Lean Automation Pack

Quick Start Guide

Models 200 and 400

Introduction:

This document describes the procedures to setup the Lean Automation Pack, LAP200 and LAP400 systems and how to use the sample application code provided.

If you have any questions regarding assembly or operation of the Lean Automation Pack, please call:

1-800-556-6766, USA, Canada, and Mexico
ia.techsupport@omron.com

A summary section at the end of this document provides a list of software reference materials and optional items. More detailed information is found on the LAP-RESOURCE-DVD.

⚠ WARNING

Warning when connecting the power source:

1. **Always** turn **OFF** the power source or unplug the power cord to the Unit before attempting to connect or wire the cables, connect or disconnect the connectors.

Warning - electric shock may occur:

1. Do not touch any of the terminals or terminal blocks while the power is being supplied. Doing so may result in electric shock.
2. Do not attempt to disassemble, repair, or modify any Units. Any attempt to do so may result in malfunction, fire, and electric shock.

All wiring must be done by a qualified electrical technician in accordance with local and national electrical codes.

Additional tools and materials required to complete assembly of the Lean Automation Pack:

Tools:
Wire strippers
No. 2 Phillips screwdriver
Soldering Iron
Personal Computer (PC)

Materials:
3m. (10 feet) 20 AWG wire for 24VDC connections (Red & Black)
Wire solder
Wire shrink-wrap or electrical tape
Grounded AC power cord
Single phase 220 AC power source (15A recommended)

This motion solution consists of an HMI, PLC, and a Servo axis system. The purpose of this document is to provide a working example configuration for the user. The user can quickly understand and practice this configuration, wiring and programs, then use them as a starting point to develop more specific applications.

The Products Used:

The hardware contents of the Lean Automation Pack consists of Omron's NV Series Operator Interface, CP1 Series Compact PLC, R7 Series Servo Drive, G Series Servo Motor, USB communication cable and other peripherals.

Sample Program:

The sample programs provided on Lean Automation Pack Resource DVD consist of the following: a program for the NV Operator Interface and a program for the CP1 Compact PLC. The two pre-designed programs work together to achieve the designed functions.

Please check the contents of your Lean Automation Pack and verify all parts are present.

LAP200 Bill of Materials

LAP200 Bill of Materials		
Qty	**Part Number**	**Description**
1	NV3Q-SW21	NV HMI, 3.6", COLOR, SD CARD
1	XW2Z-200T-3	NV TO PLC CABLE, 2M., FLYING LEADS
1	CP1L-M30DT1-D	CP1L PLC, 10K USER MEMORY
1	CP1W-CIF01	CP1L/H RS-232C COMM. MODULE
1	R88M-G20030H-S2	200W AC SERVOMOTOR, 3000 RPM, 2500 Pulse/rev Encoder
1	R7D-BP02HH	SMARTSTEP2 AC SERVODRIVER, 200W
1	R7A-CPB001S	CN1 GENERAL PURPOSE CABLE, 1M.
1	R88A-CRGB003C	INCREMENTATL ENCODER CABLE, 3M.
1	R7A-CAB003S	SMARTSTEP2 TO MOTOR CABLE, 3M.
1	R7A-CLB002S2	R7D-B POWER SUPPLY CABLE, 2M.
1	S8JX-G05024CD	50W. POWER SUPPLY, 100-240VAC IN.
1	USBAB6BLK	USB CABLE, BLACK, 2M.
1	LAP-RESOURCE-DVD	LAP RESOURCE LIBRARY DVD
1	LAP-200-400-QSG	LAP 200, 400 QUICK START GUIDE
1	OMR-SCRW	OMRON MICRO FLAT SCREWDRIVER
1	CXONE-LT01C-V4	CXONE-LITE SOFTWARE SUITE
2	2K-RESISTOR	2K OHM RESISTOR

LAP400 Bill of Materials

LAP400 Bill of Materials		
Qty	**Part Number**	**Description**
1	NV3Q-SW21	NV HMI, 3.6", COLOR, SD CARD
1	XW2Z-200T-3	NV TO PLC CABLE, 2M., FLYING LEADS
1	CP1L-M30DT1-D	CP1L PLC, 10K USER MEMORY
1	CP1W-CIF01	CP1L/H RS-232C COMM. MODULE
1	R88M-G40030H-S2	400W AC SERVOMOTOR, 3000 RPM, 2500 Pulse/rev Encoder
1	R7D-BP04H	SMARTSTEP2 AC SERVODRIVER, 400W
1	R7A-CPB001S	CN1 GENERAL PURPOSE CABLE, 1M.
1	R88A-CRGB003C	INCREMENTATL ENCODER CABLE, 3M.
1	R7A-CAB003S	SMARTSTEP2 TO MOTOR CABLE, 3M.
1	R7A-CLB002S2	R7D-B POWER SUPPLY CABLE, 2M.
1	S8JX-G05024CD	50W. POWER SUPPLY, 100-240VAC IN.
1	USBAB6BLK	USB CABLE, BLACK, 2M.
1	LAP-RESOURCE-DVD	LAP RESOURCE LIBRARY DVD
1	LAP-200-400-QSG	LAP 200, 400 QUICK START GUIDE
1	OMR-SCRW	OMRON MICRO FLAT SCREWDRIVER
1	CXONE-LT01C-V4	CXONE-LITE SOFTWARE SUITE
2	2K-RESISTOR	2K OHM RESISTOR

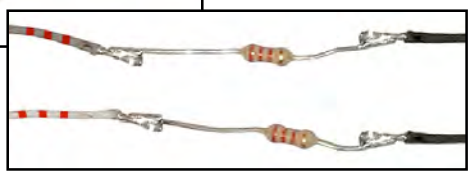
Control System Wiring for LAP200 and LAP400 systems

Please refer to the connection diagram on the following page.

Begin with the **R7A-CPB001S cable**

1a. To make wiring easier, identify and separate the 8 wires you will need:

- Gray (3 Red)
- Gray (3 Black)
- Gray (2 Black)
- White (3 Red)
- White (3 Black)
- Orange (3 Red)
- Orange (1 Black)
- Orange (1 Red)



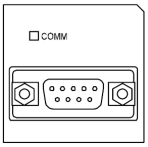
1b. Solder one 2K Ohm resistor to the end of Gray (3 Red) wire. Solder other end of the same resistor to a 20AWG wire, insulate connections. Connect the wire to PLC output terminal 100.00.

1c. Solder one 2K Ohm resistor to the end of White (3 Red) wire. Solder other end of the same resistor to a 20AWG wire, insulate connections. Connect the wire to PLC output terminal 100.01.

1d. Connect end of Orange (1 Black) wire to PLC output terminal 100.02.

1e. Connect end of Orange (3 Red) wire to PLC input terminal 00.06.

1f. From the end of R7A-CPB001S cable twist together these wires: Gray (2 Black), Gray (3 Black), Orange (1 Red), White (3 Black). Solder a Black 20AWG wire to the bundle, insulate connections, and then connect the wire to the -V terminal of S8JX Power Supply.



2. The CP1W-CIF01 must be installed in the leftmost Option Board position on the PLC. First, remove the left cover and insert CP1W-CIF01 in the orientation shown here.

3. Using Red 20AWG wire, jumper the three COM outputs of PLC terminals as shown in the following page. To supply DC power to the outputs connect one longer wire to the +V terminal on the S8JX Power Supply.

4. Using Red 20AWG wire, connect the 24VDC input terminal of the PLC and 24VDC terminal of the HMI to the +V terminal of the S8JX Power Supply. Jumper the 24VDC input terminal of the PLC to the input COM.

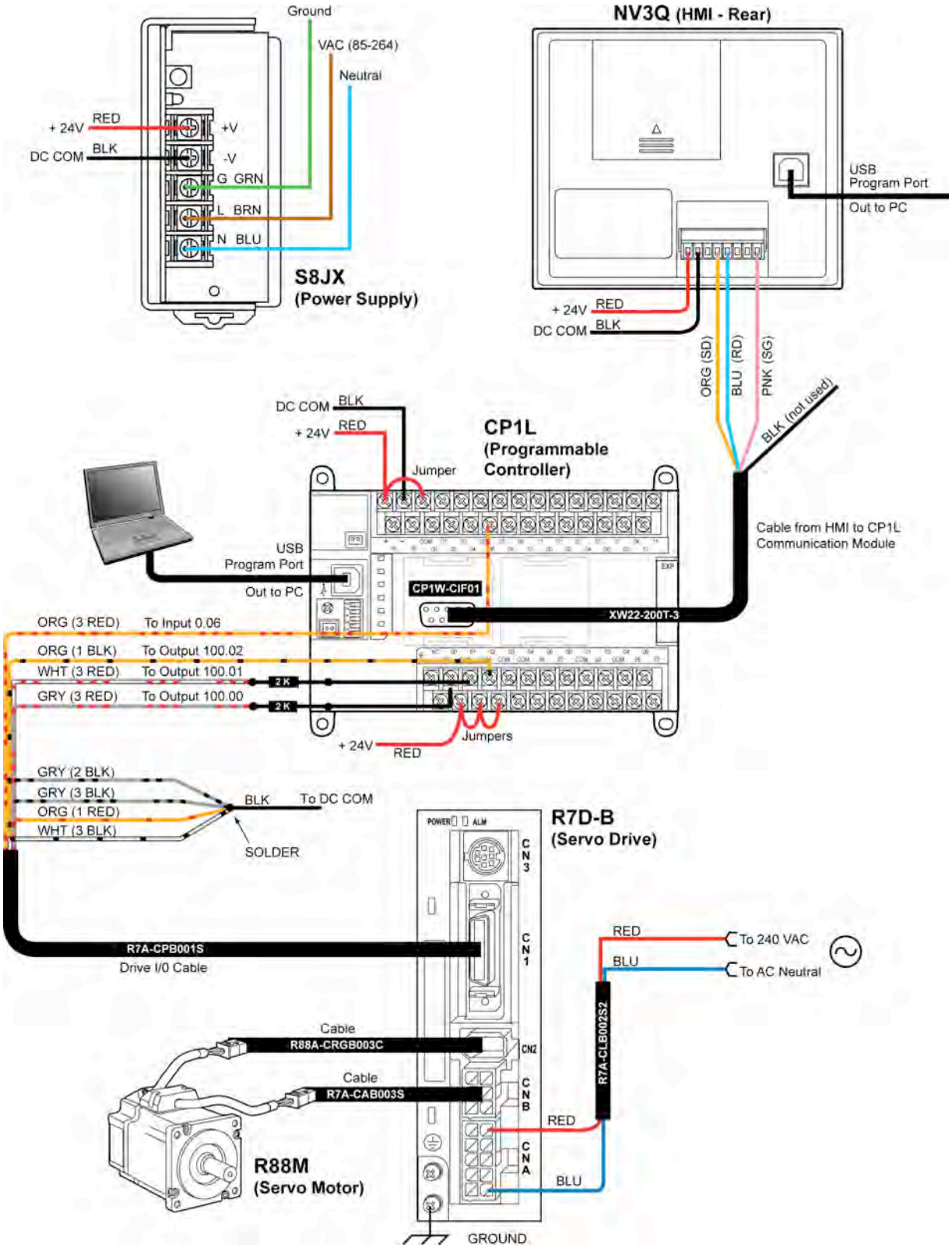
5. Using Black 20AWG wire, connect –V DC terminal of PLC and the –V DC terminal of the HMI to the -V terminal of S8JX Power Supply.

6. Connect leads from the gray cable XW2Z-200T-3 to the HMI terminal as shown on the following page. Plug this cable into the serial port on the PLC (CP1W-CIF01). Note - the black wire lead is not used.

7. Connect the R7A-CPB001S cable to Servo Drive. Connect Servo Motor cables as shown in the diagram on the following page. Connect the R7A-CBL002S2 power cable connector to the Servo Drive and the other end to a 230VAC power source.

8. Connect your grounded AC power cord to the S8JX Power Supply, plug into an AC power outlet.

Lean Automation Pack 200 – Connection Diagram



Note: LAP400 is wired the same as LAP200.

Step-by-Step Procedure to download program to PLC (CP1L) and HMI (NV3Q)

CXONE-Lite software suite of programming tools is needed to program all of the components of this system. Install CXONE-Lite software by inserting Disk 1 into your computer and follow the on-screen prompts. The application software used to program the NV3Q is NV-Designer and the application software used for the CP1L is CX-programmer.

Step 1:

Follow this step if this is the first time using CXONE software, if not go to Step 2.

Insert CXONE-Lite installation disk 1 into PC and follow on-screen prompts to load software.

Step 2:

Download the PLC USB communication driver program, if already installed go to Step 3.

A - Power up the CP1L controller and computer.

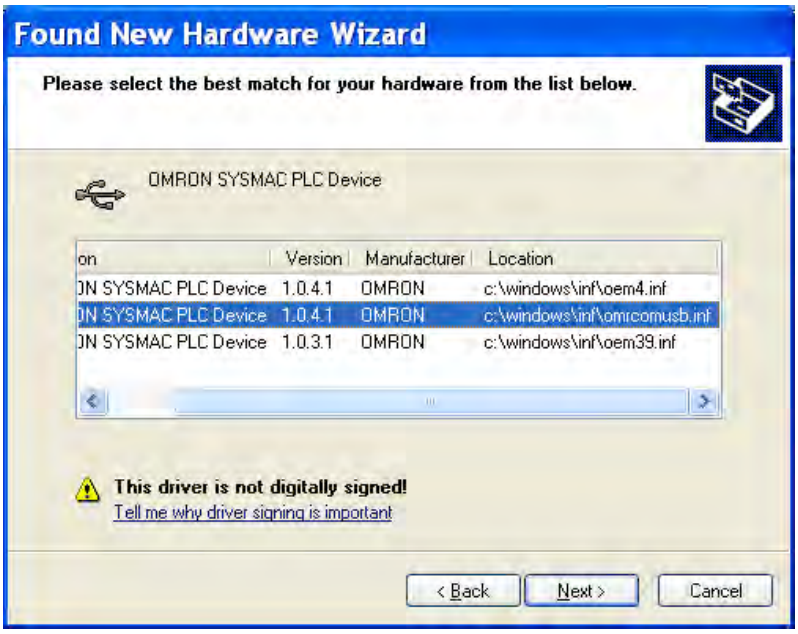
B - Connect computer to CP1L via USB cable (provided).

C - Select “Install from a list or specific location (Advanced)” and click “Next”.

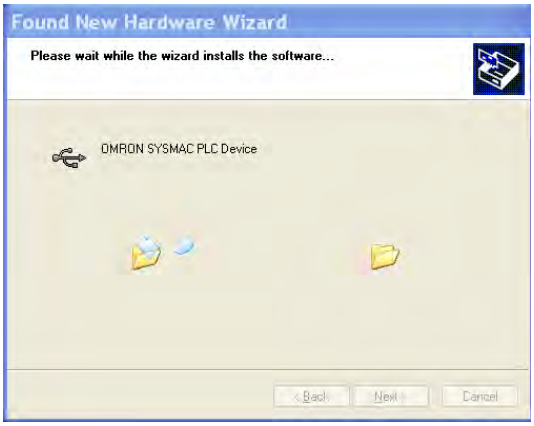
"Browse" to the following path:
C:\Program Files\OMRON\CX-Server\USB\Win2000_XP\Inf
Then click "Next".

The following windows will pop up to search for the suitable driver.

If this window appears select the “omrcomusb.inf” and click “Next”.

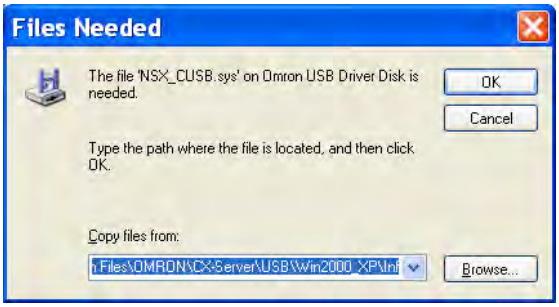


Hardware Wizard is installing the device driver.



Click “Continue Anyway”.

“Browse” to the following path: C:\Program Files\OMRON\CX-Server\USB\Win2000_XP\Inf
Then click “OK”. (This step is only required if the USB Driver is not present).

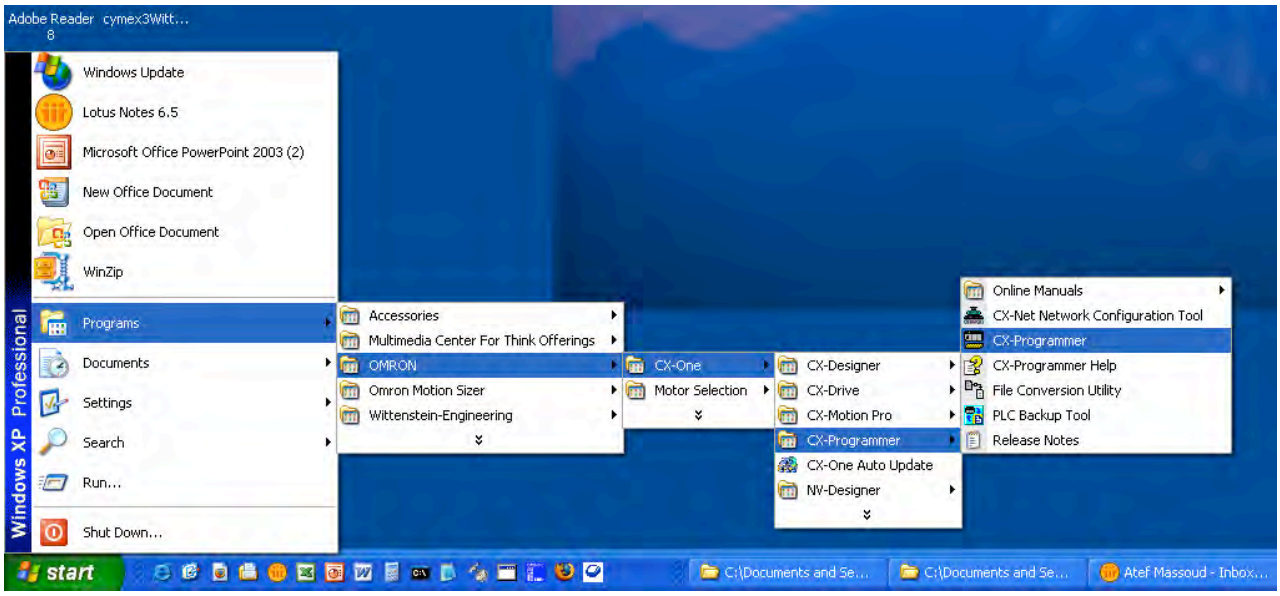


Click “Finish” to complete installation.

Step 3:

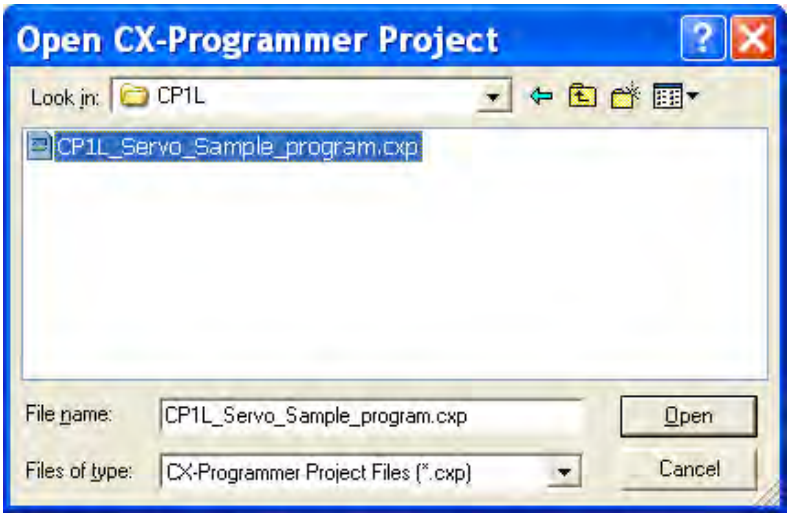
Start CX-Programmer

Go to Windows “Start” menu and select: Programs > Omron > CX-One > CX-Programmer as shown on the following window.



Step 4:

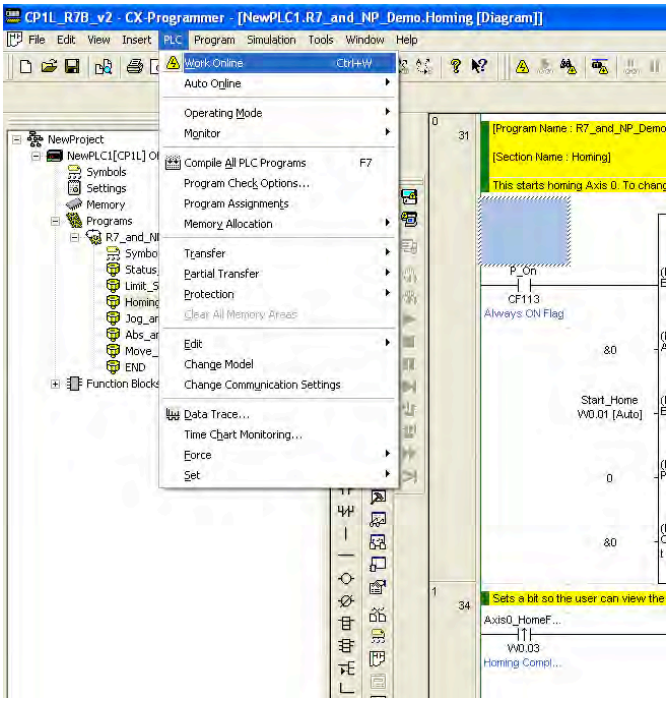
Insert the LAP RESOURCE DVD. Open the supplied CP1L program in CX-Programmer by selecting “File” in the menu bar and select “Open”, then following window will open, select the CP1L program (CP1L_Servo_Sample_program.cxp).



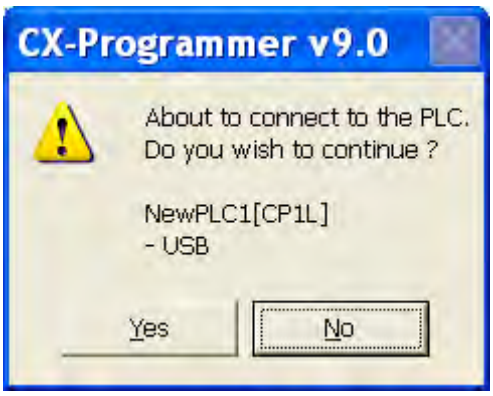
Click “Open”.
The CX-Programmer software opens and displays the project.

Step 5:

Go on-line using CX-Programmer. Select “PLC” from the menu bar and select “Work online”.



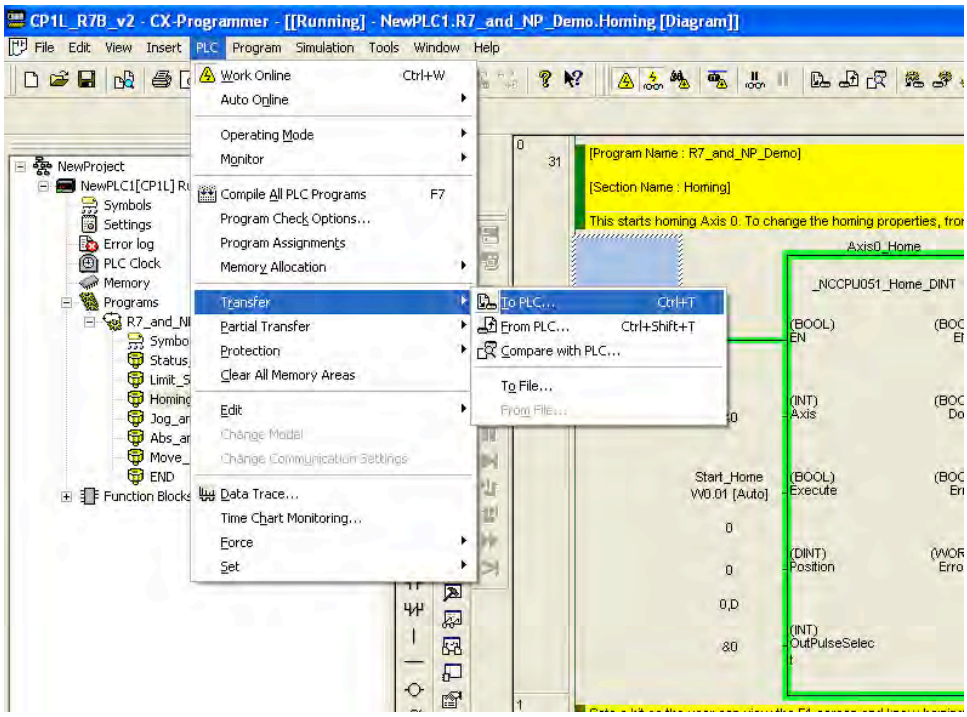
Click “Yes”



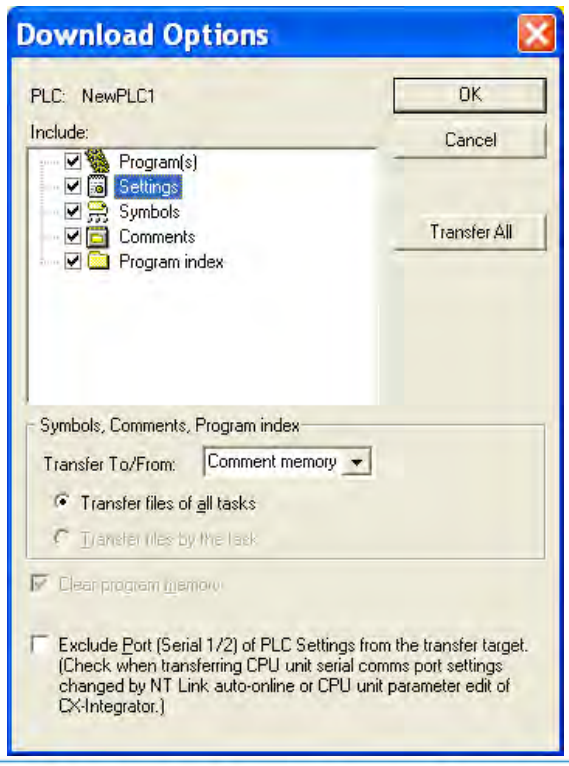
Step 6:

Download the CP1L program

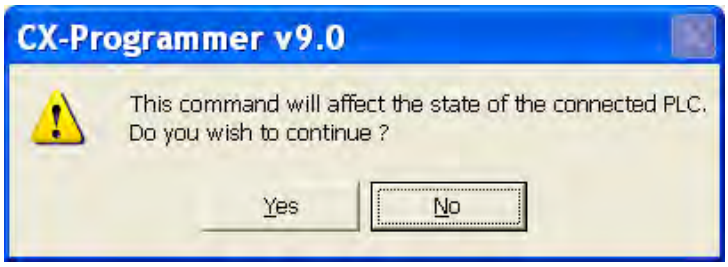
In the menu bar go to “PLC”, select “Transfer” then select “To PLC”

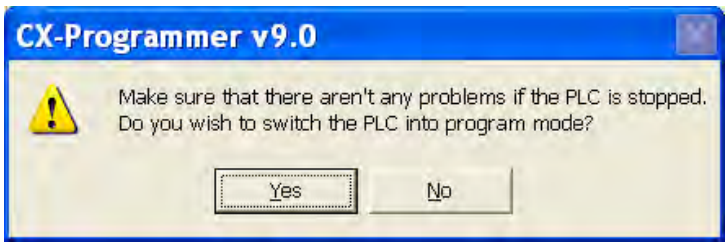


Check all boxes and click OK



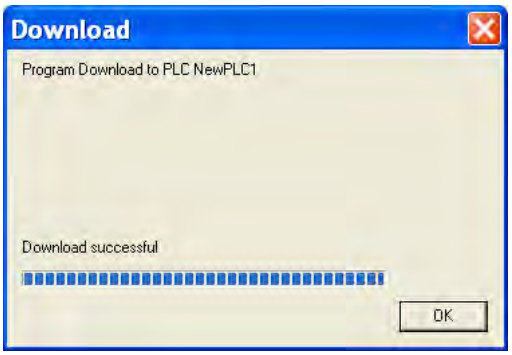
Click “Yes” on the following windows.





You will see the downloading progress.

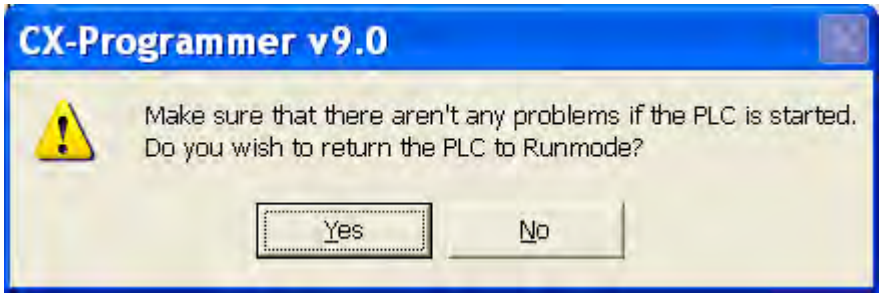
Click “OK” on the following window.



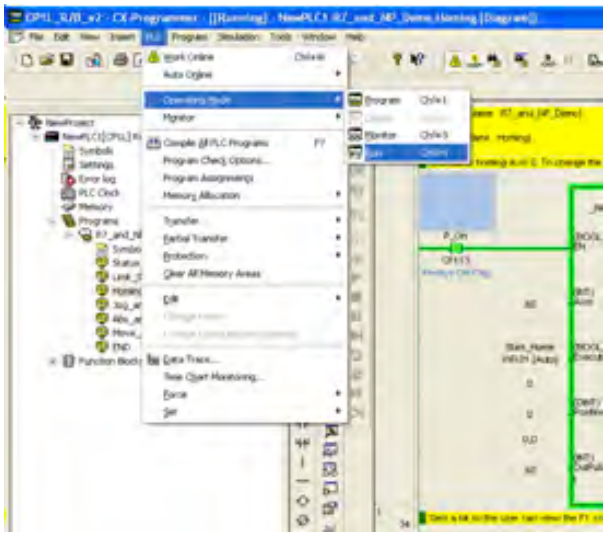
Step 7:

Put the CP1L in run mode

Click “Yes” on the following window to put the PLC to run mode.



You can also put the PLC in run mode by going to the menu bar select “PLC”, “Operating Mode”, and then select “Run” as shown on the following window.



Step 8:

Close CX-Programmer. Chose “Do Not Save File.”

Step 9:

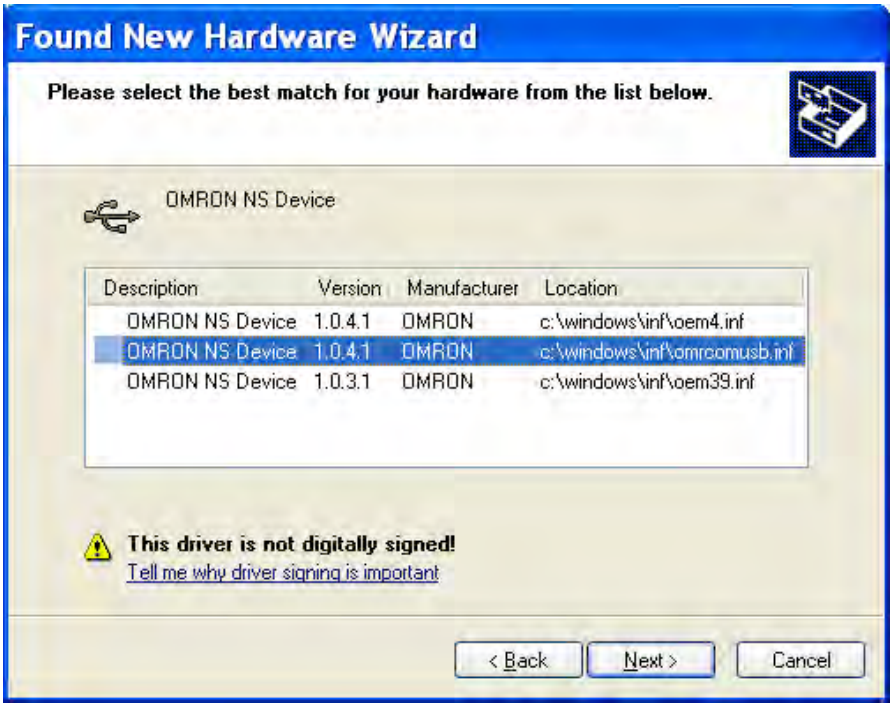
Download the NV USB communication driver. If already installed go to step 10.
Connect the computer to the NV3Q via USB cable (provided) and power up NV3Q.

Select “Install from a list or specific location (Advanced)” and click “Next”

"Browse" to the following path:
C:\Program Files\OMRON\CX-One\NV-Designer\USB\Inf
Then click "Next"

The following window will pop-up while searching for the suitable driver.

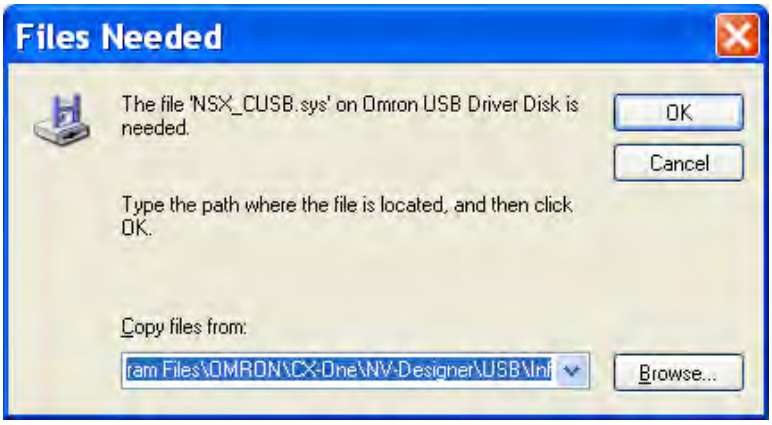
Select “omrcomusb.inf” and click “Next”



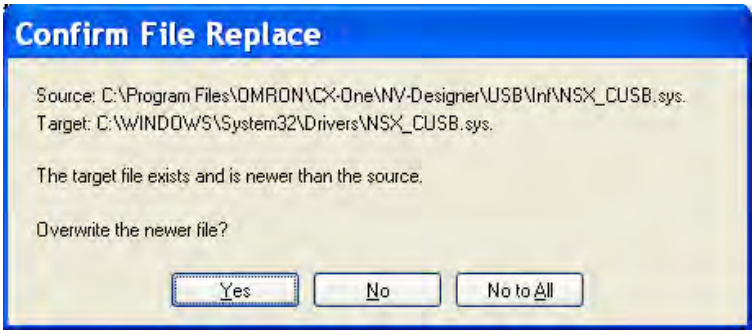
The Hardware wizard is installing the device driver.

Click “Continue Anyway”

“Browse” to the following path: C:\Program Files\OMRON\CX-One\NV-Designer\USB\Inf
Then click “Ok”



If the window below appears click “No”

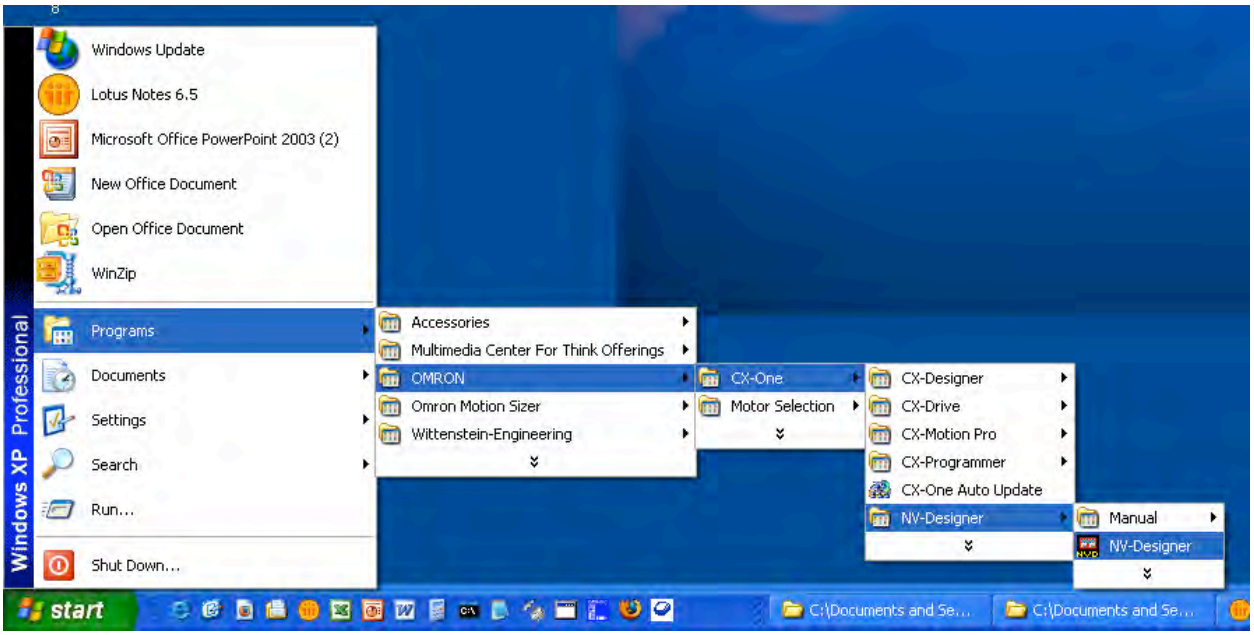


Click “Finish”

Step 10:

Start NV-Designer

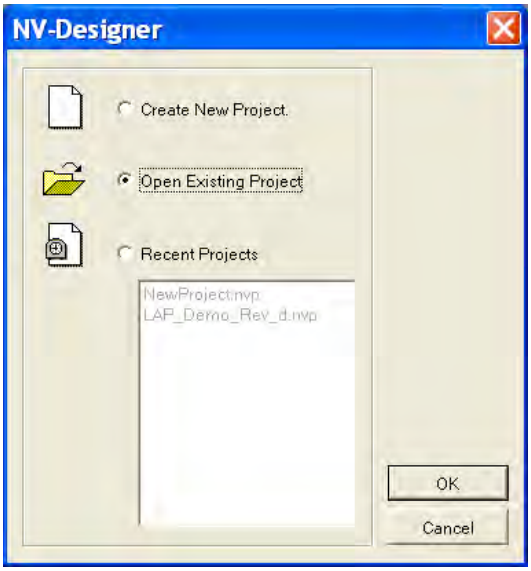
Go to Windows “Start” > Programs > Omron > CX-One > NV-Designer > NV-Designer



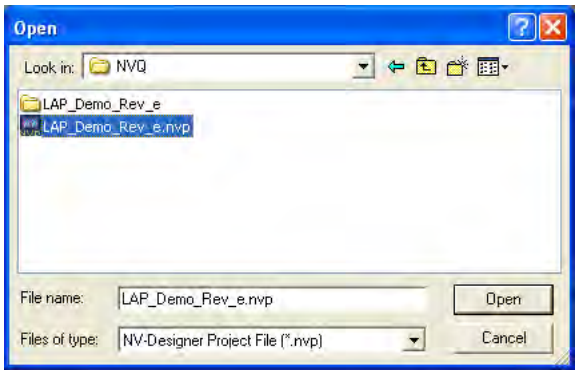
Step 11:

Open the supplied NV3Q program

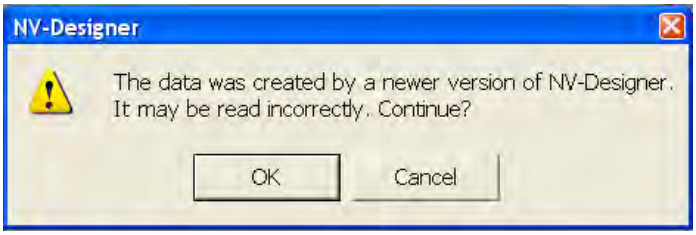
You can select “Open Existing Project” and click “OK”



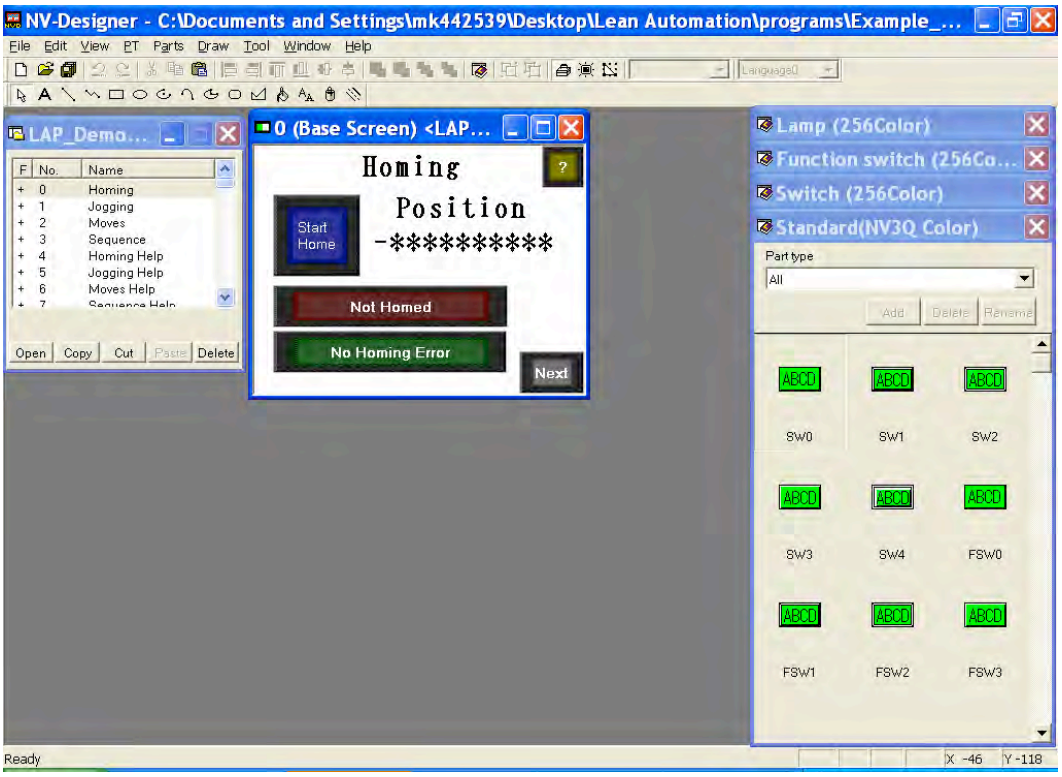
An explorer window will open; select the NV3Q program file (“LAP_Demo_Rev_e.nvp”), click “Open”



If you see this warning select “OK”.



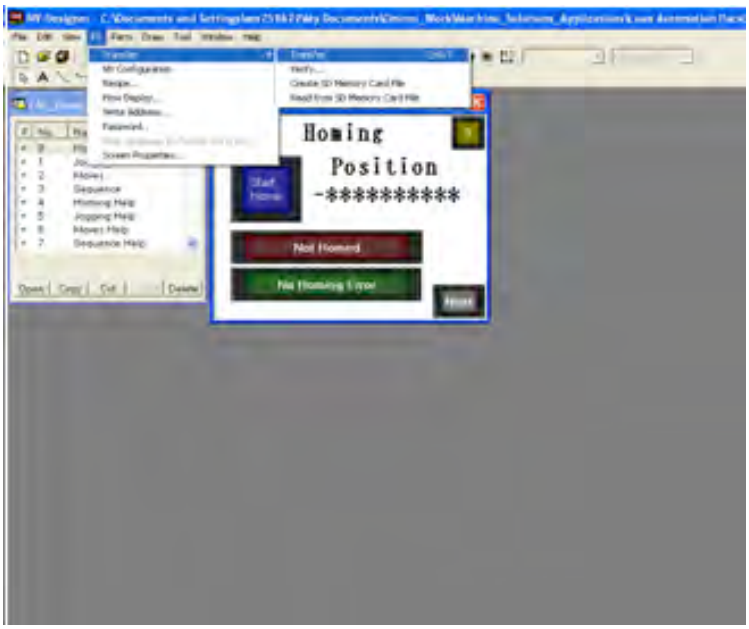
NV-Designer will open the project. You can double click on the individual screens to see the details as in the following screen



Step 12:

Download the NV3Q program

Go to the menu bar select “PT”, “Transfer”, and then select “Transfer”



A transfer data window will open. In “Direction” select “NV-designer->NV”, in “Communication Method” select “USB”, “Data to Transfer” select “All data”, and finally select “Transfer Data after Clear NV Screen”, then click “OK”.

The NV3Q will be cleared. Next, NV3Q will display “Transferring PC ---> NV”. Finally, NV3Q will re-boot.

Step-by-Step Procedure to test the system operation:

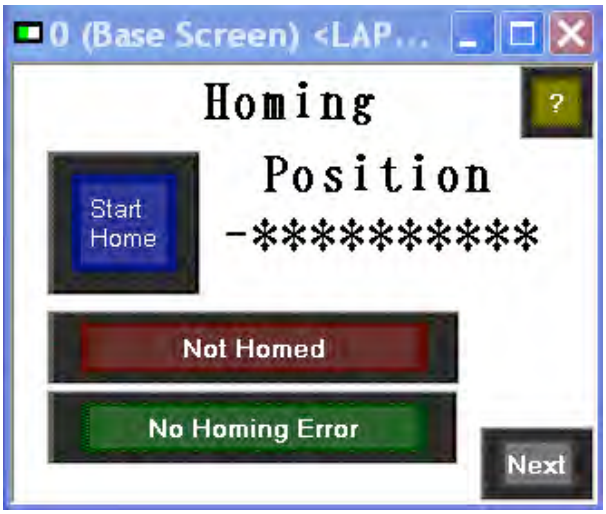
1- Make sure the connections have been wired and the programs have been downloaded to the NV3Q and CP1L.

2- Make sure the motor is not connected to the load and rotates freely.

3- Cycle the power to the LAP system.

You should see the CP1L “Power” and “Run” LEDs are ON
You should see the Homing Screen on the NV3Q.
You should see the “drive Power” LED is ON

4- Testing the homing
While at the “Homing” screen:



Press the “Start Home” button; observe the motor rotation (less than one complete revolution) and stop at zero position. Observe the display of the “Position”. The number of counts should be changing during the homing routine. The number will be at zero when the homing is completed. Observe the “Not Homed” display change state to “Homed Complete!”

5- Testing the Jog

Press the “Next” button on the “Homing” screen to go to the next screen which is “Jogging” screen. While at the “Jogging” screen:

Press the “Jog Forward” button and observe the motor rotating CW.
Press the “Jog Reverse” button and observe the motor rotating CCW.
Observe the “Position” display change the number of counts.
You can change the speed, acceleration, or deceleration, and repeat the jog again. Observe the motor operation when using the new set-points of the speed, acceleration, or deceleration.

6- Testing the Moves

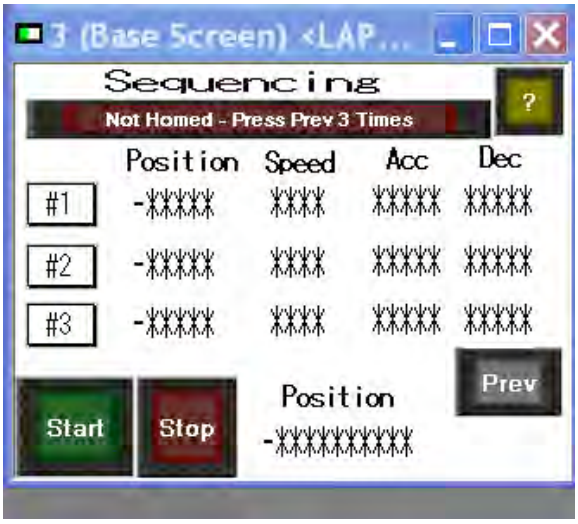
Press the “Next” button on the “Jogging” screen to go to the next screen which is “Moves” screen.

Press the “Counts” button and enter the number of counts you want to move absolute or relative. Press the “Speed”, “Acceleration”, or “Deceleration” if you want to change these set-points.

Press the “Move to Absolute Position Above” button, if you want the motor to perform on absolute move to the desired position.

Press the “Move to Relative Position Above” button, if you want the motor to perform a relative move to the desired position. You can stop motion in progress by pressing the “Stop” button. Observe the “Position” counts display change during the motion.
This screen uses the CP1L program “Abs_and_Rel_Moves”.

7- Testing the Sequence
Press the “Next” button on the “Moves” screen to go to the next screen which is the “Sequencing” screen.



This screen allows specifying 3 different moves, including the position, speed, acceleration (Acc) and deceleration (Dcc). Also, you can select which position of the three you want execute.

Press the “Position”, “Speed”, “Acc” and Dec” data display to enter each desired set-point.

Press the sequence number button “#1”, “#2”, or “#3”.

Press “Start” button, the motor performs absolute move to the entered position using the speed, acceleration and deceleration settings. You can stop motion by pressing the “Stop” button. Observe, the “Position” display will change during the motion.

Summary and References

Summary:

This document provided the starting steps with sample programs to quickly assist the user in working with the Lean Automation Pack system and components. It helps the user to immediately get familiar with the hardware and software and watch the system in motion. The user should collect the application requirements, design the programs for the application, and use the provided sample programs and additional reference material to accomplish the motion solution.

References:

The following table lists reference documents, sample software programs and optional cables that will assist to work on the Lean Automation Pack for further development and functionalities in “Reference” on the Resource DVD.

Item Number	Description	Manual Number / Part Number	Also found in the CX-One Program Directories
1	NV Setup Manual	V103-E1-02	X
2	NV Programming Manual	V104-E1-02	X
3	NV Host Connection Manual	V105-E1-02	X
4	CX Programmer Operation Manual	W446-E1-07	X
5	CX Programmer Operation Manual Function Block and Structured Text	W447-E1-08	X
6	CX Simulator Operation Manual	W366-E1-09	X
7	CP1L Getting Started Guide	W07E-EN-01A	
8	CP1L Programming Manual	W451-E1-03	
9	CP1L Operation Manual	W462-E1-03	
10	R7 Servo Drive Manual	I561E102	
11	CX Drive Operation Manual	W453-E1-06	X
12	USB to Serial Conversion Cable	CS1W-CIF31	
13	Servo Drive Programming/Configuration Communication Cable	R88A-CCG002P2	