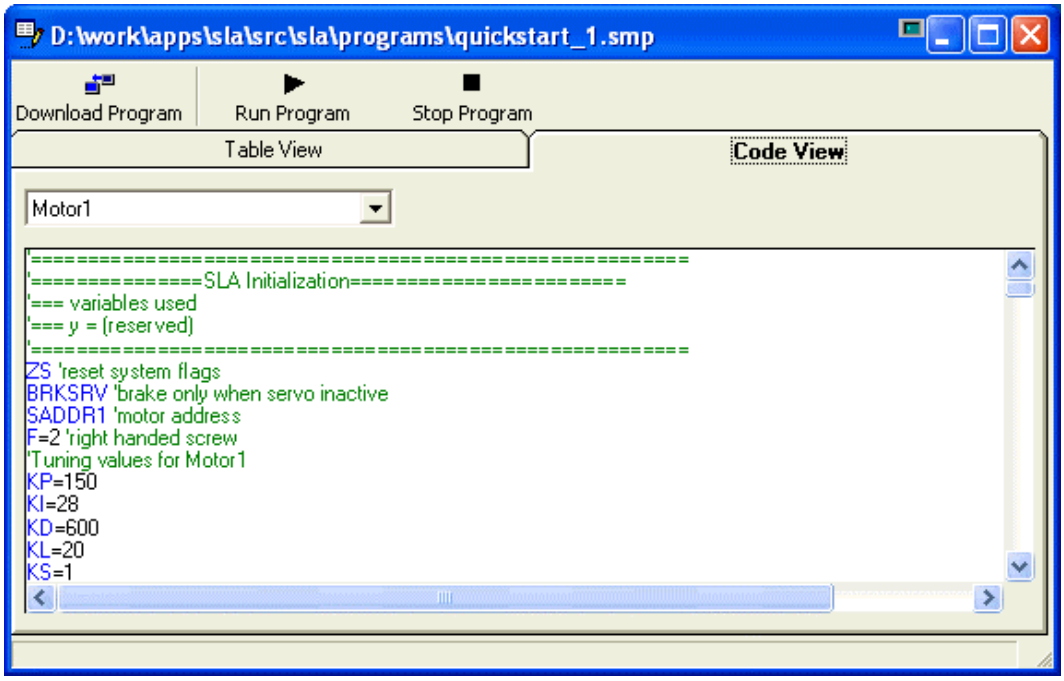
This will bring up a window with the position data tree that was earlier created in the Datasets window. Select the collection of points (either a path or points) to create BCD program from as shown below.



This will bring up the BCD Programming Environment showing the points and the corresponding BCD values.

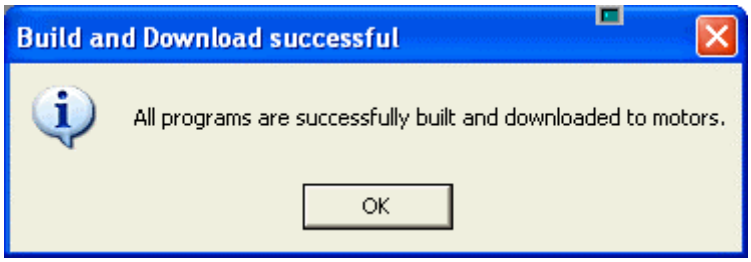


Click on the 'Code View' tab to see the SLA OS generated code which also includes code for homing to match the existing configuration information. Note that the displayed code depends on the type of slide connected to the axis. The following display corresponds to SLA.

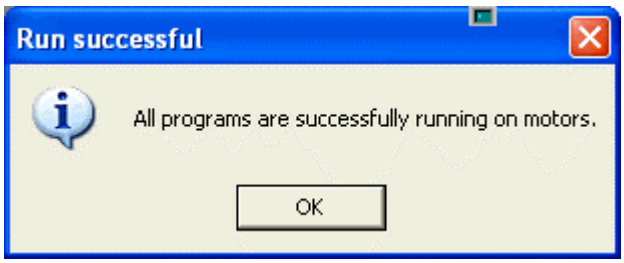


Quick Results

Since all the code is already generated by the SLA OS software, there is no additional programming involved. Before you can run the program, compile and download the programs to all the motors by clicking on the 'Build and Download' button on the top. You should see the following confirmation to make sure that everything is successful.



Now, to run the program, click on the 'Run' button. This will result in the downloaded programs running in all the motors. By default, the generated programs run the homing routine initially. This behavior can be changed using the SMP Programming Environment since BCD programs are basically SLA OS generated SMP programs.



Once the programs are running, the motion can be achieved by feeding the correct input values using either a test BCD input box or PLC.