Basic Mechatronics Workshop
Module 1:Introduction to Mechatronics

LAB-1

Introduction to Control Simulation Software

ELCO Lab

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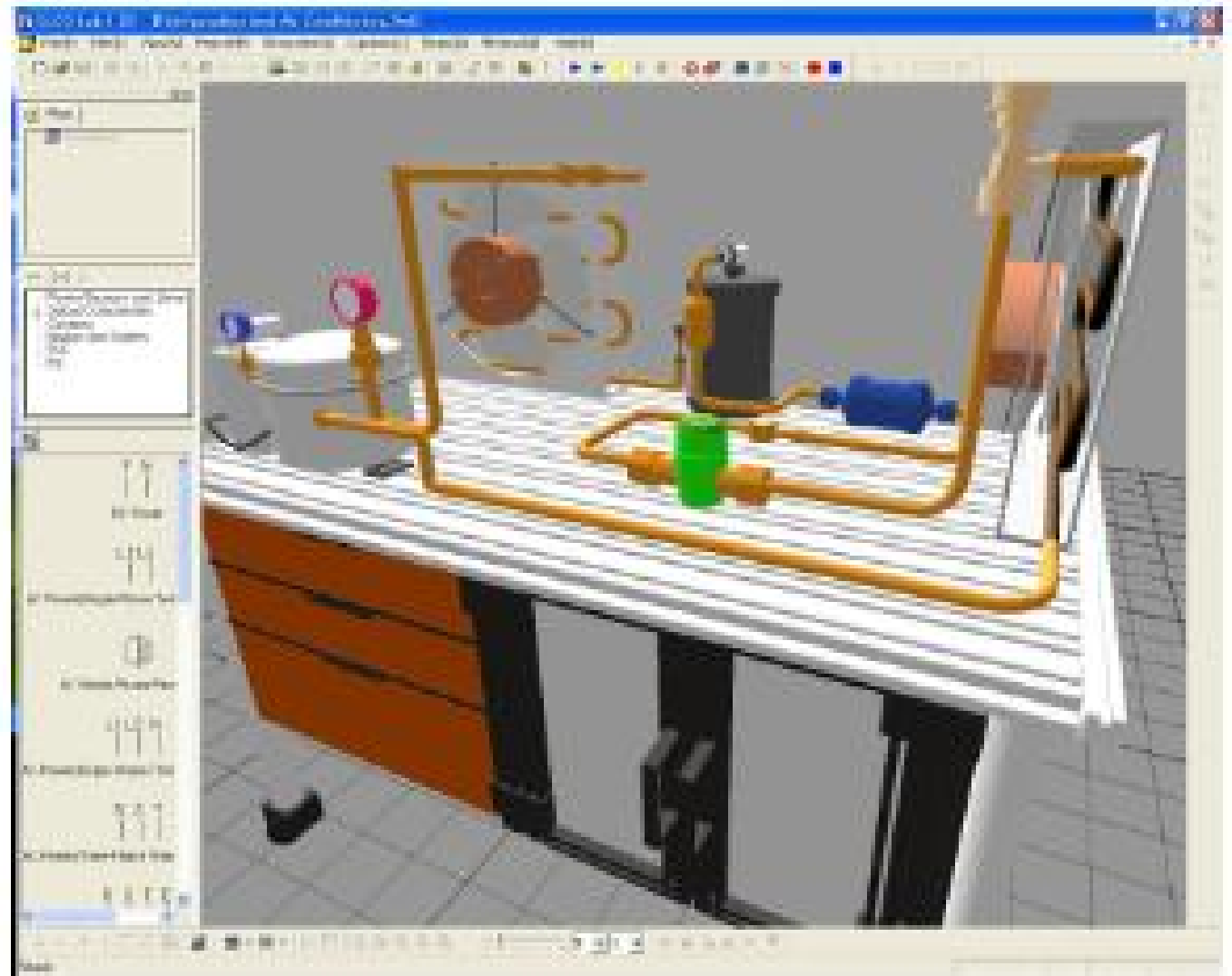Beni Suef Technological University

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LAB-1

Introduction to Control Simulation Software ELCO Lab

Tasks

1. Install the ELCO Lab

2. Recognize the basic functions of ELCO Lab

3. Exercises.

Control
Simulation
Software
ELCO Lab

Control Simulation Software ELCO Lab

Main Features / Characteristics

✓ Possible design of electro circuits and composition of distributing boards.

✓ Possible simulation connected to electro sequencing and PLC control.

✓ Explanations on electro-mechanical factors and circuits with different practical problem-solving questions provided.

✓ An electro factor library provided with actual images and electro-mechanical symbols of the IEC and KS types.

✓ Possible simulation connected with electro sequencing and PLC control of operating factors.

✓ Mainly used in technology training on electro-mechanical construction and power wiring.

✓ Practical training for the distribution board composition using actual images and for preparing sequence circuit plans

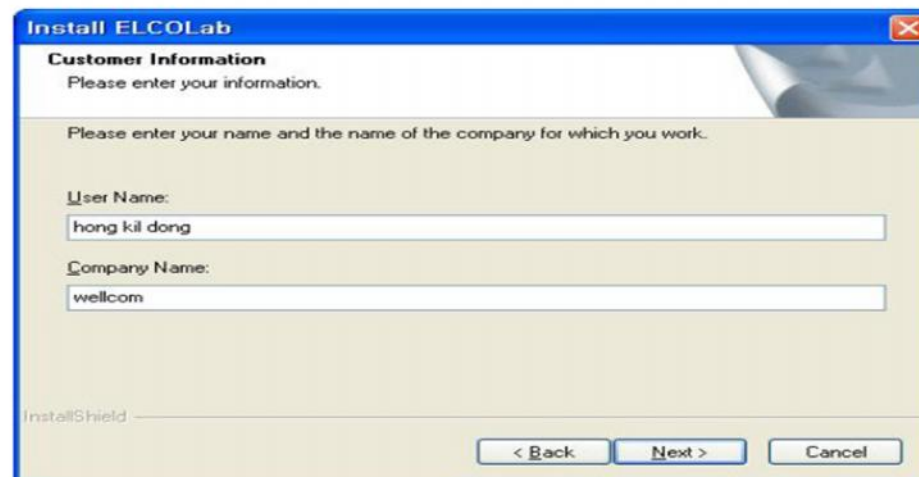✓ Alternative for the dramatic reduction of materials cost of technology trainings.

Lab 1: Install ELCO Lab

1-1   Program Installation

Start Installation Using either the Start Button or the explorer.

Installation Process

➢ Execute "setup.exe" and click [Next]
➢ Enter user name and school name, and click [Next].
➢ Select "Complete" and click [Next]
➢ After the installation is completed. Click [Done] to exit Setup.

Install ELCOLab

Customer Information
Please enter your information.

Please enter your name and the name of the company for which you work.

User Name:

hong kil dong

Company Name:

wellcom

InstallShield

< Back   Next >   Cancel

Introduction to
basic functions of ELCO Lab

Control Simulation Software ELCO Lab

File menu

1- New

In the File Men, select [New]. The New dialog appears.
Project, Circuit diagram, Panel design and Ladder diagram icons appear.
Select one of them and click [OK].

- Project: Circuit diagram, panel design and PLC ladder are associated by project, in hierarchical view project is parent set.
- Circuit diagram: Electrical sequence circuit is designed using standard symbols
- Panel design: Panel design with detailed picture of component is displayed and designed.
- PLC ladder: PLC ladder editor helps user to make PLC programming and simulation of PLC

2-Open

➢ Open saved file and change disk or folder when you want to open files in different disk or folder.

3-Close

➢ Close current diagram window.

4-Save

➢ Save working contents to a file.

5-Save As

➢ Save the diagram with a different file name.

6-Export

➢ You can also export this ELCO Lab data for other program application.

7- File Info

➢ View and change the file information. Save the diagram with a different file name.

8-Setup Diagram

➢ Set the way to print diagrams

This is similar to Page Setup in most word processors with a few extra options for printing of circuit diagrams. It is composed of three sections.

① Paper This Select command choose paper size (A4~B0) and the orientation of the diagram.

② Format
Determine which elements to add to the diagram.
It selects Outline, caption, components list and section mark.

③ Margin
Set the margins for the printed diagram.

9-Print

➢ Print currently selected diagram.

10-Preview

➢ Be sure to use Preview before actually printing the diagram.

11-Printer Setup

➢ Choose printer, paper size, paper orientation.

12-Recent Files

➢ List the file names you have recently opened or created.

13-Exit

➢ Close ELCO Lab.
ELCO Lab asks if the user wants to save diagrams that are not saved yet.

Control Simulation Software ELCO Lab

Edit Menu

1-Undo
➢ Cancel the previous operation and return to the original state.

2-Redo
➢ Redo recently undone operation.

3-Copy
➢ Copy selected items to clipboard for later use.

4-Paste
➢ Insert items in clipboard to the diagram.

5-Cut
➢ Copy selected items to clipboard, and then delete them from the diagram.

6-Delete
➢ Delete selected items.

7-Select All
➢ Select all items on the current diagram.

8-Flip Horizontal
➢ Flip the selected item horizontally along the vertical axis.

9-Flip Vertical
➢ Flip the selected item vertically along the horizontal axis.

10-Rotate Right
➢ Rotate the selected item clockwise by 90 degree.

11-Rotate Left
➢ Rotate the selected item counterclockwise by 90 degree.

12-Specification
➢ View and change the properties of the selected component.

Control Simulation Software ELCO Lab

View Menu

➢ Previous Size

If the zoom level has been changed, this command returns the zoom level to the previous level.

➢ Zoom In

Magnify the view.

➢ Zoom Out

Scale down the view.

➢ Fit in Window

Change the zoom level so that the diagram would fit into the current window size.

➢ Zoom Area

Magnify selected area.

➢ Zoom (%)

Change zoom level to a specific value.

➢ Show and Hide Tool Bar and Status Bar

ELCO Lab has two tool bars and one status bar. Check the appropriate item in View menu to display the bar and uncheck it to hide.

➢ Component List

The component list is used to add components to the diagram, and the user can turn it off for larger diagram window.

➢ Component selection window

After ELCO Lab is running, left window shows components to be added to our circuit diagram.

Control Simulation Software ELCO Lab

What is Tool Bar?

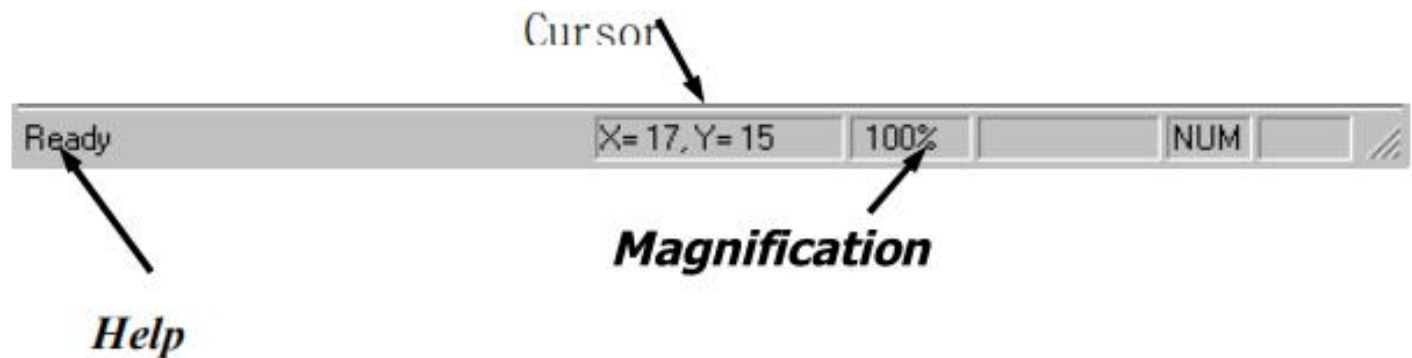A collection of buttons for frequently used functions.

①**Tool Bar**

②**Drawing Tool Bar**

③ **Status Bar**

Cursor

Ready   X= 17, Y= 15   100%   NUM

Magnification

Help

Control Simulation Software ELCO Lab

➤ Displacement and time Chart

If user selects this displacement chart toggle button, then displacement

➤ Used Components

Display the list of components used in the current circuit diagram.

➤ Grid

Toggle the grid.

➤ I/O Connection

Display the PLC port connection configuration diagram.
PLC configuration shows which port is connected to what component. The connection relationship is defined in the specification of component.

➤ Ruler

Toggle the ruler

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Project Menu

➢ **Part List**	➢ **Part List Save**
Extract component part list from working circuit diagram.	Save the list as an Excel file format.

Control Simulation Software ELCO Lab   Simulation Menu

1-Start
Run the simulation of the current circuit diagram at normal speed.

2-Stepwise
Run the simulation of the current circuit diagram in a stepwise mode.

3-Slow
Run the simulation of the current circuit diagram at slow speed.

4-Pause
Pause the simulation.

5-Verify
This function checks the connection state of the circuit. If a line is not completed; the circuit is open (not closed), a list is generated which contains the name of components with open connections. The components with open connections are displayed in red color on the diagram after verification.

6-Preference
Set simulation option and PLC control preferences using the simulation preference dialog box.

① Speed control	② Sound control	③ PLC communication
The user can adjust the normal simulation running speed and the slow running speed.	Set volume of sound of buzzer.	Set PLC communication port, type of PLC and slot.

Control Simulation Software ELCO Lab

Capture

The User defined circuit Diagram section or the entire PC screen of PH-Lab can be saved as a video file. The process of composing a circuit or the circuit movements during simulation can be saved.

1-Recording	2-Stop Recording	3-Setting up section This Command sets up the section to be recorded as a video.
This Command begins Recording to start video file recording. This continues until the Stop Recording button is clicked.	This Command stops Recording button to end recording. Enter the file route and file name to save the recorded video.	

① **User-defined Section**

User can set up the section on the Diagram randomly as the section to record. After recording function started, clicking the left mouse button on a certain apex and drag it to the diagonal direction till the mouse curse makes targeted section. When the mouse button is released, video recording for the defined section starts.
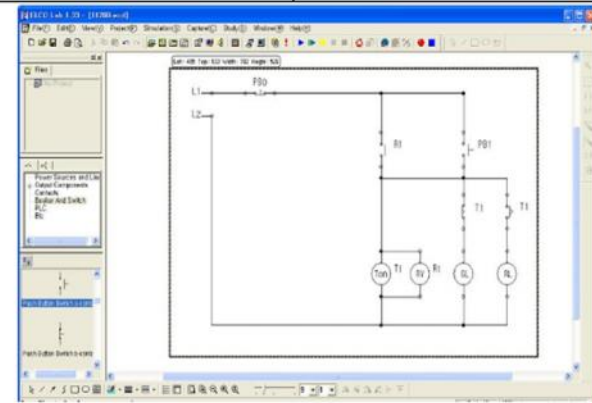
② **Fixed Section**

Enter the size of the section which you want to record, when this pop-up window appears. Click OK.

Control Simulation Software ELCO Lab

4-Options

① Video Options

The codec and quality of the video to record can be set.

  Codec: Set the compression format of the video. Select from video codecs installed on the PC.

  Recoding Quality: Set the image quality. The file size increases with higher video quality.

  Setting the Key frame: Set the location of the standard frame. As the setting value is smaller, the file size increases and the quality is higher.

  Setting the Capture Frame: Set the time between each frame. As the setting value is smaller, the file size increases and the quality is higher.

Control Simulation Software ELCO Lab   Options
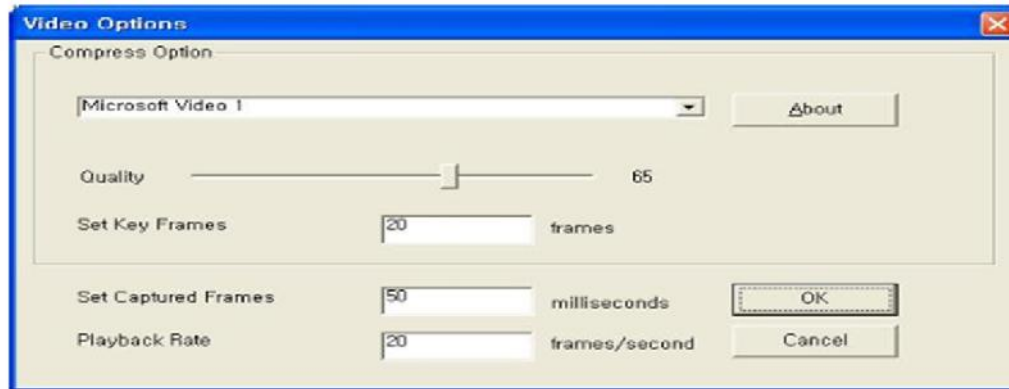
※ To play the recorded video on another PC, the used codec during recording must be installed.

③ **Cursor Options**

Set to be shown/not shown or output effects of the mouse cursor during recording of the video.
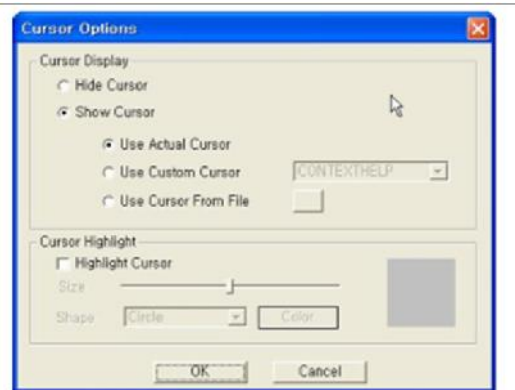
Control Simulation Software ELCO Lab

2 - 7 Window Menu

1-New Window Open a duplicate window of the current diagram window. **2-Cascade** Arrange currently opened diagram windows in cascading form. **3-Tile Horizontally** Horizontal arrange of the currently opened diagram windows in tile.	**4-Tile Vertically** Vertical arrange of the currently opened diagram windows in tile. **5-Arrange Minimized** Arrange minimized windows in a line at the bottom. • Minimized windows are not affected by the functions 2, 3&4. **6-Close** Close the selected window

7-Window List
List of windows currently opened.
This list includes the minimized ones. The selected window is located at the top. If any other window is selected, its name will be moved to the top of the list.
	Window(W)
	  New Window(N)
	  Cascade(C)
	  Tile : Horizontal(H)
	  Tile : Vertical(V)
	  Arrange Icons(A)
	  Close(L)
	
	  1 nontitled1
	  2 nontitled2
	  ✔ 3 nontitled3

Window(W)
- New Window(N)
- Cascade(C)
- Tile : Horizontal(H)
- Tile : Vertical(V)
- Arrange Icons(A)
- Close(L)

1 nontitled1
2 nontitled2
✔ 3 nontitled3

...ow List

...vindows currently opened.
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...cted window is located at the
...ny other window is selected, its
...ill be moved to the top of the
...ist.

Window(W)
- New Window(N)
- Cascade(C)
- Tile : Horizontal(H)
- Tile : Vertical(V)
- Arrange Icons(A)
- Close(L)

1 nontitled1
2 nontitled2
✔ 3 nontitled3

2- 8 Help Menu

1-About ELCO Lab

Show the version number and copyright.

ELCO Lab Info

ELCO Lab 3.21

Copyright (C) 2008
wellCom Soft Co, Ltd

Done

2-How to ELCO Lab
Display digital textbook and examples.

Control Simulation Software ELCO Lab

2-9 Other Functions in ELCO Lab

1-Component List

Component List is displayed on left at the start of the PH Lab. It consists of 4 tabs at the top, a list of component types, control buttons, and a list of components themselves.

The top 4 tabs are, from left to right, pneumatics, hydraulics, KS electrics, and ISO electrics symbol selection. Click on each tab will display the appropriate symbols in the other window.

The component type list has a tree structure. Clicking on + sign will expand the component sub-type list, while clicking on - sign will collapse the expanded sub-type list. Choose a component type and the components belong to that type are displayed in the component list.

There are 6 control buttons. They are List Type, Pneumatic Line, Hydraulic Line, Electric Line, Join the Line, and Cut the Line buttons, from left to right.

The component list displays the actual component names with or without their schematic view depending on the List Type selection.
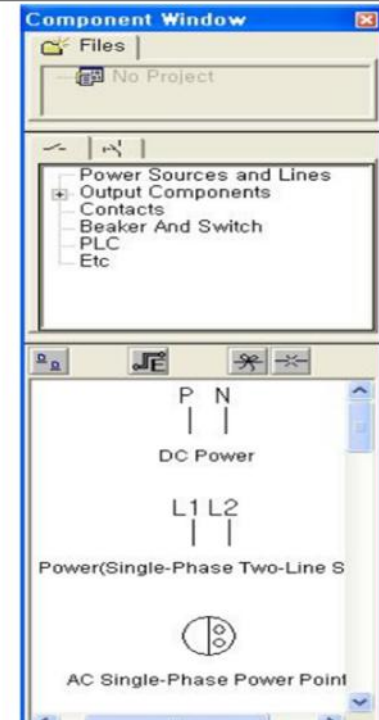
Control Simulation Software ELCO Lab

① **Change List Type**

This button changes the way component list is displayed. It could be a schematic symbol with name or name only. Click this button to toggle between these two.

- DC Power
- AC Power(Single-Phase Two-
- AC Single-Phase Power Point
- AC Power(Single-Phase Three
- AC Power(Three-Phase Three
- AC Power(Three-Phase Four-
- Power Supply
- Neutral
- Common
- Ground
- Ground
- Open Fuse
- Fuse
- Jumper
- Jumper-to Label
- Jumper-to Label
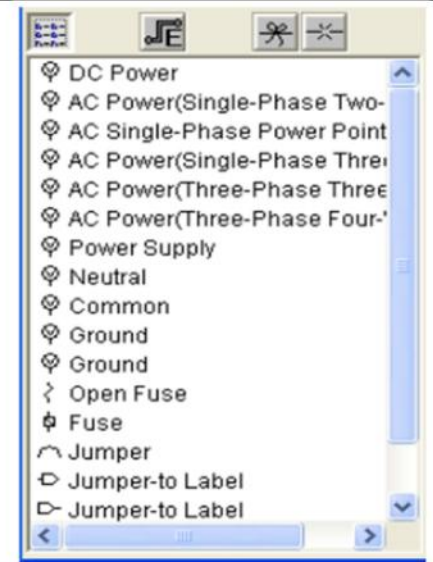
② **Draw Electric Line**

Click the electric line buttons and move cursor to the diagram window. The arrow cursor with small letter e will be appeared. You can draw lines to connect various components in the circuit. Double-click to mark the end of the current line.
Once finished, the line is adjustable by dragging the end of the line.
To exit line drawing mode, press ESC key.

③ **Join the Line**

This button joins two connected lines into one single line.
Select two lines connected end-to-end, and then click this button to combine those two lines into a single line.

Control Simulation Software ELCO Lab

④ **Cut the Line**

Cut the line into two at the selected point.
Click this button and move the mouse cursor over the line to cut. The cursor will be changed to a circle. Click on the line and there will be two lines.
Initially, they are connected end-to-end. You can move and adjust these new lines freely.

2-Displacement Chart

Displacement Chart is not displayed unless the user selects it on from View menu.
The chart is divided into two parts; components list on the left, graph on the right.
The component list on the right displays component ID and component name.
The graph is drawn on the right of the appropriate component.
There are 4 buttons at left bottom to control the component list. They are Remove, Add, Move Up, and Move Down buttons.

ID	Component ...
T1	On Timer
R1	Relay
PB1	Push Button Switch
PB0	Push Button Switch

① **Add**

This button displays the component list with the tab Displacement selected.

The list components are those that can be added to the Time Displacement Chart. Click on the box in front of component ID to Add/Remove the component to the chart. The added components have check mark in the box.

Components List

Used | Not Connected | Diagram

ID	Component Name
	AC Power(1P2W)
T1	On Timer
R1	Relay
	Green
	Red
R1	Relay a-contact
T1	On Timer a-contact
T1	On Timer b-contact
PB1	Push Button Switch a-contact
PB0	Push Button Switch b-contact

Done   Cancel

② **Remove**

Select a component in the list and click this button to remove the component from the Time Displacement Chart.

③ **Move Up, Move Down**

Add to User Library

Name: Felay

Desc: Felay Symbol

OK   Cancel

Insert into User Library

3-Drawing Tools

These tools are not essential to create a circuit diagram but are useful to add comments and explanations.

There are 9 buttons to be used in drawing. Among them, the text button will be described separately, and the other 8 buttons are described here.

① Ready

"Ready" means ready for simulation, and actually it is a mode in which you can create/modify the circuit. You can select and modify "drawn" pictures in this mode.

② Line

Draw a descriptive line. It is different from the pipeline you can create using Pipeline buttons on the component list. Click on the button, move mouse cursor over a diagram window and drag the mouse.

③ Arrow

Draw arrow headed lines. Usage is the same as line drawing.

④ Rectangle

Create a rectangle on the diagram.

⑤ Circle

Create a circle or eclipse.

⑥ Color

Select color or change color for the selected drawn object.

⑦ Line Thickness

Select or change the line thickness.

⑧ Line Type

Select or change the line type of descriptive line, arrow, rectangle, and circle. Select an item and click on the button to change the line type of the selected item.

There are five different line types to choose from. To select a line type, click on the triangular mark on the right.

4-Writing

Select the writing button and click on the diagram window to open a dialog box. Select font, type, and size, then write the text in the box at the bottom. Click on Done button to finish.

The written text resides in a "text area" on the diagram window. The text area could be resized and moved freely.

Double click on the text on the diagram window to edit the text.

Font

Font: Arial

Style: Regular

Size: 11

Done   Cancel

Arial
Arial Black
Arial Narrow
Arioso
Batang
BatangChe
Book Antiqua

Regular
Italic
Bold
Bold Italic

11
12
14
16
18
20
22

Effect
□ Underline
□ Strikethrough

Preview
AaBbYyZz

Input text

Control Simulation Software ELCO Lab

5-Pop-Pop-Up Menu

Pop-up menu is the menu displayed upon clicking the right mouse button in the diagram window.

Pop-up menu has some frequently used commands for quick use. Some menu items will not be active depending on the situation.

Paste	Ctrl+V
Copy	Ctrl+C
Cut	Ctrl+X
Delete	Del
Flip Horizontal	
Flip Vertical	
Clockwise(CW)	Ctrl+Right
Counterclockwise(CCW)	Ctrl+Left
Properties...	Enter
Transformer Capacity	
Breaker Capacity	
Description...	F1
Animation...	Shift+tF1
Add to User Library	
Insert from User Library	

① Add to user library

Using user library, the components are easily added to circuit diagram window. Select the component and click right button and select insert user library menu in pop-up window, then the pop-up window is displayed as following. Type the user library name and description and click OK button, the selected component is added to user library and can be used for next time.

RY

Add to User Library

Name	Relay
Desc	Relay Symbol

OK   Cancel