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Electrical Component editing, Catalog Data editing and importing, Electrical Control panel designing projects, Autodesk Inventor with



AUTOCAD ELECTRICAL 2016 BLACK BOOK

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DEDICATION

To teachers, who make it possible to disseminate knowledge to enlighten the young and curious minds of our future generations

To students, who are the future of the world

THANKS

To my friends and colleagues

To my family for their love and support

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Preface

AutoCAD Electrical 2016 is an extension to AutoCAD package. Easy-to-use CAD-embedded electrical schematic and panel designing enable all designers and engineers to design most complex electrical schematics and panels. You can quickly and easily employ engineering techniques to optimize performance while you design, to cut down on costly prototypes, eliminate rework and delays, and save you time and development costs.

The AutoCAD Electrical 2016 Black Book, the second edition of AutoCAD Electrical Black books, has lots of new features and examples as compared to previous edition. Following the same strategy as for the previous edition, the book is written to help professionals as well as learners in performing various tedious jobs in Electrical control designing. The book follows a step by step methodology. The book covers use of right tool at right places. The book covers almost all the information required by a learner to master the AutoCAD Electrical. The book starts with basics of Electrical Designing, goes through all the Electrical controls related tools and ends up with practical examples of electrical schematic and panel designing. Chapter on Reports makes you comfortable in creating and editing electrical component reports. This edition also discusses the interoperability between Autodesk Inventor and AutoCAD Electrical which is need of industry these days. Some of the salient features of this book are :

In-Depth explanation of concepts

Every new topic of this book starts with the explanation of the basic concepts. In this way, the user

becomes capable of relating the things with real world.

Topics Covered

Every chapter starts with a list of topics being covered in that chapter. In this way, the user can easy find the topic of his/her interest easily.

Instruction through illustration

The instructions to perform any action are provided by maximum number of illustrations so that the user can perform the actions discussed in the book easily and effectively. There are about 1000 illustrations that make the learning process effective.

Tutorial point of view

The book explains the concepts through the tutorial to make the understanding of users firm and long lasting. Each chapter of the book has tutorials that are real world projects.

Project

Free projects and exercises are provided to students for practicing.

For Faculty

If you are a faculty member, then you can ask for video tutorials on any of the topic, exercise, tutorial, or concept.

Formatting Conventions Used in the Text

All the key terms like name of button, tool, drop-down etc. are kept bold.

Free Resources

Link to the resources used in this book are provided to the users via email. To get the resources, mail us at *cadcamcaeworks@gmail.com* with your contact information. With your contact record with us, you will be provided latest updates and informations regarding various technologies. The format to write us e-mail for resources is as follows:

Subject of E-mail as *Application for resources of _____book*. Also, given your information like *Name: Course pursuing/Profession: Contact Address: E-mail ID:*

For Any query or suggestion

If you have any query or suggestion please let us know by mailing us on *cadcamcaeworks@gmail.com*. Your valuable constructive suggestions will be incorporated in our books and your name will be addressed in special thanks area of our books.

About Authors

The author of this book, Gaurav Verma, has written many books on CAD/CAM/CAE books available already in market. He has a long list of books on CAD/CAM/CAE packages available on Amazon and other distribution sites. The author has hand on experience on almost all the CAD/CAM/CAE packages. Besides that he is a good person in his real life, helping nature for everyone. If you have any query/doubt in any CAD/CAM/CAE package, then you can contact the author by writing at cadcamcaeworks@gmail.com

The technical editor of the book, Matt Weber, has written books on various CAD packages. He has published on SolidWorks and SolidWorks Simulation with 2014 and 2015 version.

With the support of CreateSpace, we assure the best books and support to the education on latest technologies.

Few Words from Author

I would like to thank all the educators and students for making the book successful in its aim. My motive while writing the first edition of book was to make it as simple as possible for students. I found some of the reviews on Amazon saying that its a basic book so there I got the satisfaction that it is helpful to newbie. I got lots of e-mails and reviews from the users of book, and I have tried to incorporate most of the suggestions in this edition.

I would like to thank all the professionals in industries who are using the book and I want to assure them that we will keep on adding the updates of industry in the book in best possible ways.

Gaurav Verma

BASICS OF ELECTRICAL DRAWINGS

CHAPTER 1

Topics Covered

The major topics covered in this chapter are:

- Need of Drawings
- Electrical Drawings
- Common Symbols in Electrical Drawings
- Wire and its Types
- Labeling

NEED OF DRAWINGS

In this book, we are going through the topics related to electrical wiring and our purpose it to create good electrical wirings. So, it is important to know that why we need electrical drawings and what is the role of AutoCAD Electrical in that.

When we work in an electrical industry, we need to have a lot of information handy like the wiring of machines, position of switches, load of every machine and so on. It is almost impossible to remember all these details of an industry because there might be thousands of wires and switches and there can be hundreds of machine. To make this thing possible, we need electrical drawings that are written or printed documentation of these informations. <u>Figure-1</u> shows an electrical drawing.

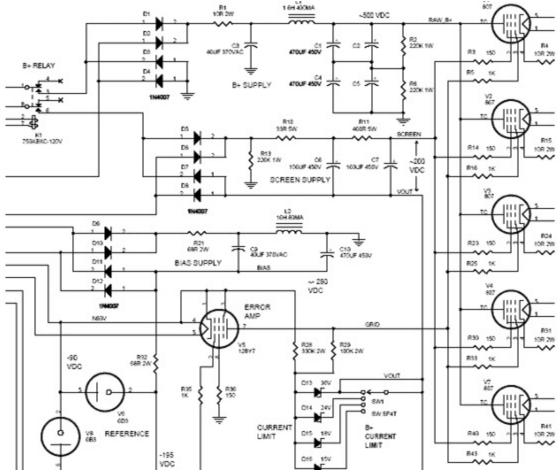


Figure-1. Circuit diagram

ELECTRICAL DRAWINGS

Electrical drawings are the representation of electrical components and connected wiring to fulfill a specific purpose. An electrical drawing can be of a house, industry or an electrical panel. Also, an electrical drawing can be divided into following categories:

- Circuit diagram
- Wiring diagram
- Wiring schedule
- Block diagram
- Parts list

Circuit Diagram

A circuit diagram shows how the electrical components are connected together and uses:

- Symbols to represent the components;
- Lines to represent the functional conductors or wires which connect them together.

A circuit drawing is derived from a block or functional diagram (see <u>Figure-2</u>). It does not generally bear any relationship to the physical shape, size or layout of the parts and although you could wire up an assembly from the information given in it, they are usually intended to show the detail of how an

electrical circuit works.

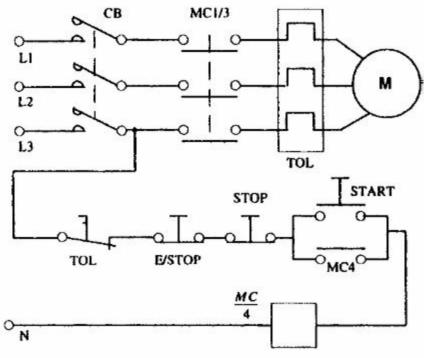


Figure-2. Circuit diagram

Wiring Diagram

This is the drawing which shows all the wiring between the parts, such as:

- Control or signal functions;
- Power supplies and earth connections;
- Termination of unused leads, contacts;
- Interconnection via terminal posts, blocks, plugs, sockets, lead-throughs.

It will have details, such as the terminal identification numbers which enable us to wire the unit together. Parts of the wiring diagram may simply be shown as blocks with no indication as to the electrical components inside. These are usually sub-assemblies made separately, i.e. pre-assembled circuits or modules. Figure-3 shows a wiring diagram.

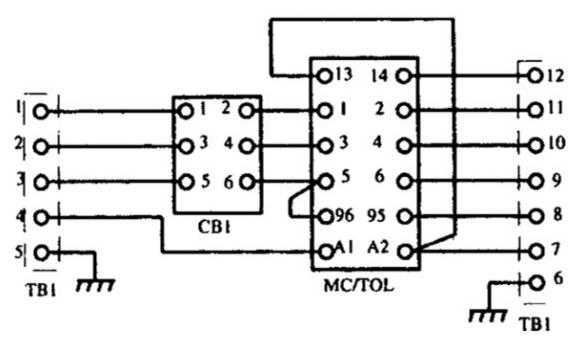


Figure-3. Wiring diagram

Wiring Schedule

A wiring schedule defines the wire reference number, type (size and number of conductors), length and the amount of insulation stripping required for soldering.

In complex equipment you may also find a table of interconnections which will give the starting and finishing reference points of each connection as well as other important information such as wire color, identification marking and so on. Refer to <u>Figure-4</u>.

Schedul	206-A				
Wire No	From	To	Туре	Length	Strip Length
01	TB1/1	CB1/1	16/0.2	600 mm	12 mm
02	TB1/2	CB1/3	16/0.2	650 mm	12 mm
03	TB1/3	CB1/5	16/0.2	600 mm	12 mm
04	TB1/4	MC/A1	16/0.2	800 mm	12 mm
05	TB1/5	Ch/1	16/0.2	500 mm	12 mm

Figure-4. Wiring Schedule

Block Diagram

The block diagram is a functional drawing which is used to show and describe the main operating principles of the equipment and is usually drawn before the circuit diagram is started.

It will not give any real detail of the actual wiring connections or even the smaller components and so is only of limited interest to us in the wiring of control panels and equipment. Figure-5 shows a block diagram.

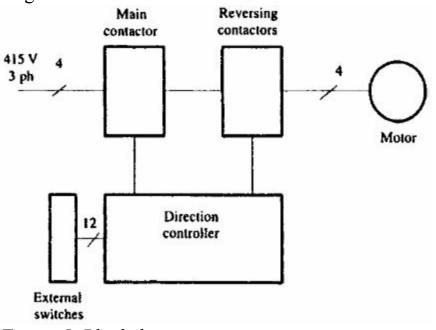


Figure-5. Block diagram

Parts list

Although not a drawing in itself, in fact it may be part of a drawing. The parts list gives vital information:

- It relates component types to circuit drawing reference numbers.
- It is used to locate and cross refer actual component code numbers to ensure you have the correct parts to commence a wiring job.

PARTS LIST					
REF	BIN	DESCRIPTION	CODE		
C81	A3	KM Circuit Breaker	PKZ 2/ZM-40-8		
MC	A4	KM Contactor	DIL 2AM 415/50		
TOL	A4	KM Overload Relay	Z 1-63		

Figure-6. Parts list

You know various types of electrical drawings but these drawings contain various symbols. The following section explains the common symbols that are used in an electrical drawing.

SYMBOLS IN ELECTRICAL DRAWINGS

Symbols used in electrical drawings can be divided into various categories that are explained next.

Conductors

There are 12 types of symbols for conductors; refer to <u>Figure-7</u> and <u>Figure-8</u>. These symbols are explained next.

- 1. General symbol, conductor or group of conductors.
- 2. Temporary connection or jumper.
- 3. Two conductors, single-line representation.
- 4. Two conductors, multi-line representation.
- 5. Single-line representation of n conductors.
- 6. Twisted conductors. (Twisted pair in this example.)

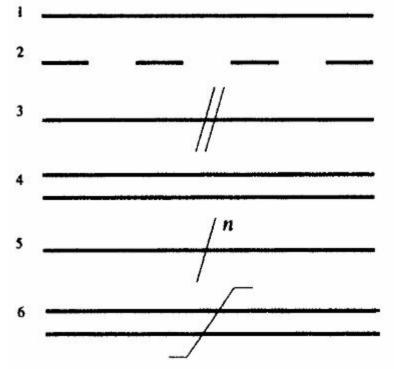


Figure-7. Symbols for conductors

- 7. General symbol denoting a cable.
- 8. Example: eight conductor (four pair) cable.
- 9. Crossing conductors no connection.

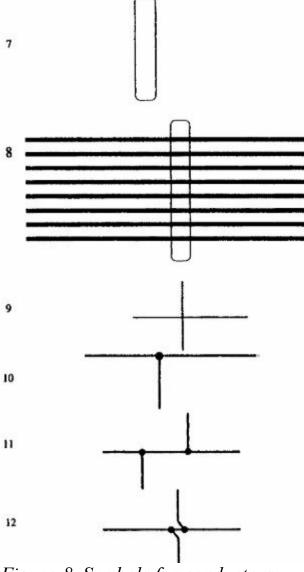


Figure-8. Symbols for conductors

- 10. Junction of conductors (connected).
- 11. Double junction of conductors.
- 12. Alternatively used double junction.

Connectors and terminals

Refer to <u>Figure-9</u>.

13. General symbol, terminal or tag.

These symbols are also used for contacts with moveable links. The open circle is used to represent easily separable contacts and a solid circle is used for those that are bolted.

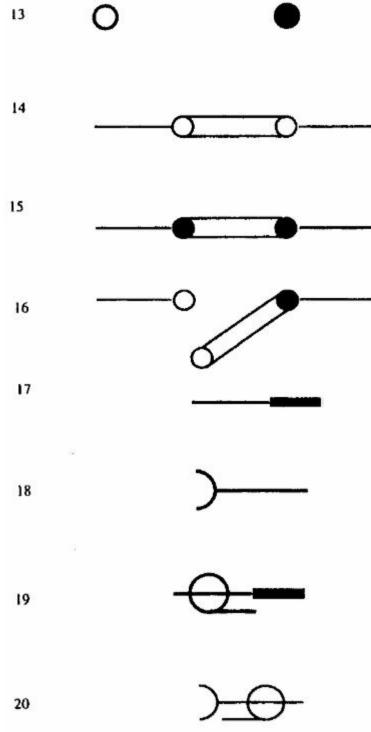


Figure-9. Connectors symbols

- 14. Link with two easily separable contacts.
- 15. Link with two bolted contacts.
- 16. Hinged link, normally open.
- 17. Plug (male contact).
- 18. Socket (female contact).
- 19. Coaxial plug.
- 20. Coaxial socket.

Inductors and transformers

Refer to <u>Figure-10</u>.

- 21. General symbol, coil or winding.
- 22. Coil with a ferromagnetic core.
- 23. Transformer symbols.

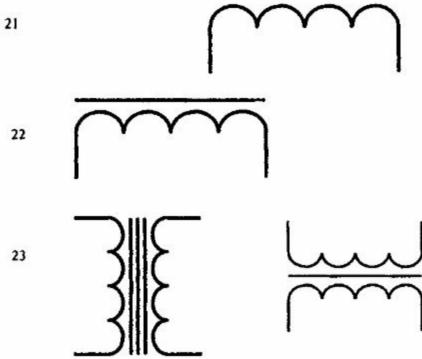


Figure-10. Inductors symbols

Resistors

- Refer to Figure-11.
- 24. General symbol.
- 25. Old symbol sometimes used.
- 26. Fixed resistor with a fixed tapping.
- 27. General symbol, variable resistance (potentiometer).
- 28. Alternative (old).
- 29. Variable resistor with preset adjustment.
- 30. Two terminal variable resistance (rheostat).
- 31. Resistor with positive temperature coefficient (PTC thermistor).
- 32. Resistor with negative temperature coefficient (NTC thermistor).

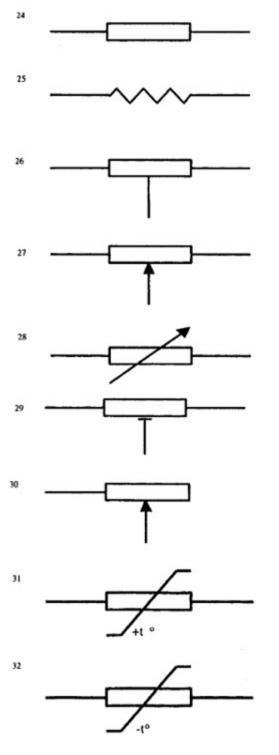
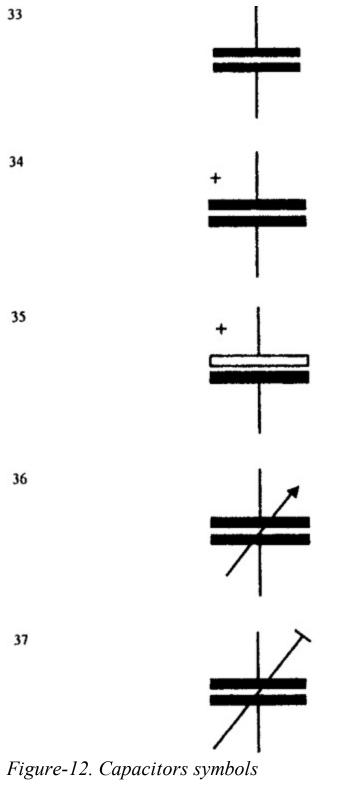


Figure-11. Resistors symbol

Capacitors

Refer to <u>Figure-12</u>.

- 33. General symbol, capacitor. (Connect either way round.)
- 34. Polarised capacitor. (Observe polarity when making connection.)
- 35. Polarized capacitor, electrolytic.
- 36. Variable capacitor.
- 37. Preset variable.



Fuses

Refer to Figure-13.

- 38. General symbol, fuse.
- 39. Supply side may be indicated by thick line: observe orientation.
- 40. Alternative symbol (older).

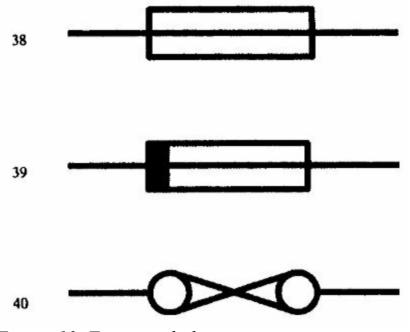


Figure-13. Fuses symbols

Switch contacts

Refer to Figure-14.

- 41. Break contact (BSI).
- 42. Alternative break contact version 1 (older).
- 43. Alternative break contact version 2.
- 44. Make contact (BSI).
- 45. Alternative make contact version 1.
- 46. Alternative make contact version 2.
- 47. Changeover contacts (BSI).
- 48. Alternative showing make-before-break.
- 49. Alternative showing break-before-make.

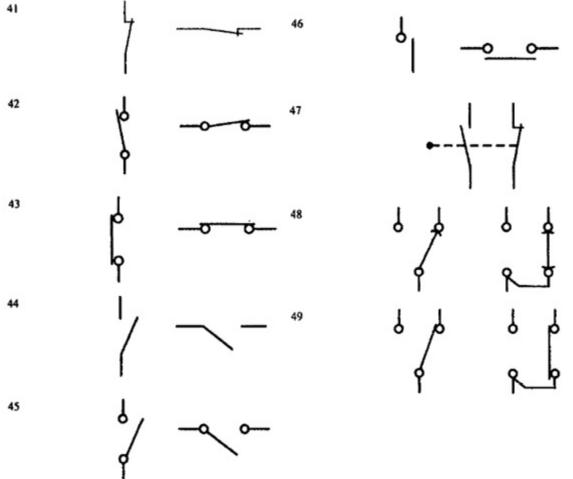


Figure-14. Switch Contact symbols

Switch types

Refer to Figure-15.

- 50. Push button switch momentary.
- 51. Push button, push on/push off (latching).
- 52. Lever switch, two position (on/off).
- 53. Key-operated switch.
- 54. Limit (position) switch.

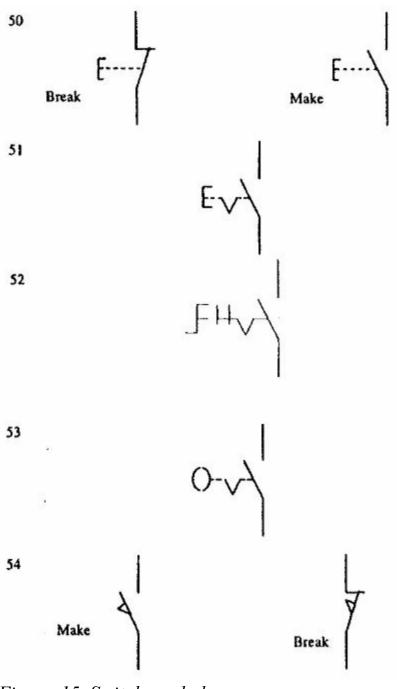


Figure-15. Switch symbols

Diodes and rectifiers

Refer to Figure-16.

- 55. Single diode. (Observe polarity.)
- 56. Single phase bridge rectifier.
- 57. Three-phase bridge rectifier arrangement.
- 58. Thyristor or silicon controlled rectifier (SCR) general symbol.
- 59. Thyristor common usage.
- 60. Triac a two-way thyristor.

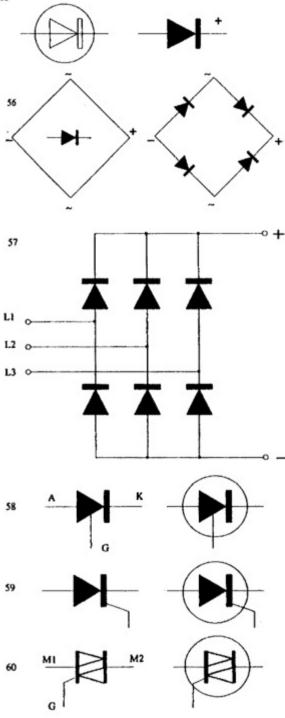


Figure-16. Diode Symbols

Earthing Refer to Figure-17.

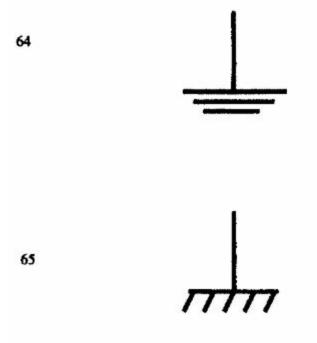


Figure-17. Earthing

Along with the above discussed symbols, you might need some user defined symbols for representation in your drawing.

After learning about various symbols the next important thing is to learn about wire and its specifications.

WIRE AND SPECIFICATIONS

Electrical equipment uses a wide variety of wire and cable types and it is up to us to be able to correctly identify and use the wires which have been specified. The wrong wire types will cause operational problems and could render the unit unsafe. Such factors include:

- The insulation material;
- The size of the conductor;
- What it's made of;
- Whether it's solid or stranded and flexible.

Types of Wires

- Solid or single-stranded wire is not very flexible and is used where rigid connections are accept able or preferred usually in high current applications in power switching contractors. It may be uninsulated.
- Stranded wire is flexible and most interconnections between components are made with it.
- Braided wire, also called Screened wire, is an ordinary insulated conductor surrounded by a conductive braiding. In this case the metal outer is not used to carry current but is normally connected to earth to provide an electrical shield to screen the internal conductors from outside electromagnetic interference.

Wire specifications

There are several ways to describe the wire type. The most used method is to specify the number of strands in the conductor, the diameter of the strands, the cross sectional area of the conductor then the insulation type.

Refer to Figure-18, Example 1:

- The 1 means that it is single conductor wire.
- The conductor is 0.6 mm in diameter and is insulated with PVC.
- The conductor has a cross-sectional area nominally of 0.28 mm .

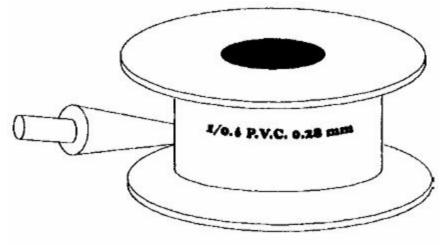


Figure-18. Example 1

Standard Wire Gauge

Solid wire can also be specified using the Standard Wire Gauge or SWG system. The SWG number is equivalent to a specific diameter of conductor; refer to Figure-19.

For example; 30 SWG is 0.25 mm diameter.

14 SWG is 2 mm in diameter.

The larger the number – the smaller the size of the conductor.

There is also an American Wire Gauge (AWG) which uses the same principle, but the numbers and sizes do not correspond to those of SWG.

SWG table

SWG No.	Diameter	
14 swg	2 mm	
16 swg	1.63 mm	
18 swg	1.22 mm	
20 swg	0.91 mm	
22 swg	0.75 mm	
24 swg	0.56 mm	
25 swg	0.5 mm	
30 swg Figure-19. SWG table	0.25 mm	

We are at a position where we know about various schematic symbols and we know about wires. Now, we will learn about labeling of contactors.

LABELING

Labeling is the marking on components for identifying incoming and outgoing supply; refer to Figure-20. We also attach numbers to wires so that later on we can identify their circuits.

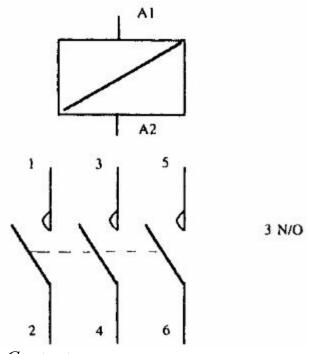


Figure-20. Contacts

Coils are marked alphanumerically, e.g. A1, A2. Odd numbers – incoming supply terminal. Even numbers – outgoing terminal.

Main contacts are marked with single numbers: Odd numbers – incoming supply terminal. Next even number – outgoing terminal.

In this way, we will find different type of markings for contacts that we would be including in our drawings.

INTRODUCTION TO AUTOCAD ELECTRICAL AND INTERFACE

CHAPTER 2

Topics Covered

The major topics covered in this chapter are:

- Introduction
- System Requirement
- Starting AutoCAD Electrical/AutoCAD
- Starting Drawing

INTRODUCTION TO AUTOCAD ELECTRICAL

In today's world, AutoCAD Electrical is a self defined name in the CAD industry. It is one of the beginners in Electrical CAD software industry. If we move back into the history, then first version of AutoCAD desktop applications came out around 1982 with the name AutoCAD Version 1.0. From 1982 to till today AutoCAD has undergone continuous enhancements and modifications. But, it is the speciality of AutoCAD that it still retains its position as No. 1 in CAD industry. The AutoCAD Electrical is built on that known platform called AutoCAD. The latest version AutoCAD Electrical 2016 is the most advanced model of AutoCAD Electrical available for us. The software has expanded more into the user interface of AutoCAD Electrical and has become the most user friendly

one. The 2016 version of software has rich capabilities to operate with Autodesk Inventor for 3D electrical CAD and electromechanical models. For every tool/command it has more that one ways to invoke. This software also gives you the access to customize it as per your requirements.

Although the software is capable to perform 3D operations but in this book we will concentrate on 2D drawing creation. Now, we will learn to start AutoCAD Electrical and then we will discuss the interface of AutoCAD Electrical. But before we discuss about starting AutoCAD Electrical, Please check the system requirements to run AutoCAD Electrical 2016 properly. The system requirements are given next.

System requirements for AutoCAD Electrical 2016

Operating System

Microsoft® Windows® 8/8.1 Enterprise Microsoft Windows 8/8.1 Pro Microsoft Windows 8/8.1 Microsoft Windows 7 Enterprise Microsoft Windows 7 Ultimate Microsoft Windows 7 Professional Microsoft Windows 7 Home Premium

CPU Type

Minimum Intel[®] Pentium[®] 4 or AMD Athlon[™] 64 processor

Memory

For 32-bit AutoCAD Electrical 2016: 2 GB (3 GB recommended)

For 64-bit AutoCAD Electrical 2016: 4 GB (8 GB recommended)

Display Resolution

1024x768 (1600x1050 or higher recommended) with True Color

Display Card

Windows display adapter capable of 1024x768 with True Color capabilities and DirectX® 9. DirectX 11 compliant card recommended.

Disk Space Installation 12.0 GB

Pointing Device MS-Mouse compliant device

Media (DVD) Download and installation from DVD

Browser Windows Internet Explorer® 9.0 (or later)

.NET Framework .NET Framework Version 4.5

Additional Requirements for Large Datasets, Point Clouds, and 3D Modeling

Memory

8 GB RAM or greater

Disk Space

6 GB free hard disk available, not including installation requirements

Display Card

1600x1050 or greater True Color video display adapter;
128 MB VRAM or greater; Pixel Shader 3.0 or greater; Direct3D®-capable workstation class graphics card.

Note: 64-bit Operating Systems are recommended if you are working with Large Datasets, Point Clouds and 3D Modeling.

Make sure that you fulfill all the requirements for the software before running it. Since there are various ways to perform the same thing so, we will use the best practice to perform an operation and alternates will be given

STARTING AUTOCAD ELECTRICAL ELECTRICAL

• Click on the Start button in the taskbar and type AutoCAD Electrical in the search box. The list of

options related to AutoCAD Electrical will be displayed; refer to Figure-1.

Programs (11)
Attach Digital Signatures - AutoCAD Electrical
AutoCAD 2016 - English - AutoCAD Electrical
AutoCAD Electrical 2016 - English
Batch Standards Checker - AL-OCAD Electrical
Here Export AutoCAD 2016 Settings - AutoCAD Electrical
1 Import AutoCAD 2016 Settings - AutoCAD Electrical
Install Now Autodesk® AutoCAD® Electrical 2015
License Transfer Utility - AutoCAD Electrical
My Documents - AutoCAD Electrical 2016
Reference Manager - AutoCAD Electrical
🖗 Reset Settings to Default - AutoCAD Electrical
₽ See more results
AutoCAD × Shut down +

Figure-1. Start menu

• Click on AutoCAD Electrical 2016 link button in the list. AutoCAD Electrical will initialize and once the background processing is complete, the interface will be displayed as shown in <u>Figure-2</u>.

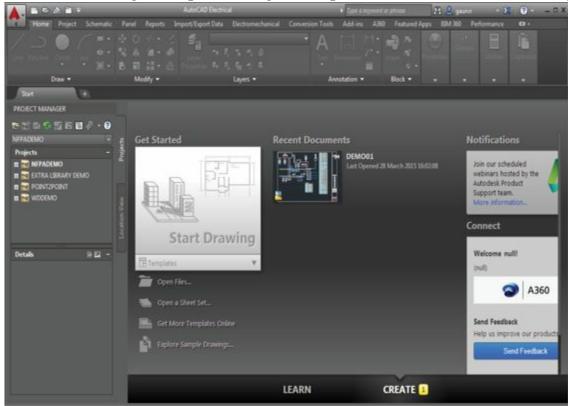


Figure-2. AutoCAD Electrical interface

The first screen of AutoCAD Electrical is divided into three columns. First column is for starting drawings. The second column is for opening the recent documents. Using the third column which connect, you can connect the other users of AutoCAD Electrical using your Autodesk account information.

Now, our first task is to create a drawing document. In real world, we will find the drawings generally in two unit systems: Metric (SI) and Imperial. We will now learn to create drawings in both the unit systems.

CREATING A NEW DRAWING DOCUMENT

• Click on the down arrow below **Start Drawing** button in the First Column. List of drawing templates will be displayed; refer to Figure-3.

Get Started	- 11
Start Drawing	
Templates 🔹	
acad -Named Plot Styles.dwt acad -Named Plot Styles3D.dwt acad.dwt acad3D.dwt acadISO -Named Plot Styles.dwt acadISO -Named Plot Styles3D.dwt	
acadiso.dwt acadiso3D.dwt Tutorial iArch dwt	
Tutorial-iArch.dwt Sheet Sets Greate New Sheet Set	

Figure-3. List of templates

• Select the desired template from the list. The drawing environment will open according to the selected template; refer to Figure-4.

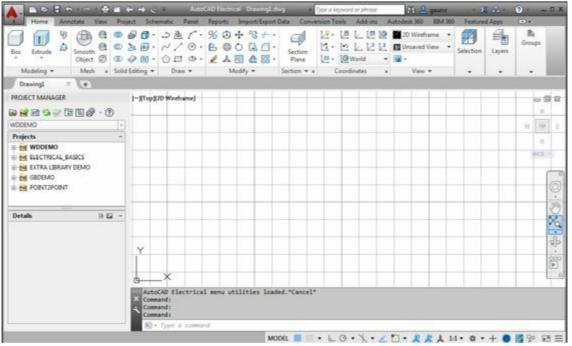


Figure-4. AutoCAD Electrical with acadiso template

Meaning of Default templates

acad -Named Plot Styles.dwt :- Using this template, we can create drawings in imperial unit system (feet and inches)that can be printed in black and white.

acad -Named Plot Styles3D.dwt :- Using this template, we can create 3D model in imperial unit system (feet and inches) that can be printed in black and white.

acad.dwt :- Using this template, we can create drawings in imperial unit system (feet and inches)that can be printed in color.

acad3D.dwt :- Using this template, we can create 3D model in imperial unit system (feet and inches) that can be printed in color.

acadISO -Named Plot Styles.dwt :- Using this template, we can create drawings in metric unit system (millimeters)that can be printed in black and white.

acadISO -Named Plot Styles3D.dwt :- Using this template, we can create 3D model in metric unit system (millimeters) that can be printed in black and white.

acadiso.dwt :- Using this template, we can create drawings in metric unit system (millimeters)that can be printed in color.

acadiso3D.dwt :- Using this template, we can create 3D model in metric unit system (millimeters) that can be printed in color.

Tutorial-iArch.dwt :- Using this template, you can create architectural drawing that are compatible with the tutorial in default library. Note that the unit for this template is imperial (Feet and Inches).

Tutorial-iMfg.dwt :- Using this template, you can create mechanical manufacturing drawing that are compatible with the tutorial in default library. Note that the unit for this template is imperial (Feet and Inches).

Tutorial-mArch.dwt :- Using this template, you can create architectural drawing that are compatible with the tutorial in default library. Note that the unit for this template is metric (Millimeters.

Tutorial-mMfg.dwt :- Using this template, you can create mechanical manufacturing drawing that are compatible with the tutorial in default library. Note that the unit for this template is metric (Millimeters).

No Template - Imperial :- Using this template, you can create a new drawing using the imperial unit system and without using any template.

No Template - Metric :- Using this template, you can create a new drawing using the metric unit system and without using any template.

Electrical Templates

The template files that start with ACE are meant for electrical drawings. Also, you can use ACAD_Electrical.dwt and ACAD_Electrical_IEC.dwt for creating AutoCAD Electrical drawings. You will learn about these templates later in the book.

We know about the default templates. We have created a new document with a selected template. Now, we will learn about interface. We divide the AutoCAD Electrical interface into following sections:

- Title Bar
- Application Menu
- Ribbon
- Drawing Tab Bar
- Drawing Area
- Command Window
- Bottom Bar

Now, we will discuss each of the sections one by one.

TITLE BAR

Title bar is the top strip containing quick access tools, name of the document and connectivity options; refer to Figure-5.

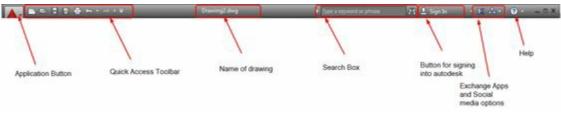


Figure-5. Title bar

- Application button is used to display Application menu, which we will discuss later.
- Quick Access Toolbar contains tools that are very common while working. The Quick Access Toolbar contains tools for creating new file, saving current file, printing the file and so on. You can add the desired tools in the Quick Access Toolbar which we will learn later.
- The center of the title bar shows the name of the drawing.
- Search Box is used to search the desired topic in the AutoCAD Electrical Help. To use this option, type the keyword for which you want the information in the text box adjacent to search button and press ENTER from the keyboard.
- Sign In button is used to sign into the Autodesk account. If you are not having an Autodesk account then you can create one from Autodesk website. If you have an Autodesk account then you can save and share your files through Autodesk cloud and you can render on cloud which are very fast services. To sign into your Autodesk account, click on the Sign In button. As a result, a drop-down will display; refer to Figure-6. Click on Sign In to Autodesk 360 button. As a result, the Autodesk Sign In dialog box will be displayed; refer to Figure-7. Enter your ID and password and click on

the Sign In button to login.



Figure-6. Sign In option



Figure-7. Autodesk sign in dialog box

- Exchange Apps is used to install or share apps for Autodesk products. Click on the Exchange Apps button and exchange apps web page will open in the browser where you can buy or try various apps as per your requirement.
- Help button is used to display the online help of AutoCAD Electrical on the Autodesk server. If you click on the down arrow next to help button then a list of options is displayed; refer to <u>Figure-8</u>. If you want to use offline help then click on the **Download Offline Help** option

Electrical Help Topics	
Download Offline Help	
Download AutoCAD Electrica	l Content
Additional Resources	•
Send Feedback	
Customer Involvement Progra	am

Figure-8. Help menu

Do	wnload & Install AutoCAD Electrical	Share <
20	16 Product Help	
Mar	5, 2015 Download	
	stall the Autodesk AutoCAD Electrical 2016 Offline Help to your computer or to a local ork location, select from the list of languages below.	ſ
	English (exe - 205824Kb)	
	English (exe - 205824Kb) French (Français) (exe - 211968Kb)	
	French (Français) (exe - 211968Kb)	
	French (Français) (exe - 211968Kb) German (Deutsch) (exe - 210944Kb)	
	French (Français) (exe - 211968Kb) German (Deutsch) (exe - 210944Kb) Italian (Italiano) (exe - 210944Kb)	
	French (Français) (exe - 211968Kb) German (Deutsch) (exe - 210944Kb) Italian (Italiano) (exe - 210944Kb) Japanese (日本語) (exe - 210944Kb)	
	French (Français) (exe - 211968Kb) German (Deutsch) (exe - 210944Kb) Italian (Italiano) (exe - 210944Kb) Japanese (日本語) (exe - 210944Kb) Korean (한국어) (exe - 203776Kb)	

Figure-9. Offline help link

Click on the desired language link to download the help file in respective language.

Now, we need to change the color scheme of AutoCAD Electrical because of printing compatibility

although you can retain the present color scheme. To change the color scheme, steps are given next.



• Click on the Application button 1.	The Application Menu w	vill be displayed; refer to	Figure-10.
--------------------------------------	------------------------	-----------------------------	------------

E	٩.
66	Recent Documents
New +	By Ordered List 👻 🛅 💌
Open +	DEMO01.DWG
Save	
Save As	
Export +	
Publish •	
Print +	
Drawing Utilities	
Close +	
	Options Exit AutoCAD Electrical 2016

Figure-10. Application menu

• Click on the **Options** button at the bottom right of the **Application Menu**. The **Options** dialog box will be displayed; refer to Figure-11.

ent profile: < < <	Liser Preferences Drafting	2D Modeling	Selection	Profiles Online
	1949	SU Modeling	Selection	Pronies Online
Window Elements Color scheme: Dark Color scheme: Dark Display scroll bars in drawing window Use large buttons for Toolbars Verified Resize ribbon icons to standard sizes Verified Show rolot to standard sizes Verified Show shortcut keys in ToolTips Verified ToolTip	Fighlight Fighlight Fighlight Poply sol Show tex Draw true Crosshair size 5	zoom with raster raster image fran	oolyline cun ct smoothne er surface & OLE ne only e only	88
Display Layout and Model tabs Display printable area Display paper background Display paper shadow Show Page Setup Manager for new layouts Create viewport in new layouts	Fade control Xref display 50 In-place edt and 70	annotative repres	sentations	

Figure-11. Options dialog box

- Click on the **Dark** drop-down button in the **Window Elements** area. List of options will be displayed.
- Select the Light option from the drop-down; refer to Figure-12.

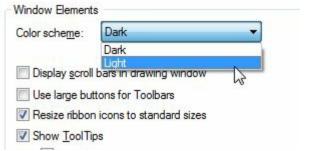


Figure-12. Light option in Color scheme drop-down

• Click on the **Colors** button; refer to <u>Figure-11</u>. The **Drawing Window Colors** dialog box will be displayed as shown in <u>Figure-13</u>.

A Drawing Window Colors		
Context:	Interface element:	Color:
2D model space Sheet / layout 3D parallel projection 3D perspective projection Block editor Command line Plot preview	Top of sky background Background sky horizon Background ground origin Background ground horizon Bottom of earth background Background earth horizon Crosshairs Viewport control Grid major lines Grid axis lines Autotrack vector 2d Autosnap marker 3d Autosnap marker	
Preview:	Dynamic dimension lines	
	Apply & Close	Cancel Help

Figure-13. Drawing Window Colors dialog box

Note that using the options in this dialog box, you can change the color of any element of interface.

• Select one of the backgrounds from **Interface element** list box, click on the drop-down for colors and select the **White** option; refer to Figure-14.

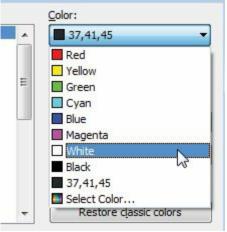


Figure-14. Color drop-down

• Similarly, one by one select the other background options from the **Interface element** box and set their colors to white.

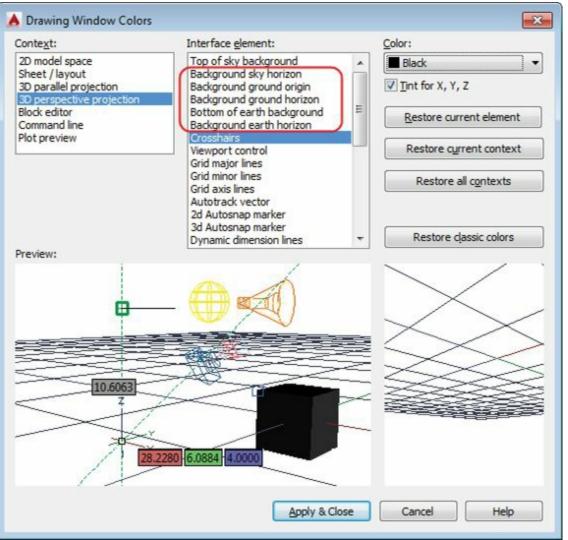


Figure-15. Background options

- Select the **Crosshairs** option from the **Interface element** box and select the **Black** option from the **Color** drop-down.
- Click on the **Apply & Close** button from the **Drawing Window Colors** dialog box and click on the **OK** button from the **Options** dialog box. The drawing area and interface will be displayed in colors that are suitable for printing of this book.

APPLICATION MENU

Application menu contains the tools that are related to the overall functioning of AutoCAD Electrical. This functioning include (opening, saving, and creating of documents), (printing, publishing, and exporting of documents), and (Drawing properties and configuration options for AutoCAD Electrical). Now, one by one we will discuss each tool and option in the **Application Menu**.

New options

• Click on the **Application** button and hover the cursor over **New** option in the menu. The options for new documents will be displayed; refer to <u>Figure-16</u>.

E	Search C	ommands	Q,
6)	Create	a new drawing	
New		Drawing Start a new drawing with a selected	
Open	•	drawing template file.	
Save	Ś	Sheet Set Create a sheet set data file that manages drawing layouts, file paths, and project data.	
Save As	•		
Export	•		
Publish	•		
Print			
Drawing Utilities	•		
Close	•		
		Options Exit AutoCAD Electrical 20	16

Figure-16. Options for new documents

• In this version of AutoCAD Electrical there are two options to create new documents; **Drawing** and **Sheet Set**.

Using the **Drawing** option, you can create an individual drawing file, which contains model and various views of the model in orthographic projection.

Using the Sheet Set option, you can create a group of inter-related drawing files in the form of sheets.

Creating Drawings

• Click on the **Drawing** option from the **New** options. The Select Template dialog box will be displayed; refer to Figure-17.

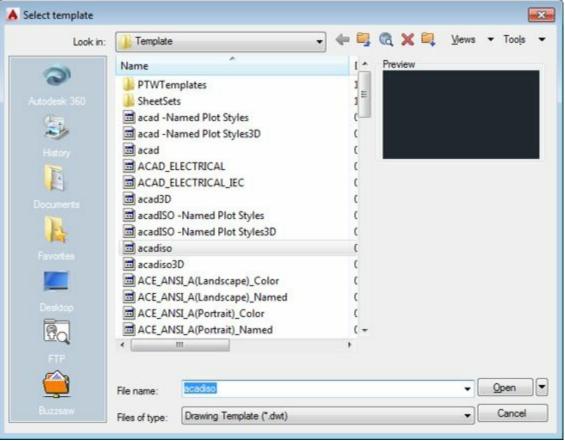


Figure-17. Select template dialog box

- Select the desired template from the dialog box. Note that the use of each template has already been discussed.
- If you want to create a document with out using any of the above template but with the desired units only then click on the down arrow next to **Open** button in the dialog box. A drop-down will be displayed; refer to Figure-18.

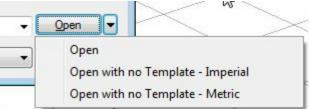


Figure-18. Open drop down

- Click on the **Open with no Template Imperial** button to work in Feet and Inches without loading any template.
- Otherwise, click on the **Open with no Template Metric** button to work in millimeters without loading any template.
- Otherwise, click on the **Open** button from the drop-down to create a drawing using the selected template. Note that if you directly select the **Open** button from the dialog box then also the functioning will be similar.
- Note that from the **Files of type** drop-down in this dialog box the **Drawing Template (*.dwt)** option is selected so you are able to select the templates. You can also use any previous drawing as a template. To do so, click on the **Drawing Template (*.dwt)** option. The **Files of type** drop-down will expand as shown in Figure-19.



Figure-19. Files of type drop down

• Select the **Drawing (*.dwg)** option from the list and you will be able to select any drawing in place of template. Rest of the procedure is same.

Creating Sheet Sets

• Click on the Sheet Set option from the New options in the Application Menu. The Begin page of Create Sheet Set dialog box will be displayed; refer to Figure-20.

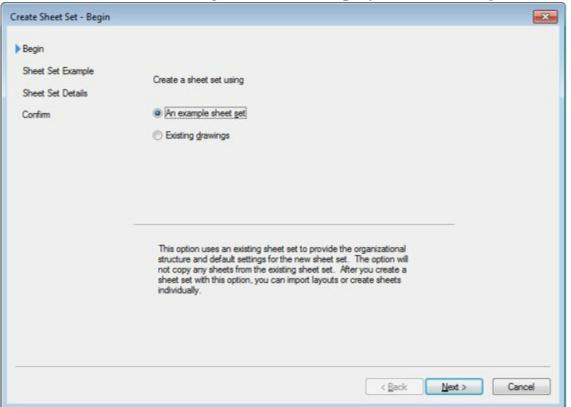


Figure-20. Begins page Create Sheet Set dialog box

- If you want to use the example sheet set (template) then select the **An example sheet set** radio button from this page. You can club more than one drawing files in the form of a sheet set by using the **Existing drawings** radio button. We will select the **An example sheet set** radio button for the time being.
- Click on the Next button from the dialog box. The Sheet Set Example page of Create Sheet Set dialog box will be displayed; refer to Figure-21.

Create Sheet Set - Sheet Se	t Example	X
Begin Sheet Set Example Sheet Set Details Confirm	 Select a sheet set to use as an example Architectural Imperial Sheet Set Architectural Metric Sheet Set Anufacturing Imperial Sheet Set Manufacturing Metric Sheet Set Manufacturing Metric Sheet Set New Sheet Set mode to another sheet set to use as an example mgbow beta 2/v20.0\venu\template\Architectural Imperial Sheet Set. mter: Architectural Imperial Sheet Set Title: Architectural Imperial Sheet Set Description: Use the Architectural Imperial Sheet Set to create a new sheet set with a default sheet size of 24 x 36 inches. 	
8	< Back Next > Cance	

Figure-21. Sheet Set Example page of Create Sheet Set dialog box

- Select the desire sheet set template from the box and click on the **Next** button from the dialog box. The **Sheet Set Details** page will be displayed as shown in <u>Figure-22</u>.
- Click in the Name of new sheet set edit box and specify the name of the sheet set as desired.
- Click on the Browse button and next to Store sheet set data file (.dst) here edit box. The Browse for Sheet Set Folder dialog box will be displayed as shown in Figure-23.

Begin	Name of new sheet set:	
Sheet Set Example	New Sheet Set (2)	
Sheet Set Details	Description (optional):	
Confirm	Use the Manufacturing Metric Sheet Set to create a new sheet set with a default sheet size of 297 x 420 mm.	
	÷	
	Store sheet set data file (.dst) here:	
	C:\Users\Gaurav\Desktop\aaaaaa	
	Note: The sheet set data file should be stored in a location that can be accessed by all contributors to the sheet set.	
	Create a folder hierarchy based on subsets	
	Sheet Set Properties	

Figure-22. Sheet Set Details page of Create Sheet Set dialog box

A Browse for Shee	t Set Folder			- 8 - X -
Look in:	🔒 аааааа		📮 🔍 🗶 📮 <u>V</u> e	ws - Too <u>l</u> s -
-	Name	*	Date modified	Туре
History Documents Favorites		This folder is em	pty.	
Desktop	•	m		P Open
				Cancel

Figure-23. Browse for Sheet Set Folder dialog box

- Browse to the desired folder and click on the **Open** button to set the directory.
- You can set the properties by using the dialog box displayed on clicking on the Sheet Set Properties button in this page.
- Click on the **Next** button from the page. The **Confirm** page will be displayed with the preview of all the properties set; refer to Figure-24.

Begin	Sheet Set Preview:	
Sheet Set Example Sheet Set Details Confirm	New Sheet Set (2) Top Level Assemblies Subassemblies Part Sheets Presentation Sheets Note: References to sheets in the source sheet set are not copied. Sheet Set Copied Manufacturing Metric Sheet Set Sheet set data file copied: C:\Users\Gaurav\appdata\local\autodesk\sutocad longbow beta 2 \v20.0\venu\template\Manufacturing Metric Sheet Set.dst New Sheet Set Sheet set name: New Sheet Set Sheet set of 297x 420 mm. Sheet set storage location: C:\Users\Gaurav\Desktop\aaaaaa\ Sheet set data file:	

Figure-24. Confirm page of Create Sheet Set dialog box

• Click on the **Finish** button from the page. The **Sheet Set Manager** will be displayed with the current sheet set; refer to <u>Figure-25</u>.

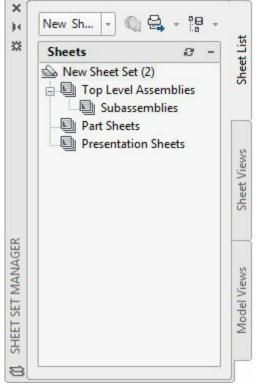


Figure-25. Sheet Set Manager

We will learn more about the sheet sets later in this book.

Open Options

These options are used to open files of different formats and from different locations. In this version of AutoCAD Electrical, you can open drawing file from local drive or cloud (Autodesk 360), you can open sheet sets from local drive, you can import DGN format files, and you can open sample files from local drive as well as online. Note that the procedure to open all the type of files is similar, so here we will discuss the procedure to open a drawing file from local drive.

Opening Drawing File

- Click on the **Drawing** option from the **Open** options in the **Application Menu**. The Select File dialog box will be displayed as shown in <u>Figure-26</u>.
- Browse to the desired folder and select the file that you want to open in AutoCAD Electrical.
- Click on the **Open** button to open the file.

A Select File					
Look in:	666666		•	٩,	🜊 💥 🚉 Views 🔻 Tools 👻
Hatoy	Name	This folder is empty.			Preview
Documents					
					Initial View
Favortes					Select Initial View
Desktop					
Ba					
ette					
Buzzsaw	File name:				▼
	Files of type:	Drawing (*.dwg)			▼ Cancel

Figure-26. Select File dialog box

Note that there are three more methods to open a file; opening as read only, opening partially, and opening as read only with partial content. The options to do so are displayed on clicking at the down arrow next to **Open** button; refer to Figure-27. Partially opening a drawing file mean skipping some of the layers that are not of our use. A layer is transparent sheet on which we draw something in AutoCAD Electrical. In AutoCAD Electrical, each drawing is stacking of multiple layers one over the other.

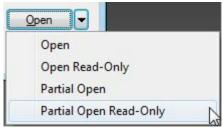


Figure-27. Open options

- If you want to open the file as read only and don't want to make the changes in it then select the **Open Read-Only** option from the drop-down.
- If you want to open a drawing file partially, then select the **Partial Open** option from the dropdown. The **Partial Open** dialog box will be displayed as shown in <u>Figure-28</u>.

ew geometry to load	Layer geometry to load	
Extents*	Layer Name	Load Geometry
"Extents" "Last"	0 7BRIDGE ASHADE Defpoints Dimensions (COTAS) Text	
dex status		
Use spatial index Spatial index: No	Load All Clear All	

Figure-28. Partial Open dialog box

- Select the check boxes corresponding to the layers that you want to include while opening the drawing.
- Click on the **Open** button from the dialog box. The file will open with only the selected layers.

You can similarly open a file partially and read only by using the **Partial Open Read-Only** option.

Save

This option is used to save the current file in the local drive for its later use. The steps to save the file are given next.

• Click on the **Save** option from the **Application Menu**. The Save Drawing As dialog box will be displayed as shown in <u>Figure-29</u>.

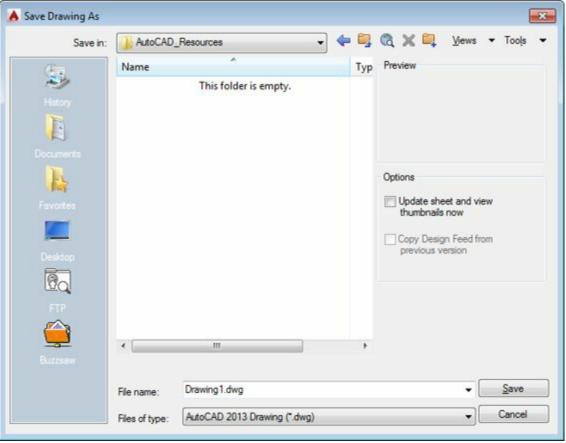


Figure-29. Save Drawing As dialog box

• Change the file name as desired and click in the Files of type drop-down to change the file format. On clicking at the **Files of type** drop-down, the list of formats is displayed as shown in <u>Figure-30</u>.

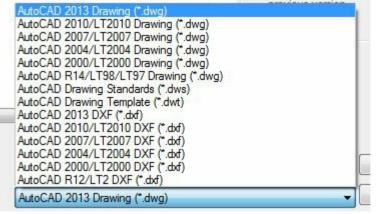


Figure-30. AutoCAD Electrical file formats

- Browse to the desired location where you want to save the file. Note that the buttons in the left area of the dialog box are used to access some common locations like Documents, Desktop, FTP, and so on.
- Click on the **Save** button and the file will be saved with the specified settings.

Applying Password on File

Note that you can apply a password to the drawing file for security of your design. To apply the password follow the steps given next.

• In the **Save Drawing As** dialog box, click on the down arrow next to **Tool** button; refer to <u>Figure-31</u>. A list of options will be displayed.

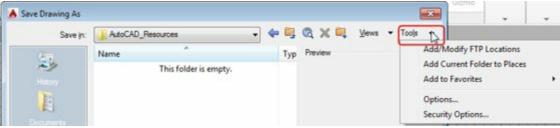


Figure-31. Tools drop down

 Click on the Security Options button in the drop-down. The Security Options dialog box will be displayed as shown in <u>Figure-32</u>.

Security Options Password Digital Signature	
Password or phrase to open this drawing:	Encrypt drawing properties
Current encryption type: Microsoft Base Cryptographic Provider v1.0	
	OK Cancel Help

Figure-32. Security Options dialog box

- Specify the password for security in the edit box corresponding to password.
- Select the Encrypt drawing properties check box to encrypt the properties of the drawing.
- Note that after specifying the password, the **Advanced Options** button becomes active. Click on this button and select the encryption provider as per your requirement. If you are sending this file to someone else then make sure that the person has the same encryption agent in this system.
- Click on the **OK** button from the dialog box. The **Confirm Password** dialog box will be displayed as shown in Figure-33.



Figure-33. Confirm Password dialog box

• Type your password again and click on the **OK** button from the dialog box. Next, click on the **Save** button from the dialog box.

Save As

This option is used to save the file with a different format. The steps to use this option are given next.

• Click on the arrow next to Save As in the Application Menu. The Save As options will be displayed as shown in Figure-34.



Figure-34. Save As options

- If you want to save the file with a format different from the AutoCAD Electrical format then click on the **Other Formats** button from the list of options. The **Save Drawing As** dialog box will be displayed as discussed earlier. Note that some additional formats will be displayed in the **Files of type** drop-down.
- Select the desired file format from the list and click on the **Save** button from the dialog box to save the file. Note that later when we will work on 3D models and some more options will be available in this drop-down.

Export

The options for this section are used to save the file in external formats. The options in this section work in the same way as the **Save** options work. The steps to export a file in iges format are given next. You can apply the same procedure to save files in other formats.

• Hold the cursor on the **Export** option in the **Application Menu**. The options related to exporting file are displayed; refer to Figure-35.



Figure-35. Export options

• Click on the **Other Formats** button from the list. The **Export Data** dialog box will be displayed as shown in <u>Figure-36</u>.

Export Data						6	×
Save in:	AutoCAD	_Resources	• •	📑 🔍 🗶 🛤	Views	▼ Tools	•
œ.	Name	*		Date modified	Туре		
S.			This folder is e	empty.			
History							
1							
Documenta							
A							
Favortes							
_							
Desktop							
Øq							
FTP							
Buzzsaw	*		m		_		,
						Court	_
	File name:	Drawing1.bmp			•	Save	_
	Files of type:	Bitmap (*.bmp)			-	Cancel	

Figure-36. Export Data dialog box

• Specify the desired name in the File name edit box and click on the Files of type drop-down. The list of formats will be displayed as shown in <u>Figure-37</u>.

File <u>n</u> ame:	for_reference	
Files of type:	Bitmap (*.bmp)	
	3D DWF (*.dwf)	
	3D DWFx (*.dwfx)	
	FBX (*.fbx) Metafile (*.wmf)	
	ACIS (*.sat)	
	Lithography (*.stl)	
	Encapsulated PS (*.eps)	
	DXX Extract (*.dox)	
	Bitmap (*.bmp) Block (*.dwg)	
	V8 DGN (*.dgn)	
	V7 DGN (*.dgn)	
	IGES (* iges)	
	- IGES (*.igs) レダ	

Figure-37. Formats for export

• Select the **IGES (*.iges)** option from the list and click on the **Save** button from the dialog box to save the file with the selected format.

Publish

The options for this section are used to package and transfer the file to external sources like 3D printer, web services and e-mail transfer.

- To use the **Send to 3D Print Service** option, you must have a 3D model which can be sent for 3D printing. If you have the model then click on this button and select the models that you want to print.
- Archive option is used to package the files for transfer. Note that to use this option, you need to create a sheet set of drawing. If you have the sheet set then click on this button and you can package the files in a zip format.
- eTransmit option is also used to package the files but it compresses the files to their fast electronic transfer.
- Email option is used to directly e-mail the current file to your client.

Print

Printing is an important requirement of the CAD industry. All the designs are manufactured and controlled on the basis of printed copy of the drawing. To get the print out follow the steps given next.

• Click on the Plot option from the Print options in the Application Manager. The Plot dialog box will be displayed for Model option; refer to Figure-38. (Model is the workspace in AutoCAD Electrical in which 3D view of model is displayed. Layout/Paperspace is the workspace where model is displayed in its paper print form. It is advised to shift to Layout/Paperspace before printing on the paper.).

age setup		
N <u>a</u> me:	<none></none>	▼ Add
Printer/plotte	er	
Na <u>m</u> e:	😫 None	Properties
Plotter: Where: Description:	None Not applicable The layout will not be plotted unless configuration name is selected. le	a new plotter
Paper si <u>z</u> e ISO A4 (21	0.00 x 297.00 MM)	Number of copies
ISO A4 (21 Plot area What to plot		v I v Plot scale V Fit to paper
ISO A4 (21 Plot area		▼ 1 ×
ISO A4 (21 Plot area <u>W</u> hat to plot Display	t: prigin set to printable area)	v I v Plot scale V Fit to paper Scale: Custom 1 mm m =

Figure-38. Plot dialog box

• Select the Printer/plotter from the **Name** drop-down in the **Printer/plotter** area of the dialog box; refer to <u>Figure-39</u>.

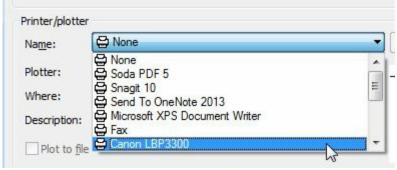


Figure-39. Printer selection

- Select the paper size from the drop-down in the **Paper size** area of the dialog box.
- Select the Center the plot check box to print the drawing at the center of the paper.
- Select the Fit to paper check box to fit it in the current paper size.
- Click on **More options** \bigcirc button or press **ALT** + > to expand the dialog box. The dialog box will be displayed as shown in Figure-40.

age setup			Plot style table	e (pen assignments)
Name: <pre></pre>	•	Add	None	• 2
rinter/plotter			Shaded viewpo	ort options
Name: Canon LBP3300	*	Properties	Sha <u>d</u> e plot	As displayed 🔹
Plotter: Canon LBP3300 - Windows System I	Driver - by Autodesk	-1 210 NN K-	Quality	Normal
Where: USB001 Description:		29	DPI	300
Plot to file	11	Number of copies		t lineweights
A4	•	1	Plot trans	
lot area What to plot: Display •	Plot scale Fit to paper Scale: Custom	Ţ	Plot stam	erspace objects
lot offset (origin set to printable area) <u>¥</u> : 0.00 mm ▼ Center the plo <u>Υ</u> : 104.24 mm	20.10	Ineweights	Drawing orient	e A

Figure-40. Expanded Plot dialog box

- Select the Landscape radio button from the Drawing orientation area of the dialog box to print the drawing in landscape orientation.
- Select the **Plot upside-down** check box from the **Drawing Orientation** area to reverse the printing side of the paper.
- To increase or decrease the quality of printout, select the desired quality option from the **Quality** drop-down in the **Shaded viewport options** area.

• Click on the **OK** button from the dialog box to print the drawing. You will learn more about the printing later in this book.

DRAWING TAB BAR

The **Drawing tab bar** contains tabs for each drawing that is opened; refer to Figure-41.

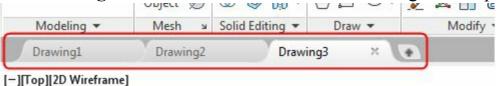


Figure-41. Drawing Tab bar

There are various functions that can be performed by using the Drawing tab bar, which are discussed next.

• Hold the cursor over the tile of any drawing file in the Drawing tab bar. An interactive box will be displayed allowing you to switch between model and their paper spaces/layouts; refer to Figure-

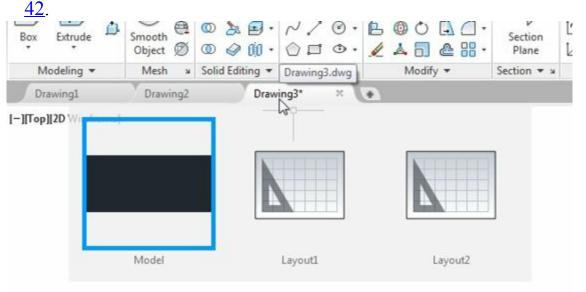


Figure-42. Interactive box for layout switching

- Click on the Layout1 or Layout2 to switch to paper space mode. You can switch back to Model space mode by using the same procedure.
- You can create a new drawing file by clicking on the plus sign next to the drawing tile. On doing so, the Start page of AutoCAD Electrical will be displayed.
- Using the options in this page, you can start a new drawing as discussed earlier.

DRAWING AREA

The blank area in below **Drawing Tab bar** is called **Drawing Area**. This area is used to create sketches and models. Figure-43 shows the annotated drawing area. You will learn about more options related to drawing area later in this book.

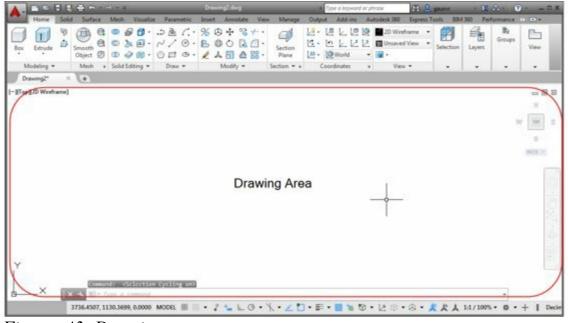


Figure-43. Drawing area

COMMAND WINDOW

This window is used to start new commands or specify the parameters for current running commands. This window is available above the **Bottom bar**; refer to <u>Figure-44</u>.



Figure-44. Command Window

You can press **CTRL+9** to display/hide the command window. The methods to use the command window are given next.

- Click in the **Type a Command** box in the Command window. You are prompted to specify the command.
- Type a few alphabets of your desired command, a list of commands relevant to your specified alphabets will be displayed; refer to <u>Figure-45</u>.

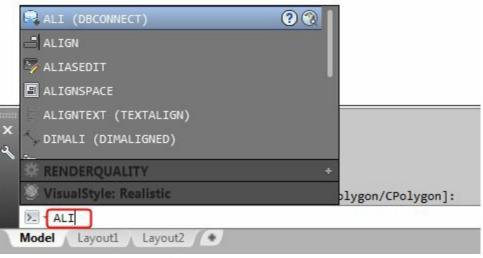


Figure-45. Command list

• Hold the cursor on the name of a command, the description of the command will be displayed; refer to <u>Figure-46</u>.

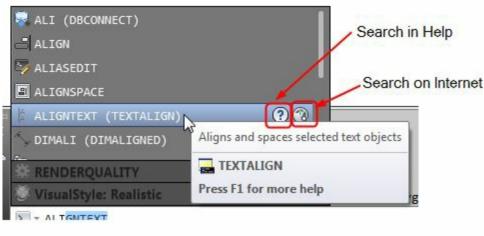


Figure-46. Tool description

- To know more about the highlighted command click on the **Search in Help** or **Search on Internet** button next to the command name.
- You can scroll down in the box to browse the command not visible currently in the box. You can also specify the values of various variables.
- Click on the + sign next to the variables tile in the box; refer to <u>Figure-47</u>. The list of variables related to the specified alphabets will be displayed; refer to <u>Figure-48</u>.

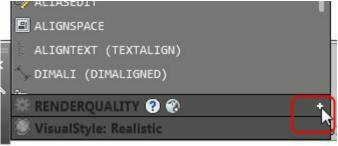


Figure-47. Variables

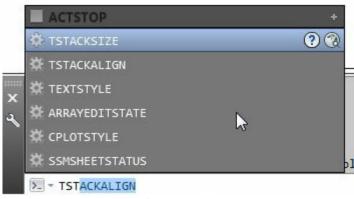


Figure-48. List of variables

• To start any command or specify value of any variable click on it in the box. The respective options will be displayed in the command window and you will be prompted to specify the desired values. For example, type L at the command prompt in the **Command Window** and click on the **Line** tool at the top in the command box. You will be prompted to specify the position of the starting point of the line; refer to Figure-49. You will learn more later in this book. Press **ESC** to exit the tool.

Command Prompt	Specify first point: -2.2483 -0.5391
Dynamic Input	
	corner or [Fence/WPolygon/CPolygon]:
Command: L LINE Specify first point: >>Enter new value for ORT Recuming LINE command.	HOMODE <0>:

Bottom Bar

The tools in the **Bottom Bar** are used to perform various functions like creating a new layout or switching between existing ones, enabling orthogonal movement of cursor and so on; refer to Figure-50. The options in the Bottom Bar are discussed next.

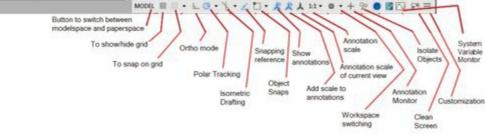


Figure-50. Bottom bar

Modelspace and Paperspace

In a layout, you can switch between paper space and model space by using the **MODEL** button in the Bottom Bar. To display layout or switch back to Model environment, hover the cursor on the File name tile in the Tile bar below **Ribbon**. An interactive box will be displayed showing buttons to switch between Model and Layout environment; refer to Figure-51. Click on the desired button to switch between model and layouts.

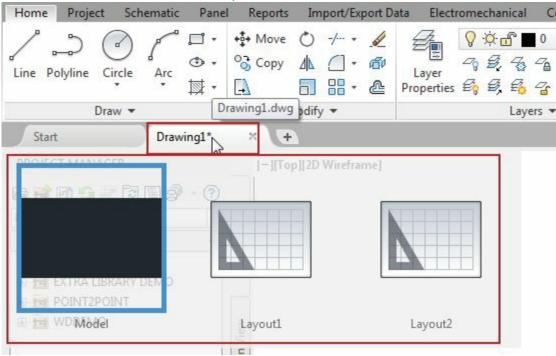


Figure-51. Options to switch model and layout

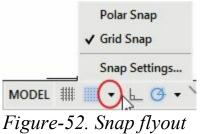
Grid Display

In AutoCAD Electrical, the grid lines are used as reference lines to draw objects. If the **Grid Display** button is chosen, the grid display is on and the grid lines are displayed on the screen. The F7 function key can be used to turn the grid display on or off.

Grid Snap

This option is used to enable snapping of cursor to the grid points as per the specified settings. Snapping is the attraction of cursor to the key points of AutoCAD Electrical. There are two options for specifying grid snap: Grid Snap button and corresponding drop-down. The steps to use Grid Snap are given next.

- Click on the Grid Snap button to enable snapping of cursor to the key points on grid.
- Click on the down arrow next to **Grid Snap** button; a flyout will be displayed as shown in Figure-52.



- Select the **Grid Snap** option if you want to snap the cursor to the grid intersections. Select the **Polar Snap** option from the flyout if you want to snap the cursor to the angular lines.
- Select the Snap Settings option from the flyout to specify the setting related to the selected type of Snap. The Drafting Setting dialog box will be displayed with the Snap and Grid tab selected; refer to <u>Figure-53</u>.

Snap On (F9	0i		📃 <u>G</u> rid On (F7)					
Snap spacing			Grid style					
Sna <u>p</u> X spaci	ng: 0.	5000	Display dotted					
Snap Y spa <u>c</u> i	ng: 0.	5000	2 <u>D</u> model sp Block editor					
Equal X ar	nd Y spacing		Sheet/layou	ıt				
	ing i spaoning		Grid spacing	-				
Polar spacing			Grid X spacing:	C).5000	0		
Polar <u>d</u> istance	e: 0.	5000	Gr <u>i</u> d Y spacing:	C	.5000	000		
Snap type			Major line every	r: 5	5			
Orid sna	30		Grid behavior					
The second	angular snap		Adaptive gri	id				
	etric snap		spacing			rid		
PolarSn	ар		Display grid		its			

Figure-53. Drafting Settings dialog box

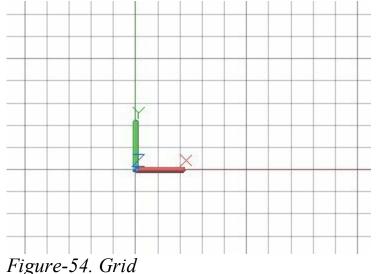
• After specifying the desired setting click on the OK button from the dialog box. The cursor will automatically start snapping to the key points as specified by the settings. Various options in the Drafting Setting dialog box are discussed next.

Drafting Settings dialog box

You can use the **Drafting Settings** dialog box to set the drawing modes such as grid, snap, Object Snap, Polar, Object snap tracking, and Dynamic Input. All these modes help you draw accurately and also increase the drawing speed. You can right-click on the Snap Mode, Grid Display, Ortho Mode, Polar Tracking, Object Snap, 3D Object Snap, Object Snap Tracking, Dynamic Input, Quick Properties, or Selection Cycling button in the Status Bar to display a shortcut menu. In this shortcut menu, choose Settings to display the Drafting Settings dialog box, as shown in Figure-53. This dialog box has seven tabs: **Snap and Grid**, **Polar Tracking**, **Object Snap, 3D Object Snap, 3D Object Snap, 3D Object Snap, 4 Drafting Settings dialog box**, as shown in Figure-53. This dialog box has seven tabs: **Snap and Grid**, **Polar Tracking**, **Object Snap, 3D Object Snap, Dynamic Input**, **Quick Properties**, and **Selection Cycling**. On starting AutoCAD Electrical, these tabs have default settings. You can change them according to your requirements. You will learn about them later in the book.

Snap and Grid

Grid lines are the checked lines on the screen at predefined spacing, see Figure-54. In AutoCAD Electrical, by default, the grids are displayed as checked lines. You can also display the grids as dotted lines, refer to Figure 4-39. To do so, set the 2D model space check box in the **Grid style** area. These dotted lines act as a graph that can be used as reference lines in a drawing. You can change the distance between grid lines as per your requirement. If grid lines are displayed within the drawing limits, it helps to define the working area. The grid also gives you an idea about the size of the drawing objects. To display the grid up to the limits, clear the **Display grid beyond Limits** check box. Now, the grids will be displayed only up to the limits set.



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5			8	1		8	1	3	8	1		8	3	:8	82	1	:	
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5	•	•	8	1		8	13		82	1		8	1	:0	12	3	:	
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÷	•	•	8		•	8		•	39			99÷		•	8			
6	1	20	31	32	24	1	3.	1	12	3.	25	31		53	31		1	
						88.	4		88.	4		8.			8.			
									33									

Figure-55. Dotted grid

Ortho Mode

If the **Ortho Mode** button is chosen, you can draw entities like lines at right angles only. You can use the F8 function key to turn ortho on or off.

Polar Tracking

- Click on the **Polar Tracking** button for polar tracking.
- To set the polar tracking angle, click on the down arrow next to the Polar Tracking button. A list of

options will be displayed; refer to Figure-56.

√ 90 , 180, 270, 360
45 , 90, 135, 180
30 , 60, 90, 120
23, 45, 68, 90
18 , 36, 54, 72
15 , 30, 4 5, 60
10 , 20, 30, 40
5 , 10, 15, 20
Tracking Settings
G()X · Z] ·

Figure-56. Polar tracking angles

- Click on the desired angle option from the list. The cursor will start tracking as per the selected angle option.
- To specify the settings related to **Polar Tracking**, click on the **Tracking Settings** button from the list of options. The **Drafting Settings** dialog box will be displayed with the **Polar Tracking** tab selected; refer to <u>Figure-57</u>.

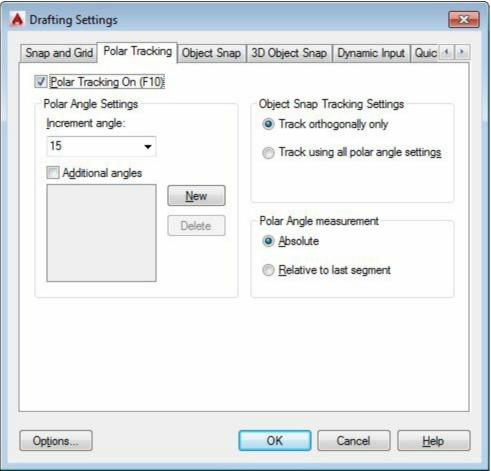


Figure-57. Drafting Settings dialog box with Polar Tracking tab

- Click in the Increment angle drop-down and select the desired angle.
- You can specify more than one angle for tracking. For that, click on the Additional angles check box and click on the New button. You will be asked to specify the additional angle.

- Enter the desired angle in the edit box. You can follow the same procedure to specify up to 10 additional angles.
- Click on the **OK** button to apply the specified settings.

Isometric Drafting

This button is used to enable isometric drafting. The procedure to use this option is given next.

• Click on the **Isometric Drafting** button if from the Bottom bar. The orientation of the cursor will change as per the current isometric plane selected; refer to <u>Figure-58</u>.



Figure-58. Cursor orientation

• To select another isometric plane, click on the down arrow next to the **Isometric Drafting** button. A list of isometric planes will be displayed; refer to <u>Figure-59</u>.



Figure-59. Isometric planes

• Select the desired isometric plane and the cursor will be oriented accordingly.

Annotation buttons

There is a group of four buttons that we call annotation buttons in AutoCAD Electrical; refer to <u>Figure-60</u>.

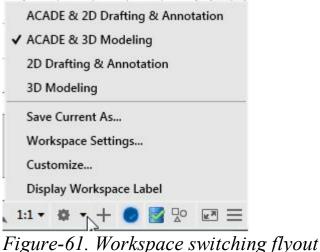
R k k k 1:1 *⋅ Figure-60. Annotation buttons*

These buttons are used to manage annotation and their display in the drawing area. You will learn more about these options later in the book.

Workspace Switching

This flyout is used to switch between various workspaces available in AutoCAD Electrical. A workspace is defined as a customized arrangement of **Ribbon**, toolbars, menus, and window palettes in the AutoCAD Electrical environment. Click on the down arrow next to gear symbol in the Bottom

bar. A flyout is displayed; refer to Figure-61.



There are four default workspaces, ACADE & 2D Drafting & Annotation; ACADE & 3D Modeling; 2D Drafting & Annotation; and 3D Modeling. ACADE & 2D Drafting & Annotation workspace displays the tools and options related to 2D electrical drafting. ACADE & 3D Modeling workspace displays the tools and options related to basic 3D electrical modeling. In this environment, you can generate isometric drawings. The 2D Drafting & Annotation workspace displays the tools to perform 2D drafting in general. The 3D Modeling workspace displays almost all the tools required to perform advanced modeling.

Hardware Acceleration On

This button is used to set the performance of the software to an acceptable level.

Isolate Objects

This button is used to hide or isolate objects from the drawing area. On choosing this button, a flyout will be displayed with two options. Choose the **Isolate Objects** option from this flyout and then select the objects to hide or isolate. To end isolation or display a hidden object, click this button again and choose the **End Object Isolation** option.

Clean Screen

The **Clean Screen** button is at the lower right corner of the screen. This button, when chosen, displays an expanded view of the drawing area by hiding all the toolbars except the command window, Status Bar, and menu bar. The expanded view of the drawing area can also be displayed by choosing **View** > **Clean Screen** from the menu bar or by using the CTRL+0 keys. Choose the **Clean Screen** button again to restore the previous display state.

Customization

This option is used to customize the **Bottom** bar. You can add or remove the buttons from the **Bottom** bar as per the requirement. Click on the **Customization** button at the right corner in the **Bottom** bar. A flyout will display as shown in Figure-62. The options that are displayed with tick mark are available in the **Bottom** bar and other options are not. To display the other options or hide the current

displaying options click on them in the flyout.

Convelimenta	
	ж.
Coordinates	۶

- ✓ Model Space
- ✓ Grid
- ✓ Snap Mode

Infer Constraints

Dynamic Input

- ✓ Ortho Mode
- ✓ Polar Tracking
- ✓ Isometric Drafting
- ✓ Object Snap Tracking
- ✓ 2D Object Snap

LineWeight

Transparency

Selection Cycling

3D Object Snap

Dynamic UCS

Selection Filtering

Gizmo

✓ Annotation Visibility

✓ AutoScale

✓ Annotation Scale

✓ Workspace Switching

✓ Annotation Monitor

Units

Figure-62. Customization flyout

For example, click on the **Units** option from the flyout. It will be added in the **Bottom** bar; refer to <u>Figure-63</u>. Now, you can change the unit style by clicking on this option in the Bottom bar any time while working.

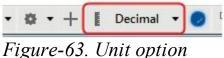


Figure-03. Unit option

System Variable Monitor 🖾

This is one of the enhancement given in 2016 version of AutoCAD based software. Earlier, we used to type system variables and then change their values but in 2016 version, there is an interactive way to change the system variables. Click on the **System Variable Monitor** button from the Bottom bar,

the **System Variable Monitor** dialog box will be displayed as shown in <u>Figure-64</u>. Double click on the value of variable to change it. Note that the warning sign is displayed under Status column for variables whose value is not as preferred.

To add more variables in the list, click on the **Edit List** button from the dialog box and add the variables you want to manage.

Status	System Variable	Preferred	Current	Help	Reset All
	FILEDIA	1	0	0	Edit List
	CMDDIA	1		0	
	HIGHLIGHT	1		0	
	MIRRTEXT	0		0	
	PICKADD	2		0	
	PICKAUTO	5		0	
	PICKFIRST	1		0	
	SDI	0		0	
	SELECTIONPREVIEW	3		0	

Figure-64. System Variable Monitor dialog box

PROJECT MANAGEMENT

CHAPTER 3

Topics Covered

The major topics covered in this chapter are:

- Workflow in AutoCAD Electrical
- Starting a New Project
- Changing Properties of a project
- Adding drawings in the project
- Retagging and renumbering ladders in the drawings of project
- Plotting/publishing project files

WORKFLOW IN AUTOCAD ELECTRICAL

AutoCAD Electrical is a software that can manage a complete project of electrical circuits. But, before we start to learn various tools in AutoCAD Electrical, it is necessary to understand the workflow in AutoCAD Electrical. The workflow in AutoCAD Electrical in given in Figure-1.

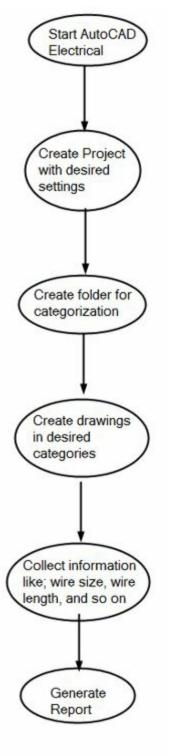


Figure-1. Workflow

We have learned about starting AutoCAD Electrical and now, its time to understand the procedures to manage projects in AutoCAD Electrical.

INITIALIZING PROJECT

As discussed earlier, Project is the categorized combination of various inter-related drawings. In AutoCAD Electrical, there are two major categories of drawings- Schematic diagrams and Panel drawings. Before we create these drawings, let's create a Project file. The procedure to create a project is given next.

• Start AutoCAD Electrical. If you are starting it for the first time then you will get the screen as shown in <u>Figure-2</u>. The marked left area displays the **Project Manager** which is used to manage projects.

New Tab PROJECT MANAGER	AutoCAD Dectrical	 Type a Reyword or phrase 	21 1 Sgala	· X 0· - = = ×
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Detalh ⊮⊠ -	Femplate Provide the set of the set			
,		LEARN <mark>5</mark> CR	EATE	

Figure-2. AutoCAD Electrical initial screen

• Click on the **Project Manager** button in the **Quick Access Toolbar**; refer to <u>Figure-3</u>, if the **Project Manager** is not displayed.

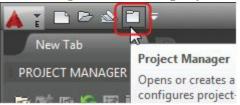


Figure-3. Project Manager button

• To be able to use all the tools in the **Project Manager**, open a drawing file or create a new one. The deactivated tools in the **Project Manager** will become active; refer to <u>Figure-4</u>.

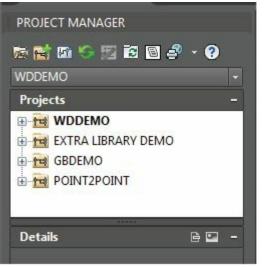


Figure-4. Project Manager

• Click on the **New Project** button in the **Project Manager**. The **Create New Project** dialog box will be displayed; refer to Figure-5.

Create New Project	
Name:	1
Location:	
C:\Users\Gaurav\Documents\AcadE 2016\AeData\proj\	Browse
Create Folder with Project Name C:\Users\Gaurav\Documents\AcadE 2016\AeData\proj\ Copy Settings from Project File:	
C:\Users\Gaurav\Documents\AcadE 2016\AeData\proj\Demo\wddemo.wdp	Browse
Descriptions OK - Properties OK Cancel Help	

Figure-5. Create New Project dialog box

- Specify the name of the Project in the Name edit box of the dialog box.
- Make sure that the **Create Folder with Project Name** check box to create folders with the name of project file.
- Click on the **Browse** button next to **Location** edit box to change the location of the project files. The **Browse For Folder** dialog box will be display; refer to <u>Figure-6</u>.

Browse I	For Folder	
Þ	Google Drive	*
I	InstallAnywhere	
	Links	
4	My Documents	
⊳	🍌 Acade 2015	
4	🍌 Acade 2016	
	🛯 🍌 AeData	
	🖻 🎒 en-US	-
∢	III	•
Make	New Folder OK	Cancel

Figure-6. Browse For Folder dialog box

- Click on the nodes to move into sub-folder and select the desired location.
- Click on the **OK** button to create project files in the desired folder.
- If you want to copy settings from a desired project file then click on the **Browse** button next to **Copy Settings from Project File** edit box. Select the desired file using options in the dialog box displayed.
- Click on the **Descriptions** button to specify the description of the Project. The **Project Description** dialog box will be displayed as shown in <u>Figure-7</u>.

ne1		🚺 in reports
ne2		 🚺 in reports
ne3		 V in reports
ne4		 in reports
ne5		 in reports
ne6		in reports
ne7		 in reports
ne8		 in reports
ne9		in reports
ne10		 in reports
ne11		in reports
ne12		 in reports

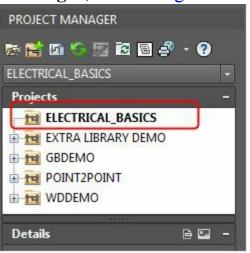
Figure-7. Project Description dialog box

- Specify the descriptions in the lines one by one. If you want to include any of the description line in your report then click on the **in reports** check box next that line.
- Click on the **OK** button to save the descriptions.
- Click on the OK button to create the Project. If you want to specify the properties of the project while creating, then click on the OK Properties button. The Project Properties dialog box will be displayed; refer to Figure-8.

ject Settings Components Wire	Numbers Cross-	References	Styles	Drawing Forma	at
Project: C:\Users\Gaurav\Docum	nents\AcadE 2016	AeData\pro	Electric	al_Basics\Elect	trical_Basics.wdp
Library and Icon Menu Paths					
🕀 🕀 Schematic Libraries					Add
	File				
🖶 👼 Panel Footprint Librarie	s				Browse
🗄 🖳 🎦 Panel Icon Menu File					Remove
					Move Up
					Move Down
					Default
Catalog Lookup File Preference					
 Catalog Lookup Hiereference Use component specific table Always use MISC_CAT table Use MISC_CAT table only if of 			ther File. ot exist	(none def	ined)
 Use component specific table Always use MISC_CAT table Use MISC_CAT table only if of 				(none def	ined)
 Use component specific table Always use MISC_CAT table 	component specific	table does n	ot exist	(none def	
 Use component specific table Always use MISC_CAT table Use MISC_CAT table only if of 	component specific	table does n Number / Wi	ot exist		
 Use component specific table Always use MISC_CAT table Use MISC_CAT table only if only Options 	Tag / Wire	table does n Number / Wi	ot exist re Seque		
 Use component specific table Always use MISC_CAT table Use MISC_CAT table only if only Options 	Tag / Wire No Project Electrical Co	table does n Number / Wi Default	ot exist re Seque	nce Sort Order	
 Use component specific table Always use MISC_CAT table Use MISC_CAT table only if only Options 	Tag / Wire No Project Electrical Co	table does n Number / Wi Default ode Standard	ot exist re Seque	nce Sort Order	

Figure-8. Project Properties dialog box

- Specify the desired settings and click on the **OK** button from the dialog box to apply settings. Note that you will learn about project properties in the next section.
- As you click on the **OK** button, the project name is added in the Project list in the **Project Manager**; refer to <u>Figure-9</u>.



PROJECT PROPERTIES

Project Properties are the key players for any project whether it is for AutoCAD Electrical or any other related software. Follow the procedure given next to change the properties of the project.

- Right-click on the name of the project in the **Project Manager** whose properties are need to be changed. A shortcut menu will be displayed; refer to <u>Figure-10</u>.
- Click on the **Properties** button in shortcut menu. The **Project Properties** dialog box will be displayed as shown in Figure-8.

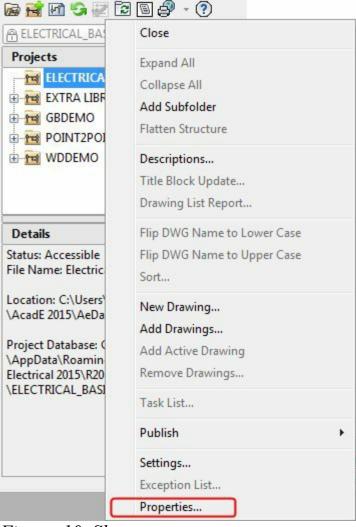


Figure-10. Shortcut menu

Project Settings tab

The options in this area are used to specify settings for the current project file. Various options in this tab are discussed next.

Library Icon Menu Paths area

- The first area in the dialog box is **Library Icon Menu Paths**. The options in this area are used to specify the directories containing symbols and icons required in Electrical drawings.
- To add any new library, click on the Add button from the dialog box. A new link will be added

under the Schematic Libraries node. Specify the location of the directory that contains the symbols.

• Similarly, you can add more files for Icons and panels.

Catalog Lookup File Preference area

- Options in the **Catalog Lookup File Preference** area are used to set the database of files that are to be included in the library. If you add any new symbol or icon then make sure that you have entered it in the database file used in this section.
- To set a user defined database, click on the **Other File** button in this area. The **Catalog Lookup File** dialog box will be displayed as shown in <u>Figure-11</u>.

			Lange of the second sec
(default)			
lary catalog lookup file	for this project		
			Browse
ОК	Cancel	Help	
	_	lary catalog lookup file for this project	lary catalog lookup file for this project

Figure-11. Catalog Lookup File dialog box

• By default system uses the default Lookup file available with the library. But if you need additional file for look up then click on the **Optional : Define a secondary catalog lookup file for this project** radio button and then click on the **Browse** button. The **Secondary Catalog Lookup File** dialog box will be displayed; refer to Figure-12.

🔥 Secondary Catalog Lookup File		×
Look in: 🎉 Catalogs	- 🕝 🤌 📂 🖽-	
Name	Date modified	Ту
ace_electrical_standards	19-01-2014 21:04	М
🔊 default_cat	11-04-2014 14:23	M
footprint_lookup	17-04-2014 14:04	M
🖻 schematic_lookup	14-04-2010 15:39	М
🕗 wd_lang1	10-12-2012 21:37	M
wd_picklist	14-04-2010 15:39	М
· [Þ
File <u>n</u> ame:		
Files of type:	▼ Cance	el
	Locate Find File	a

Figure-12. Secondary Catalog Lookup File dialog box

- Select the desired database file and click on the **Open** button. The location of file will be added in the edit box.
- Click on the **OK** button from the dialog box.

Options area

- Select the **Real time error checking** check box to allow the system to check for some basic errors in the drawing.
- The **Tag/Wire Number Sort Order** drop-down is used to specify the order in which the Tags/wire numbers will be arranged in the Project. There are many options in this drop-down to modify the order; refer to Figure-13.

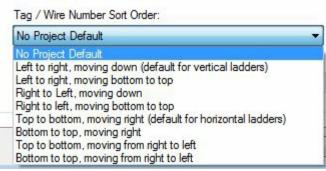


Figure-13. Sort Order drop-down

• Electrical Code Standard drop-down is used to set the standard for electrical codes.

Components tab

The options in the Components tab are used to manage properties of the components; refer to Figure-14. Various options in the **Components** tab of the dialog box are discussed next.

oject Settings	Components	Wire Numbers	Cross-References	Styles Dr	awing Format	
Project: C:\	Users\Gaurav\	Documents \Acad	E 2016\AeData\pro	j\Electrical_	Basics\Electrical	_Basics.wdp
Componer	nt TAG Format					
Tag Format: %F%N				a sector la	1	
101 1014			0 56	quential:		
Search	for PLC I/O add	dress on insert	Lin	e Reference	Suffix S	etup
Componer	nt TAG Options					
Combin	ed Installation/l	Location tag mod	e			
Supp	press dash whe	n first character o	f tag			
E Form	at Installation/l	ocation into tag				
🗆 S	uppress Installa	tion/Location in t	ag when match drav	ving default		
Supp	oress Installation	n/Location in tag	on reports			
			cation with drawing o	efault or last	used	
C openna			contracting (
📬 Componer	nt Options					
Descrip	tion text upper	0366				
	umbering	10				

Figure-14. Components tab Project Properties dialog box

Component TAG Format area

- The **Tag Format** edit box is used to set the format for tag assigned to various components. By default, %F%N is specified in the **Tag Format** edit box. %F is used to assign Family number to tag. %N is used to assign serial number to the tag. Similarly, %S is used to assign Sheet number and %D is used to assign Drawing number in the tag.
- The Suffix Setup button is used to manage suffix for component tag. On clicking this button, the Suffix List for Reference-Based Component Tags dialog box will be displayed; refer to Figure-15. These suffix are automatically applied in case of duplicates in component tags.

Suffix List for Reference-Based Component Tags	×
List of suffix characters for duplicate family components on the same line reference or in same zone (to keep tags unique).	
Note: suffix is added at the end of the component tag. To add inside the tag, use code "%X" in the Configuration component Examples (using "A" as suffix): "%N-%F" or "%%N-%F%X" = suffix always at end: "101-CRA" "%N%X-%F" = add to number, before family code: "101A-CR"	ent tag format.
A B C D E	F G H J
1st 2nd 3rd 4th 5th 6th	7th 8th 9th 10th
Standard defaults (ex: PB's on reference "100") A,B,C ex: PB100, PB100A, PB100B, A,B,C ex: PB100A, PB100B, PB100C, 1,2,3 ex: PB1001, PB1002, PB1003, -1,-2,-3ex: PB100-1,PB100-2,PB100-3, 	$ \begin{array}{c ccccccccccccccccccccccccccccccccccc$
OK	el

Figure-15. Suffix List for Reference-Based Component Tags dialog box

- Select the **Sequential** radio button if you do not want to use the suffix. In this case, successive numbers will be added in the duplicate component tags.
- If you are working with PLC as in the later chapter, then select the Search for PLC I/O address on insert check to force system for checking the assigned PLC I/O addresses.

Component TAG Options area

- Select the **Combined Installation/Location tag mode** check box to use tag created by combining installation/location code. Once you select this check box, the check boxes related to this option will become active. You can use these activated check boxes to further refine the Installation/Location tag mode. You will learn about Installation code and Location code later in the book.
- Select the Upon insert: automatic fill installation/Location with drawing default or last used check box to insert the default installation/location code with the component tag.

Component Options area

- Select the **Description text upper case** check box to make the description text uppercase in drawing.
- Click on the **Item Numbering** button to setup the item numbering mode for the current project. On clicking this button, the **Item Numbering Setup** dialog box is displayed; refer to Figure-16. If the **Accumulate Project Wide** radio button is selected in the **Item Numbering Mode** area of the dialog box then the item numbering continues from one drawing to another drawing in the project. If you select the **Reset with Each Drawing** radio button then the numbering restarts from **1** in the each drawing with its respective suffix/prefix.

Item Numbering Setup	×
Item Numbering Mode Accumulate Project Wide Reset with Each Drawing	
Item Assignments Per-Component Basis Per-Part Number Basis (excluding ASSYCODE Combinations) 	
OK Cancel Help	

Figure-16. Item Numbering Setup dialog box

• If you select the **Per-Component Basis** radio button from the **Item Assignments** area of the dialog box then Item number is assigned to each component in the catalogue during insertion in the drawing. If you select the **Per -Part Number Basis** radio button then the Item number is assigned for each part number of the component in the catalogue. Note that a component can have more the one part numbers in the catalogue.

Wire Numbers tab

The options in the Wire Numbers tab are used to set the numbering system for wires in the project; refer to <u>Figure-17</u>. The options in this tab are discussed next.

ject Settings	Components	Wire Numbers	Cross-References	Styles D	Prawing Format	
Project: C:\	Jsers\Gaurav\	Documents Acad	E 2016\AeData\pro	j\Electrical	_Basics\Electrical_Ba	asics.wdp
Wire Num	per Format					
Format:			O Se	quential:	1	
No.N			In	crement:	1	
Search f	for PLC 1/O add	fress on insert	 Lin 	e Referenc	e Suffix Setup	p
Wire Num	per Options					
Based o	n Wire Layer		Layer Setu	ıp		
Based o	n Terminal Sym	bol Location				
Hidden	on Wire Netwo	rk with Terminal (Displaying Wire Numl	her		
			spidying this ham			
5.	Wire Basis					
Exclude	· .					
	Number Placer	mant				
Nou Mire						
New Wire		ile it	Centered	Offeet	Distance	
Above	Wire		Offset	Offset	Distance:	1
 Above In-Line 	Wire Gap	Setup	Offset		Distance:	
Above	Wire Gap				Distance: 123	
 Above In-Line Below N 	Wire Gap Wire		Offset		Distance: 123	
Above Above In-Line Below \	Wire Gap Wire	Setup	Offset		Distance: 123	
Above Above In-Line Below \	Wire Gap Wire	Setup	Offset		Distance: 123	
Above Above In-Line Below \	Wire Gap Wire	Setup	Offset		Distance: 123	

Figure-17. Wire Numbers tab in Project Properties dialog box

Wire Number Format area

• The Format edit box in the Wire Number Format area is used to set the format for wire numbering in project. You can add any suffix or prefix to %N for making wire numbering unique for your project. The other options in this area work in the same way as they do for components in the Components tab of the dialog box.

Wire Number Options area

• Select the **Based on Wire Layer** check box to make the wire numbering based on the wire layers. On selecting this check box, the **Layer Setup** button becomes active. Click on this button to display the **Layer Setup** dialog box; refer to <u>Figure-18</u>. In this dialog box, you can add, remove, or update the wire layer for wire numbering.

Wire Number Format	Sequential start %N	Suffix List	
Wire laye	rname		
(wild card	is OK)		
Wire	number format for layer		
Starting wire sequence (for this layer (Sequential t	%N part) tag mode only)		
	number suffix list for layer		
	Wire layer (wild card Wire Starting wire sequence (*	Add Update Delete Wire layer name (wild cards OK) Wire number format for layer Wire number format for layer Starting wire sequence (%N part) for this layer (Sequential tag mode only)	Wire layer name (wild cards OK) Wire number format for layer Starting wire sequence (%N part)

Figure-18. Assign Wire Numbering Fornats by Wire Layer dialog box

- Select the **Based on Terminal Symbol Location** check box to make the wire numbering dependent on the terminal symbols. For example, a wire network starts at line reference 100 and drops down and over on line reference 103. If a schematic terminal symbol carries the WIRENO attribute located on line reference 103, and this option is enabled, AutoCAD Electrical calculates a reference-based wire number using 103 instead of 100. If multiple wire number terminals exist on this network, the line reference value of the upper left-most terminal is used.
- Select the **Hidden on Wire Network with Terminal Displaying Wire Number** check box to make the wire numbering hidden in the Wire network when the wire number is linked with terminal location.
- Select the **On per Wire Basis** check box to make the wire numbering on per wire basis rather then the wire network.
- The **Exclude** check box is used to exclude the wire numbering of the specified range from the wire numbering of the network. On selecting this check box, the edit box next to it becomes active and you can specify the range of the wire numbering like, 200-500 or 2;4;5;23.

New Wire Numbering Placement area

The options in this area are used to define the placement position for wire numbering with respect to wire. The options are discussed next.

- Select the **Above Wire** radio button to place the wire numbering on the wire. This is the default option for the wire numbering placement.
- Select the **In-Line** radio button to place the wire numbering in line with the wire. On selecting this radio button the **Gap Setup** button becomes active. Click on this button to specify the gap between the wire number and wire ends; refer to <u>Figure-19</u>. After specifying the values, click on the **OK** button from the dialog box displayed to apply the gap.

0.0	Blank width adjustment step increment (0.0 = continuous)
	(u.u = continuous)
0.0	Total gap width's lower limit (0.0 = no lower limit)
).0

Figure-19. In-Line Wire Label Gap Setup dialog box

• Click on the **Below wire** radio button to place the wire numbering below the wire. On selecting this radio button, the options related to leaders will become active. Select the desired option from the **Leaders** drop-down to specify the type of leader to be used while placing the wire number below the wire; refer to Figure-20.

O Above Wire		Centered	Offset Distance:	
⊚ In-Line	Gap Setup	Offset	0.0	
Below Wire		Leaders:		
		As Required	- 123	
		As Required		
Wire Type		Always Never		

Figure-20. Leaders drop-down

- Click on the **Centered** radio button to make the wiring horizontally centered in the wire ends.
- Select the **Offset** radio button to specify the offset distance of the wire number from one of the end point of the wire.

Wire Type area

There is only one option in this area, Rename User Columns button. This button is used to rename the user columns. Note that the user columns are used to specify user defined parameters. Like, you can make a user defined column with the name location of manufacturer.

Cross-References tab

Options in this tab are used to manage cross-referencing of the project files. These options are discussed next.

Cross-Reference Format area

There are two edit boxes in this area: **Same Drawing** and **Between Drawings** edit boxes. Specify the desired formate for both the edit boxes.

Cross-Reference Options area

- Select the **Real time signal and contact cross-referencing between drawings** check box to make the real-time changes in the drawing. Means, if there is some change in an object being cross-referenced then the same changes will be reflected in the corresponding drawing.
- Select the **Peer to Peer** check box to make cross-referencing between components of different categories in the same drawing.
- The **Suppress Installation/Location codes when matching the drawing default** check box does the same as the name suggests. Selecting this check box suppresses the installation codes and locations codes while matching the drawing defaults.

Similarly, options in the **Component Cross-reference Display** area are used to modify the display of component cross-references.

Styles tab

The options in the **Styles** tab are used to change various styles related to Wiring, Arrow, PLCs and so on; refer to <u>Figure-21</u>. The options in this tab are discussed next.

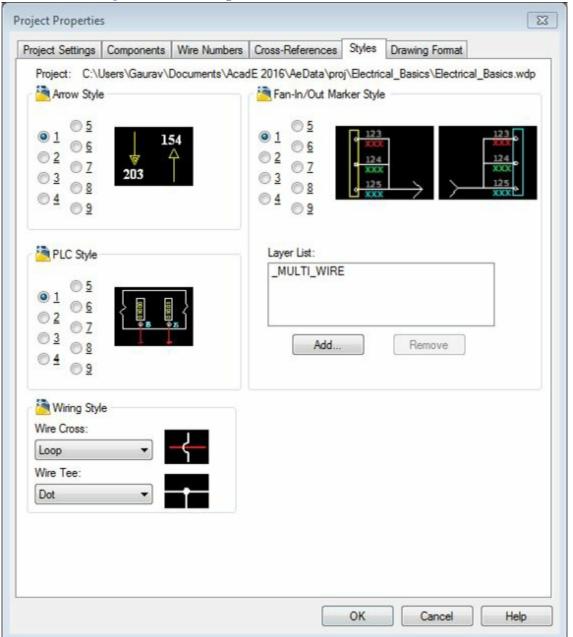


Figure-21. Styles tab of Project Properties dialog box

- Select the desired radio button from the **Arrow style** area of the dialog box to change the arrow style.
- Similarly, you can change the PLC style and Fan In/Out Marker style.
- Select the desired option from the **Wire Cross** drop-down to change the way wire crossing should be displayed in drawing. Note that preview is also displayed on selecting an option from the drop-down.
- Similarly, you can select the desired option from the **Wire Tee** drop-down to change the Wire tee formation in drawing.

Drawing Format tab

The options in the **Drawing Format** tab are used to manage some of the basic parameters of the drawing like default shape and size of ladders, Feature scale, and so on. These options are discussed next.

- Select the **Horizontal** or **Vertical** radio button from the **Ladder Defaults** area to change the ladder to horizontal or vertical, respectively.
- Click in the **Spacing** edit box and change the distance between two consecutive wires in the ladder.
- Similarly, you can setup the other parameters in this tab.

OPENING A PROJECT FILE

The procedure to open a project file is similar to open a drawing file, which is given next.

• Click on the **Open Project** button in from the **Project Manager**. The **Select Project File** dialog box will be displayed as shown in Figure-22.

Look in:	Bectrical	_Basics	•	- 📮 🔍 🗶 🗖	Views	 Tool
0	Name	*	Date modified	Туре	Size	
todesk 350 History Documents Favortes Desktop	Electrica	al_Basics	17-04-2014 15:23	WDP File		2 KB
	File <u>n</u> ame:	T			•	Open

Figure-22. Select Project File dialog box

• Browse to the location of the project file and double-click on the file. The project file will open and display in the **Project Manager**.

NEW DRAWING IN A PROJECT

Creation of a new drawing is discussed earlier. At this stage, we will learn to create drawings in a project (Although earlier also, unknowingly we were creating drawing in a project). The procedure to create a drawing file in a project is given next.

• Click on the New Drawing button in from the Project Manager. The Create New Drawing dialog box will be displayed as shown in Figure-23.

Drawing File				
Name:				
Template:				Browse
For Referen	ce Only			
Location:	C:\Users\Gaurav\Documents\	AcadE 2015\AeData	proj\Electrical_Ba	Browse
C:\Users\	aurav\Documents\AcadE 2015	VAeData\proj\Electrica	al_Basics	
Description 1:	1		.]
Description 2:			•	
Description 3:				1
IEC - Style Desig Project Code:	nators		-	
	nators		1	
	nators]	
Project Code: Installation Code	nators		Drawing	Project
Project Code:	nators			
Project Code: Installation Code	nators		Drawing Drawing	Project
Project Code: Installation Code	nators			
Project Code: Installation Code Location Code:	nators	Section:		

Figure-23. Create New Drawing dialog box

- Click in the Name edit box in the dialog box and specify the name of the drawing file.
- Click on the **Browse** button to select a file as template. The **Select template** dialog box will be displayed; refer to Figure-24.

Look in:	Template			٢,	@ XI		Views	•	Tools	
\sim	Name	×	1	-	Preview					
	PTWTem	plates	1							
utodesk 360	J. SheetSets		1							
æ.	🖬 acad -Na	med Plot Styles	(
	🚮 acad -Na	med Plot Styles3D	(5						
History	🛅 acad		(2						
B	ACAD_EL		(2						
E	ACAD_EL	ECTRICAL_IEC	(2						
Documents	🛅 acad3D		(2						
		Named Plot Styles	(2						
1 Alian	annes.	Named Plot Styles3D	([
Favortes	acadiso	25	(
-	acadiso3	Contraction of the second seco	(
	and a second sec	I_A(Landscape)_Color	(
Desktop	and a second sec	I_A(Landscape)_Named	(
		I_A(Portrait)_Color								
	ACE_ANS	I_A(Portrait)_Named		-						
	File name:						•	0	pen	
	Files of type:	Drawing Template (*.dwt)		_		_	-	(Cancel	ī

Figure-24. Select Template dialog box

- Select the desired template for your drawing. You can conclude the template style of default templates from their names in the list.
- After selecting the desired template, click on the Open button from the dialog box. Path of the template will be added in the **Template** edit box.
- Click in the **Description 1**, **Description 2**, and **Description 3** edit boxes one by one and specify the description as required.

The options in the IEC - Style Designators area are used to specify the identifiers for the project.

- Click in the **Project Code** edit box and specify the identifier code for the project.
- Similarly, you can specify **Installation Code** and **Location Code**. Note that you can use the codes of the earlier created drawings or projects by selecting the buttons corresponding to them.
- Also, you can specify the Sheet, Drawing, Section and Sub-Section numbers for the current drawing.
- All the parameters starting from **Project Code** to **Sub-Section** number are used as meta-data for the drawing and later help to identify the drawing.
- Click on the **OK** button. You are asked to set the default settings of the project or not. Click on **Yes** or **No** as desired. The drawing will be created.

REFRESH

The **Refresh** button is used to refresh the files in the Project. If you have performed any change in any drawing of the project then click on this button from the **Project Manager**, the information in the

Project Manager will get updated.

PROJECT TASK LIST

The **Project Task List** button is used to display the tasks that are need to be performed in the current project. Click on this button, the list of tasks will be displayed.

PROJECT WIDE UPDATE OR RETAG

The **Project Wide Update/Retag** button is used to update or retag component tags, wire numbers, cross-references, and so on. The procedure to update or retag these parameters is given next.

• Click on the **Project Wide Update/Retag** button from the **Project Manager**. The **Project-Wide Update or Retag** dialog box will be displayed as shown in <u>Figure-25</u>.

Component Retag		Sheet (%S value)	
			-
Component Cross-Reference Update		Resequence - Start with	1
Wire Number and Signal Tag/Retag	Setup	🗇 Bump - Up/Down by	0
		(Use ''-'' to bu	mp down)
Ladder References		Drawing (%D value)	
Resequence	Setup	Other Configuration Settings	Setup
Bump - Up/Down by	0	Title Block Update	Setup
(Use "." to bump	down)		oorap

Figure-25. Project Wide Update or Retag

- Click on the **Component Retag** check box to specify tags of the non-fixed components while adding drawings in the project.
- Select the **Component Cross-Reference Update** check box to update all the component cross-references of the drawing while adding them in the project.
- Select the Wire Number and Signal Tag/Retag check box, the Setup button next to the selected check box will become active.
- Click on the **Setup** button to change the settings for wire numbers and signal tags. The **Wire Tagging (Project-Wide)** dialog box will be displayed; refer to <u>Figure-26</u>.

/ire Tagging (Project-wide)	<u></u>
Wire tag mode	
Sequential (1st tag defined for each	drawing)
Sequential (consecutive drawing to	drawing) 1 Start
Reference-based tags	
To do	Format override
Tag new/unnumbered only	%N Wire tag format
Tag/retag all	Use wire layer format overrides
Cross-reference Signals	Setup
☑ Freshen database (for Signals)	Insert as Fixed
OK	Cancel <u>H</u> elp

Figure-26. Wire Tagging dialog box

- Using the options in the dialog box you can update the tags of wires and signals. You will learn more about these options later in the book.
- Select the Ladder References check box to renumber the ladders in the circuits. On selecting this check box, the two radio buttons below it will become active.
- Select the **Resequence** radio button and click on the **Setup** button. The **Renumber Ladders** dialog box will be displayed.
- Specify the starting number of the ladders in the edit box displayed at the top in the dialog box. This numbering will be applicable to the first drawing in the project and similarly, you can specify the starting number of ladder for second onwards drawings by selecting the desired radio button in the dialog box.
- Click on the OK button from the dialog box to renumber the ladders in the current project.
- Select the **Bump Up/Down by** radio button and specify the value in the edit box next to the radio button to increase the ladder numbers by specified value. Specify the negative value to decrease the ladder numbers.
- Select the desired check box from the right area of the dialog box and specify the related values.
- Click on the **OK** button from the dialog box. The **Select Drawings to Process** dialog box will be displayed refer to Figure-27.

				Orawing Obs	cription
ef	Subfolder	Section St	ub-Section	Project Drawing List	
		Main 5		C:\Users\Gaurav\Do\proj\Bectrical_Basics\Sta	iting section dw
			III		
			1.17		
Do A	Process	Reset	1	n-select by Section/sub-section	by Subfolder
	-				
f	Subfolder	Section St	ub-Section	Project Drawing List	

Figure-27. Select Drawings to Process dialog box

- Select the drawings from the list by holding the CTRL key and then click on the **Process** button to include the drawings for applying the settings we have specified earlier. The drawings will come in the bottom list.
- You can include all the drawings by clicking on the **Do All** button from the dialog box.
- Click on the **OK** button from the dialog box, the modified settings will be applied to the selected drawings.

DRAWING LIST DISPLAY CONFIGURATION

This button is used to configure the details of the drawings that are to be displayed in the **Project Manager** with the name of the drawings. The procedure to use this option is given next.

• Click on the **Drawing List Display Configuration** button. The **Drawing List Display Configuration** dialog box will be displayed as shown in <u>Figure-28</u>.

)isplay Options:			Current Display Order
nstallation Code (%l) Location Code (%L) Section Sub Section Sheet Number (%S) Drawing Number (%D) Drawing Description 1 Drawing Description 2	* III •	>> Al >> << << Al	File Name
Separator Value			Move Up
Always show selection high Show selection highlight on	- T- 1		Move Down

Figure-28. Drawing List Display Configuration

- Select the details from the left list box that you want to display in **Project Manager** one by one.
- Press the **Include** button **button** from the dialog box. The details will be added in the right list box.
- You can include all the details by clicking on the All>> button.
- To exclude any detail or all the details, click on the << or <<All button respectively.
- After selecting the desired details, click on the **OK** button from the dialog box. The details will be displayed with the name of the drawing in the **Project Manager**.

PLOTTING AND PUBLISHING

After creating any drawing in the software, the next step is to take a hardcopy or distribution media by which the drawing can be shared with other concerned people. There are four tools to plot or publish drawings of a project: **Plot Project**, **Publish to WEB**, **Publish to PDF/DWF/DWFx**, and **ZIP Project**; refer to Figure-29. These tools are one by one discussed next.

9	- 🧿
	Plot Project
	Publish to WEB
	Publish to PDF/DWF/DWFx
	ZIP Project
_	

Figure-29. Tools to plot publish

Plot Project

The **Plot Project** tool is used to plot drawings of the project on the paper by using your printing/plotting device. The steps to use this tool are given next.

- Click on the **Plot Project** tool from the **Project Manager**. The **Select Drawings to Process** dialog box will be displayed; refer to Figure-27.
- Include the drawings that you want to plot by using the **Process** button after selecting them in the list.

• Click on the **OK** button from the **Select Drawings to Process** dialog box. The **Batch Plotting Options and Order** dialog box will be displayed; refer to <u>Figure-30</u>.

Run a pre-plot command script file C:/Users/Gaurav/AppData/Roaming/Autodesk/Auti Run a post-plot command script file C:/Users/Gaurav/AppData/Roaming/Autodesk/Auti Output device name Use plot configuration (.pc3) Use layout tab's default Detailed Plot Configuration mode OFF Optional Page Setup name Pick list (from active drawing) Plot to file	plot	Pick list (from active drawing)	
C:/Users/Gaurav/AppData/Roaming/Autodesk/Aut) Run a post-plot command script file C:/Users/Gaurav/AppData/Roaming/Autodesk/Aut) Output device name Use plot configuration (.pc3) Use layout tab's default Detailed Plot Configuration mode OFF Optional Page Setup name Pick list (from active drawing) Plot to file Yes: plot to= Enter plot folder or leave blank for default to drawing's folder.		Model	•
C:/Users/Gaurav/AppData/Roaming/Autodesk/Aut) Run a post-plot command script file C:/Users/Gaurav/AppData/Roaming/Autodesk/Aut) Output device name Use plot configuration (.pc3) Use layout tab's default Detailed Plot Configuration mode OFF Optional Page Setup name Pick list (from active drawing) Plot to file Yes: plot to= Enter plot folder or leave blank for default to drawing's folder.	r each drawing		100285
Run a post-plot command script file C:/Users/Gaurav/AppData/Roaming/Autodesk/Auti Output device name Use plot configuration (.pc3) Use layout tab's default Detailed Plot Configuration mode OFF Optional Page Setup name Pick list (from active drawing) Plot to file Yes: plot to = Enter plot folder or leave blank for default to drawing's folder.	plot command script file		
C:/Users/Gaurav/AppData/Roaming/Autodesk/Auti Output device name Use plot configuration (.pc3) Image: Use layout tab's default Detailed Plot Configuration mode OFF Optional Page Setup name Pick list (from active drawing) Plot to file Image: Plot to file Image: Plot folder or leave blank for default to drawing's folder.	C:/Users/Gaurav/Ap	pData/Roaming/Autodesk/Auto	Browse
Output device name Output device name Use plot configuration (.pc3) Image: Setup configuration mode Optional Page Setup name Pick list (from active drawing) Image: Plot to file Image: Plot folder or leave blank for default to drawing's folder.	t-plot command script file		
 Use plot configuration (pc3) Use layout tab's default Detailed Plot Configuration mode OFF Optional Page Setup name Pick list (from active drawing) Plot to file Plot to file Enter plot folder or leave blank for default to drawing's folder. 	C:/Users/Gaurav/Ap	pData/Roaming/Autodesk/Auto	Browse
Use layout tab's default Detailed Plot Configuration mode OFF Optional Page Setup name Pick list (from active drawing) Plot to file Yes: plot to= Enter plot folder or leave blank for default to drawing's folder.	e name		
Use layout tab's default Detailed Plot Configuration mode OFF Optional Page Setup name Pick list (from active drawing) Plot to file Yes: plot to= Enter plot folder or leave blank for default to drawing's folder.	onfiguration (.pc3)		Browse
Detailed Plot Configuration mode OFF Optional Page Setup name Pick list (from active drawing) Plot to file Image: Setup name Plot to file Image: Setup name Image: Setup name Image: Setup name Plot to file Image: Setup name Image: Setup name Image: Setup name Plot to file Image: Setup name Image: Setup name Image: Setup name Plot to file Image: Setup name Image: Setup name Image: Setup name Plot to file Image: Setup name Image: Setup name Image: Setup name Plot to file Image: Setup name Image: Setup name Image: Setup name Plot to file Image: Setup name Image: Setup name Image: Setup name Image: Setup name Image: Setup name Plot to file Image: Setup name Image: Setup name Image: Setup name <t< td=""><td></td><td></td><td></td></t<>			
Optional Page Setup name Pick list (from active drawing) Plot to file Image: Plot folder or leave blank for default to drawing's folder.			
Plot to file Yes: plot to= Enter plot folder or leave blank for default to drawing's folder.	led Plot Configuration mode	OFF	
Plot to file Yes: plot to= Enter plot folder or leave blank for default to drawing's folder.	Setup name	Pick list (from active drawing)	
Enter plot folder or leave blank for default to drawing's folder.		(_
Enter plot folder or leave blank for default to drawing's folder.			•
Enter plot folder or leave blank for default to drawing's folder.			
	o=		
Order		to drawing's folder.	
Plot in normal sequence or in reverse order		to drawing's folder.	
OK OK-Reverse Cancel Help	ler or leave blank for default		

Figure-30. Batch Plotting Options and Order dialog box

• Click on the **Detailed Plot Configuration mode** button to specify settings for the plot. The **Detailed Plot Configuration Option** dialog box will be displayed; refer to <u>Figure-31</u>.

reconcer rot com	figuration Option	1		×
Orientation	Plot area	Plot sca	ale	
🧿 defau <mark>l</mark> t	Plot Extents	Plot t	to Fit	
Portrait	Plot Display	Plot :	scale = 1	
Landscape	Plot Limits			
Paper size				
Use driver's def	ault			
Pick from gener	ric list			
Misc settings				
Upside down	Offset	Lineweights	Remove Hidden	
Ø default	🔘 default	efault	efault	
🔘 No	0,0	🔘 None	🔘 No	
O Yes	Centered	🔘 Yes	O Yes	
Use a Plot Style fi	ile?			
No				
O Use plot style	(cth)			
O coo plot cific	()			Browse
				browse

Figure-31. Detailed Plot Configuration Option dialog box

- Modify the desired settings of plotting like orientation of page, plot area, paper size and so on using the options in this dialog box.
- To select the desired paper size, click on the **Pick from generic list** radio button in the **Papersize** area. The dialog box with various paper sizes will be displayed; refer to <u>Figure-32</u>.
- Select the desired paper size and click on the OK button from the dialog box.
- Next, click on the **On** button from the **Detailed Plot Configuration Option** dialog box.

C:\Users\Gaurav\\Support\generic_papersizes.txt	×
Select a paper size from the generic list below. Note: if the paper size you select is not supported by the current Plotter Device Output driver, then batch plotting in AutoCAD Electrical will fail.	
=== HP Laserjet 5 === User-defined size Envelope Monarch 3 7/8 x 7 1/2 in Envelope C5 162 x 229 mm Envelope DL 110 x 220 mm Envelope #10 4 1/8 x 9 1/2 in A5 148 x 210 mm A4 210 x 297 mm Executive 7 1/4 x 10 1/2 in Legal 8 1/2 x 14 in Letter 8 1/2 x 11 in JIS B4 (257.00 x 364.00 MM) JIS B5 (182.00 x 257.00 MM) ISO A4 (210.00 x 297.00 MM) Business Legal (8.50 x 14.00 Inches) Business Letter (8.50 x 11.00 Inches) Business Executive (7.25 x 10.50 Inches) ANSI A (8.50 x 11.00 Inches) Editor Note: f you edit the "generic_papersizes.txt" list, then "saveas" to file name "user_papersizes.txt". OK Cancel	

Figure-32. Paper sizes

• Click on the **OK** button from the **Batch Plotting Options and Order** dialog box. The drawings of the project will be plotted by the assigned plotter.

Publish to WEB

This tool is used to publish drawings on the website. The procedure to use this tool is given next.

• Click on the **Publish to WEB** tool from the **Plot/Publish** drop-down in the **Project Manager**. The **Publish to WEB** dialog box will be displayed as shown in <u>Figure-33</u>.

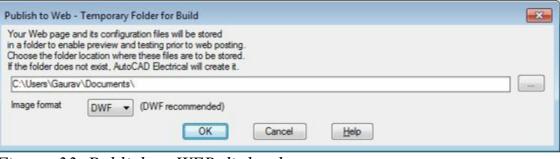


Figure-33. Publish to WEB dialog box

• The edit box in this dialog box will be used to specify the storage location of web files of the drawing. Click on the Browse button — next to the edit box. The **Browse For Folder** dialog box will be displayed; refer to Figure-34.

Browse For Folder	
Digital Google Drive	
🌗 InstallAnywhere	
🗽 Links	
4 📗 My Documents	
Acade 2015	
4 📙 Acade 2016	
🔺 🍌 AeData	
Þ 퉲 en-US	-
< [III	•

Figure-34. Browse For Folder dialog box

- Browse to the desired folder and click on the OK button from the dialog box to exit.
- Click in the **Image** drop-down and select the desired image format from **DWF**, **JPEG**, and **PNG** for web view.
- Click on the **OK** button from the dialog box. The **Select Drawings to Process** dialog box will be displayed as discussed earlier.
- Include the desired drawings and click on the **OK** button from the dialog box. The **AutoCAD Electrical Publish to Web** dialog box will be displayed; refer to <u>Figure-35</u>.

AutoCAD Electrica	l Publish to Web - Banner, Title text,	Options	×
	Project Banne	er Text for Web Page	
Banner	c:\users\gaurav\documents\acade	2015\aedata\proj\electrical_basics\electrical_basics.wdp	
	Project Title	Text for Web Page	
Title 1			
Title 2			
Title 3			
Title 4			
Layout to output (Model La Configuration Name:	Plot to dwf) yout 1 (As saved PublishToWeb PNG.pc3	 Build intra-drawing "Surf" pick lists Allow drag/drop of the drawing files straight from your web page (choose below). drawing drawing 	
	ОК	Cancel <u>H</u> elp	

Figure-35. AutoCAD Electrical Publish to Web dialog box

- Specify the meta data as desired in the displayed fields.
- Select the Allow drag/drop of the drawing files straight from your web page check box to enable drag/drop of the drawing files.
- Click on the **OK** button from the dialog box. After the publishing is finished, the **Finish** page of the **Publish to Web** dialog box will be displayed as shown in <u>Figure-36</u>.



Figure-36. Publish to WEB dialog box Finish page

- Click on the **Preview** button to preview the web page of the drawing.
- Click on the **OK** button from the dialog box to exit.

Publish to DWF/PDF/DWFx

This tool is used to publish the drawings in Dwf or pdf forms. The procedure to use this tool is given next.

- Click on the **Publish to DWF/PDF/DWFx** tool from the **Plot/Publish** drop-down in the **Project Manager**. The **Select Drawings to Process** dialog box will be displayed as discussed earlier.
- Include the drawings that you want to publish in the DWF or PDF format. Click on the **OK** button from the dialog box. The **AutoCAD Electrical-Publish Setup** dialog box will be displayed as shown in <u>Figure-37</u>.

Include when	adding shee	ts	
Model t	ab	Ē	rst layout tab
Publish type:	PDF	• VM	<u>ulti-sheet file</u>
Substitute	TrueType for	nts for SHX	fonts
Multi-sheet P	DF options		
Include I	<u>B</u> ookmarks		
🔽 Include I	Hyperlinks		
Zoom fa	actor: 50	×	
Run Publis	h in back <mark>gro</mark> u	nd	

Figure-37. AutoCAD Electrical Publish Setup dialog box

- Select the check boxes for the options that you want to include in your DWFs and PDFs.
- Click in the **Publish type** drop-down to change the type of file for publishing.

• Click on the **OK** button from the dialog box. The **Publish** dialog box will be displayed; refer to <u>Figure-38</u>.

heet List:		Publish Optio	ns Information		
bectrical_Basics.dsd		Location: C:\Users\Gaurav\Documents\			
ublish to:		File type: Mu	lti-sheet file		
20F 🔹		Naming: Pron	npt for name		
$\overline{\ell}$ Automatically load all open drawings			ation: Don't include ol: Lines overwrite		
		Publish (options		
Sheet Name		3D DWF	Page Setup	Status	
Starting section-Model			Contraction of the second s		
		ш	-		,
•	Publish Outp				
6 Selected Sheet Details	Publish Outp	ut		de plot st <u>a</u> mp	
selected Sheet Details		ut	E Indu	de plot stamp	
Selected Sheet Details Ource drawing rawing location ayout name	Number of c	ut	E Indu		
Selected Sheet Details Ource drawing rawing location ayout name lot device	Number of a	ut	□ Indu ☑ Puble ☑ Open	de plot stamp	
Selected Sheet Details Selected Sheet Details Source drawing Krawing location ayout name lot device lot size	Number of c	ut	⊡ Indu Indu	de plot stamp sh in background	
٠	Number of a	ut	□ Indu ☑ Puble ☑ Open	de plot stamp sh in background	

Figure-38. Publish dialog box

• Set the desired options and then click on the **Publish** button from the dialog box. The **Specify PDF File** dialog box will be displayed (in case of PDF format selected); refer to <u>Figure-39</u>.

Save in:	AutoCAD	_2015	- +		Views -	Tools
-	Name	*		Date modified	Туре	
	Congbo	w Beta 2 Preview Gu	iide	11-01-2014 19:27	PDF File	1
utodesk 360						
1						
History						
E						
Documents						
1						
Favortes						
Favortes						
Desktop						
Desktop	٠		ш			
Desktop	•		ш			
Desktop	< File name:	Electrical_Basics.pd			•	Select

Figure-39. Specify PDF File dialog box

• Browse to the desired location and then click on the **Select** button. If you have unsaved sheet list then the **Publish - Save Sheet List** dialog box will be displayed as shown in <u>Figure-40</u>.

Publish - Save Sheet List		×
Do you want to save the c	urrent list of she	eets?
Always perform my current choice	Yes	No Cancel

Figure-40. Publish Save Sheet List dialog box

- Click on the **Yes** button from the dialog box. The dialog box to specify location for saving the file will be displayed. Browse to the desired location and save the file.
- The drawing file will be saved in the PDF format and will automatically open in the PDF reader of your system.

Zip Project

This tool works in the same way as the other publishing tools discussed above. The procedure to use this tool is given next.

• Click on the **Zip Project** tool from the **Plot/Publish** drop-down in the **Project Manager**. If you are creating the zip file for the first time in this version of AutoCAD, then you will get the error message as shown in <u>Figure-41</u>.

ZIP Executable Not Defined	×
Cannot find a default "zip" program executable or one defined in the ".env" file.	
Exit AutoCAD Electrical and open the ".env" file with a text editor.	
C:\Users\Gaurav\Documents\AcadE 2016\AeData\wd.env	
Enter a "WD_ZIP" entry plus "," plus the full path\name to your zip program.	
Cancel	

Figure-41. Error message

- Click on the Cancel button from this message box and exit AutoCAD Electrical.
- Open the folder C:\Users\{your user name}\Documents\AcadE2016\AeData using windows browser.
- Open the wd.env file using any text editor(in our case, Notepad). The file will be displayed as shown in Figure-42.

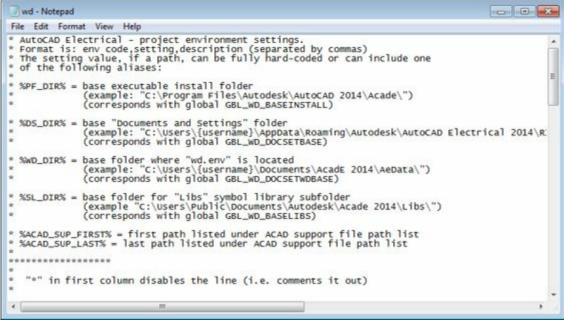


Figure-42. wd file in notepad

• Move down in the file at the location as shown in Figure-43.

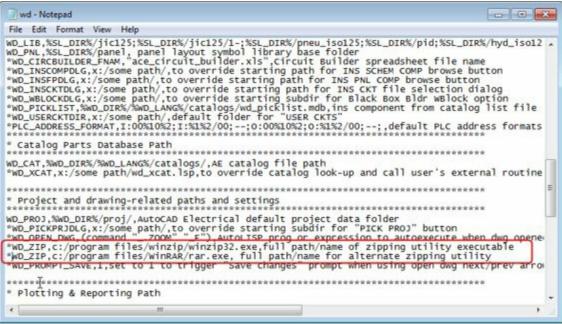


Figure-43. Location to identified

- Check carefully the lines marked in the red box. You will notice that these lines link the zip file with two programs **WinZip32** and **WinRAR**.
- Remove the * mark from these line. Press CTRL+S to save the file.
- Restart the AutoCAD Electrical and reopen the project file and drawing you were working on.
- Click on the **Zip Project** tool from the **Plot/Publish** drop-down in the **Project Manager**. The **Select Drawings to Process** dialog box will be displayed as discussed earlier.
- Rest of the procedure is same as discussed earlier.

REMOVING, REPLACING, AND RENAMING DRAWINGS IN A PROJECT

Till this point you have learned to add drawings in the Project and you have learned to modify properties of the drawings. Now, you will learn to remove, replace, or rename a drawing file in a project. The steps to perform these actions are given next.

• Select the drawing from the **Project Manager** that you want to remove, replace, or rename. Rightclick on it, a shortcut menu will be displayed; refer to <u>Figure-44</u>.

Open Close Copy To Remove
Replace
Rename Properties

Figure-44. Shortcut menu for drawing

- Select the Remove, Replace, or Rename option from the menu.
- Follow the instructions and do accordingly.
- If you have selected the **Remove** option then a confirmation will be asked and if you select Yes then the file will be removed.
- If you have selected the **Replace** option then the dialog box will be displayed prompting you to select the drawing for replacement.
- If you have selected the **Rename** option then you will be prompted to specify the new name of the drawing.

LOCATIONS VIEW IN PROJECT MANAGER

The Location View tab is added in the Project Manager in AutoCAD Electrical 2016 version. The Location View tab gives a fast report on various components by their location and installation codes. To display options in the Location View tab, click on the tab in the Project Manager; refer to Figure-45.

ype here to search Go wddemo.wdp ⊞ (??)	cts
	10
	Projects
	Stion View
	Los

Figure-45. Location View tab in Project Manager

Click on the + sign before (??) in the Location View to check sub-categories of the category. The (??) is displayed for Installation code. Since, we have not defined the installation code for current project

so (??) is displayed there. On expanding the installation code, we will get various components arranged as per their location codes; refer to <u>Figure-46</u>.

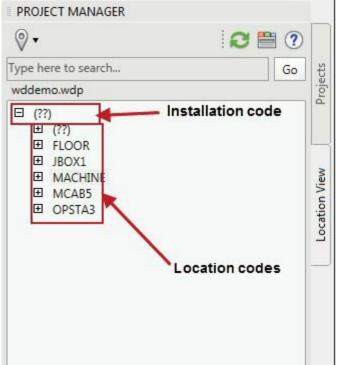


Figure-46. Installation code and location code in Location View tab

Now, expanding the location codes will display components for those locations. The other options in the Location View tab are discussed next.

Filter by Installation and Location 🔊

Using this option, you can filter out the unwanted installations or locations. The procedure to use this option is given next.

• Click on the **Filter by Installation and Location** button. A drop-box will be displayed; refer to <u>Figure-47</u>.

0.	Q	2
	Select all	Go
	=(??)+(??)	
	=(??)+FLOOR	
	=(??)+JBOX1	
	=(??)+MACHINE	
	=(??)+MCAB5	
	=(??)+OPSTA3	
-	OK Cancel	

Figure-47. Drop-box for filtering installations and locations

• Clear the check boxes for the locations and installations that you do not want to see in the Location View tab and click on the OK button from the drop-box. The locations and installations for which the check box is selected will be displayed in the Location View tab; refer to Figure-48.

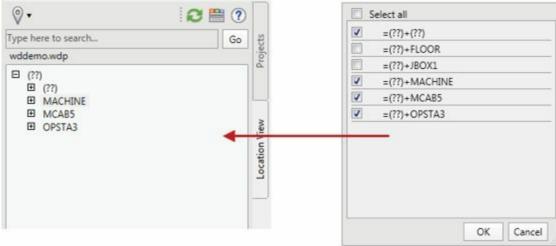


Figure-48. Locations and installations after filtering

Search box

Oh!! This tool always works in same way. Nothing new, specify your parameters to search for components on the basis of their locations or installation. Procedure to use this tool is given next.

• Type the location code, installation code, component keyword in the type box for searching and click on the **Go** button next to the search box; refer to <u>Figure-49</u>.

•	2 🗎 🕐
Floor wddemo.wdp	o S
	Location View

Figure-49. Search box for Location view tab

• On clicking the Go button, only the objects with the specified keywords will be displayed.

Details and Connections tabs

The **Details** and **Connections** tabs are used to display the details and connections of the component selected in the **Component View** tab of the **Project Manager**. To learn more about them, follow the steps given next.

• Click on the **Display Details and Connections** button from the **Project Manager**; refer to <u>Figure-50</u>. The **Details** and **Connections** tabs will be added in the **Project Manager**; refer to <u>Figure-51</u>.

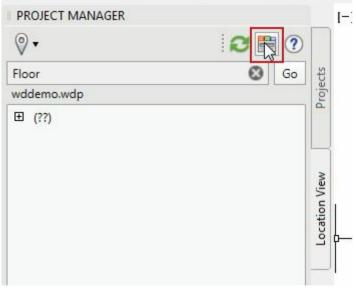


Figure-50. Display Details and Connections button

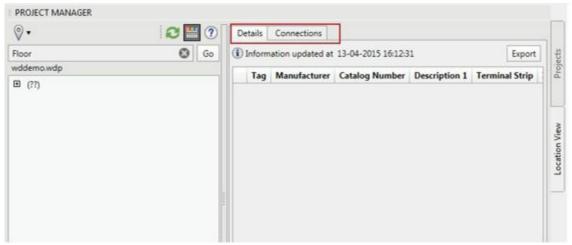


Figure-51. Details and Connections tabs

• Select a component from the left pane of the **Project Manager**. The detail of the component will be displayed in the **Details** tab of the **Project Manager**; refer to <u>Figure-52</u>.

0.		?	De	tails Co	onnections				
Floor	Θ	Go	١	Informatio	on updated at 13	-04-2015 16:12:31			Export
wddemo.wdp			П	Tag	Manufacture	Catalog Number	Description	Terminal	Item Number
□ (??) Ⅲ (??)				D DS211		194E-A25-1753	1	Strip	nem rumber
FLOOR		. 1995							

Figure-52. Details of a component

• To check the connections of the component, click on the **Connections** tab. Various connections of the component will be displayed in the **Project Manager**; refer to Figure-53.

?• RE	? De	tails Connection	15				
oor 🕲	Go 🕕 I	nformation update	ed at 13-04-2015	16:12:31			Export
ddemo.wdp		Wire Number	From Location	From Component	From Pin	To Location	To Com
(77) (77)	6	211A	FLOOR	PJ211:[J]	1	FLOOR	DS211
E (??) E FLOOR		2118	FLOOR	D5211		FLOOR	MOT212
E O DS207		212A	FLOOR	PJ211:[J]	2	FLOOR	DS211
		2128	FLOOR	DS211	1	FLOOR	MOT212
⊕ DS215		212E	FLOOR	PJ211:[J]	3	FLOOR	DS211
E O MOT208	0	212F	FLOOR	MOT212		FLOOR	DS211
MOT212 MOT216		1					

Figure-53. Connections of the component

• If you want to check the component in the drawing then right-click on any field in the **Connections** tab for desired component. A shortcut menu will be displayed; refer to Figure-54.

D	info	ormatio	n update	ed at 13-04-201	5 16:1	2:31			Export
1		Wire N	lumber	From Location	n Fr	rom Component	From Pin	To Location	To Com
1		211A		FLOOR	PJ.	211:[J]	1	FLOOR	DS211
(2	211B		FLOOR	DS	5211		FLOOR	MOT212
(212A		FLOOR	PJ	211 : [J]	2	FLOOR	DS211
(2128	_	FLOOR	DS	211		FLOOR	MOT212
(212E		Copy Ctrl	+C	1:[J]	3	FLOOR	DS211
(212F	æ :	Surf		212		FLOOR	DS211
	1		Alla .	5011	_	1			

Figure-54. Shortcut menu for component

• Click on the **Surf** button from the shortcut menu. The **Surf** dialog box will be displayed; refer to <u>Figure-55</u>.

Туре	Wire nu	Sheet	Installation	Location
w	212B	2		
Fresher	ı	E	dit	Pan
oom Sa	va	Pick N	ew List	Zoom In

Figure-55. Surf dialog box

• Click on the Go To button from the dialog box to check the component in the drawing.

Note that you can export the details of components in csv or xls format by using the **Export** button above the table in the **Project Manager**. Using the exported file, you can share the information with your peers.

INSERTING COMPONENTS

CHAPTER 4

Topics Covered

The major topics covered in this chapter are:

- Inserting Components using Icon menu
- Inserting Components using Catalog Browser
- Inserting Components using User Defined list
- Inserting Components using Equipment list
- Inserting Components using Panel list
- Inserting Components using Terminal (Panel list)
- Pneumatic, Hydraulic, and P&ID components

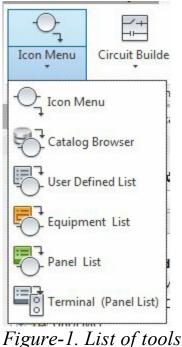
ELECTRICAL COMPONENTS

Electrical Components in AutoCAD Electrical are schematic symbols of various components used in electrical systems. There are various ways to insert the electrical components in AutoCAD Electrical. Some of the methods to insert electrical components are given next.

INSERTING COMPONENT USING ICON MENU

The **Icon Menu** tool is used to insert schematic symbols of various electrical components by using the **Icon Menu**. The procedure to use this tool is given next.

• Click on the Down arrow below **Icon Menu** button in the **Schematic** tab of the **Ribbon**. The list of tools will be displayed; refer to <u>Figure-1</u>.



• Click on the **Icon Menu** tool in this menu. The **Insert Component** window will be displayed; refer to <u>Figure-2</u>.

C: Schematic Symbols				12	Menu 🗊	Views - D	isplay: 10
	× JC: Schematic	Symbols					Recently Used
JIC: Schematic Symbols Har Push Buttons Har Push Buttons Har Selector Switches Har Fuesc/ Circuit Breaken Har Relays/ Contacts Har Relays/ Contacts Har Motor Control	Push Buttons	Selector Switches	Fuses/Circut Breakers/	Relays/ Contacts	Timers	Motor Control	overload
Har Pilot Lights Har Pilot Lights Har PLC I/O Har Terminals/ Connectors Har Terminals/ Connectors Har Annotation Har Miscellaneous Switche Har Solenoids Har Instrumentation Har Miscellaneous Har One-Line Components	sw 1	PLC I/O	Terminals/ Connectors	Limit Switches	Pressure/ Temperatu DOT	Row Level Switches	Push Button NO
Horizontal No edit dialog	Scale schematic: Scale panel:	1.000	Type #:	(Browse	Always display (previously used menu Cancel Help

Figure-2. Insert Component window

• Select the category of desired component from the Menu box at the left in the dialog box. Note that the categories that have a + sign before their name are having sub-categories to browse in. Note that you can specify the scale value for schematic symbols by using the **Scale schematic** edit box

available at the bottom of the dialog box.

• After selecting the category and subcategory, click on the desired symbol. The symbol will be attached to the cursor and you will be prompted to specify the location for the symbol; refer to <u>Figure-3</u>.

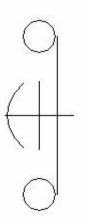


Figure-3. Component attached to cursor

• Click in the drawing area to place the component symbol at desired place. The **Insert/Edit Component** dialog box will be displayed; refer to <u>Figure-4</u>.

Component '	Tag	Description
PBLT1	Fixed	Line 1
Use	PLC Address	Line 2
Tags	Schematic	Line 3
Used:	Panel	List: Drawing Project Defaults Pick
E	xtemal List	
	Options	Cross-Reference
Catalog Data Manufacture Catalog [Assembly		Component override Setup Reference NO Reference NC
Item Next>>	Count	Installation code
Lookup	Previous	Drawing Project Pins
Drawing Multiple	Project e Catalog	Location code 1 < >
Cat	talog Check	Drawing Project × C >
Ratings		Show/Edit Miscellaneous
Rating	w All Ratings	OK-Repeat OK Cancel Help

Figure-4. Insert Edit Component dialog box

• This dialog box is divided into various areas like; Component Tag, Description, Catalog Data, Cross-Reference and so on. The options in these areas specify various parameters of the component being inserted. We will start with the Component Tag area and then one by one we will use options in other areas.

Component Tag area

- The edit box in this area is used to specify the tag value for your current component. Click in the edit box and specify the desired value.
- You can link your component with PLC by using the tag of PLC. To do so, click on the Use PLC Address button. If your components are not directly connected to PLC via wires as in our case then the Connected PLC Address Not Found dialog box will be displayed; refer to Figure-5.

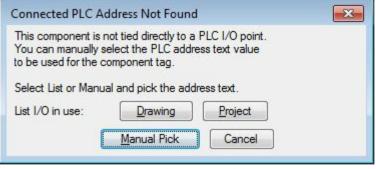


Figure-5. Connected PLC Address Not Found

• Click on the **Drawing** button to display all the PLC connections available. The **PLC I/O Point List** (this drawing) dialog box will be displayed as shown in <u>Figure-6</u>.

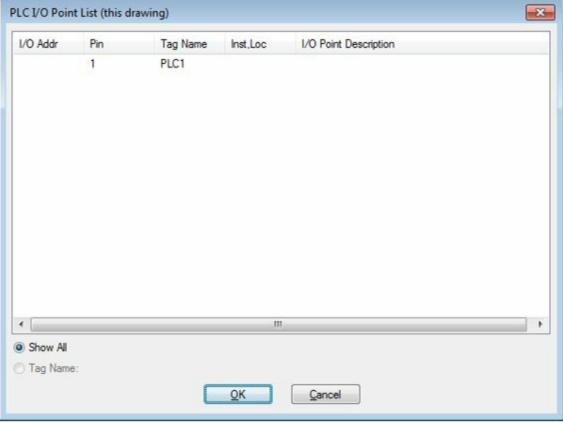


Figure-6. PLC IO Point List dialog box

• Select the desired plc pin from the dialog box and click on the **OK** button from the dialog box. The component will be linked to the selected pin of plc.

Schematic tag

• Using the Schematic button in the Component Tag area. The SOL Tags in Use dialog box will be displayed as shown in Figure-7.

		Sort:	🖲 Tag 🛛 🔘	Drawing Sequence	O Description
Tag	Installation	Location	Sheet	Description 1,2,3	
one)					
	4 /			Copy	
	nt / stand-alone referen	ces		Descriptions	
Show parer	references			 Descriptions Catalog values 	
Show parer Show child Show all co				Descriptions	

Figure-7. SOL Tags in Use dialog box

- Select the **Show all components for all families** check box. The list of all the tags in the drawing will be displayed. Also the name of the dialog box will be modified as shown in **All Tags in Use**.
- Select the desired tag number and then select **Copy Tag** or **Calculate Next** button. If you select the **Copy Tag** button then same tag will be assigned to the current component. If you select the **Calculate Next** button then the next tag number will be assigned to the component. Note that in both the cases system will ask your permission to overwrite the tag value. Do as per your requirement.

In the same way, you can use the **Panel** button and the **External List** button from the **Component Tag** area.

Catalog Data area

The options in this area are used to link the inserted component to a catalog. A catalog is a collection of various related components in a categorized form. To specify the details of the Catalog Data follow the steps given next.

• Click in the Manufacturer edit box of the Catalog Data area and specify the name of the manufacturer. Name of various companies like AB, ABB, Siemens, and so on that manufacture

electrical components are available in the AutoCAD Electrical Database. You can also start a new manufacturer by specifying your desired name.

- Click in the **Catalog** edit box and specify the value of Catalog number. This number can include alphabets as well as numeric. For example, 300F-1PB.
- Click in the Assembly edit box and specify the desired value for assembly code.
- Click in the **Item** edit box and specify the item number for the component. Note that each type of component has a unique Item number.
- Click in the **Count** edit box and specify the number of components required in the current drawing. The specified numbers will be automatically added in the Bill of Materials. The area after specifying all the values will be displayed as shown in <u>Figure-8</u>.

Manufacturer	CADCAMCA
Catalog 30	DF-1PB
Assembly	300F-1PB-NO
Item 1	Count 5
Next>>	1
Lookup	Previous
Drawing	Project
Multiple C	atalog
Catalo	a Check

Figure-8. Catalog Data area

• Instead of specifying all the parameters related to Catalog data, you can pick the desired component's details from the library of standard components in AutoCAD Electrical. To do so, click on the **Lookup** button in this area. The **Catalog Browser** dialog box will be displayed as shown in <u>Figure-9</u>.

ategory: PB (Push	buttons) 💌			6
earch: AB *30.5r	mm EXTENDED" RED			-
Results				*
CATALOG	MANUFACTURER	DESCRIPTION		
800H-BR6A	AB	PUSH BUTTON - MOMENTARY, NEMA 4/4X		
800H-BR6A2	AB	PUSH BUTTON - MOMENTARY, NEMA 4/4X		
800H-BR6B	AB	PUSH BUTTON - MOMENTARY, NEMA 4/4X		
800H-BR6C	AB	PUSH BUTTON - MOMENTARY, NEMA 4/4X		
800H-BR6D1	AB	PUSH BUTTON - MOMENTARY, NEMA 4/4X		
800H-BR6H	AB	PUSH BUTTON - MOMENTARY, NEMA 4/4X		
ecord Count: 9	☑ <u>F</u> ilt	er by WDBLKNAM value: PB11	Search Database:	Primary
			OK	Cancel

Figure-9. Catalog Browser dialog box

• Select the desired option from the **Category** drop-down at the top in the dialog box. If you want to

check all the components in this category then click on the search button. The list of all the components in that category will be displayed.

- You can customize user search by specifying the desired keywords in the **Search** edit box. After specifying the keywords, click on the **Search** button. The list of components related to the specified keyword will be displayed.
- Double click on the desired component in the list. The related data will be displayed in the **Catalog** area.
- Similarly, you can use **Drawing** button or **Project** button to select the catalog data from earlier created components in the drawing or project respectively.

Multiple Catalog Data

• You can use multiple catalog for a component to display alternates for the component. To do so, click on the **Multiple Catalog** button from the **Insert/Edit Component** dialog box. The **Multiple Bill of Material Information** dialog box will be displayed; refer to Figure-10.

	Aaterial Information
	Sequential Code 01 - List
Catalog Data	
Manufacturer	AB
Catalog	871A-TS4-D1
Assembly	
	Count Unit
Parts Catalog Lo	ookup √catalogs∖default_cat.mdb
Table C0	
	Miscellaneous
	Catalog Lookup
	Catalog Lookup Catalog Check
lter	
Iter	Catalog Check
lter	Catalog Check

Figure-10. Multiple Bill of Material Information dialog box

- Enter the details of **Manufacturer**, **Catalog**, and **Assembly** in the related edit boxes. Now, you have specified first manufacturer of the desired component.
- Click on the Sequential Code drop-down and select 02 from the list displayed; refer to Figure-11.

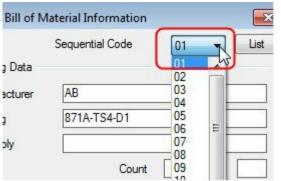


Figure-11. Sequential Code drop down

- Specify the alternate data for **Manufacturer**, **Catalog**, and **Assembly**. Repeat the process until you get the desired number of alternates for the selected type of components. You can specify 99 alternates at max.
- After specifying the data, click on the **OK** button from the dialog box.

Description Area

The options in this area are used to specify the description about the component. To specify the description, follow the steps given next.

- Click in the Line 1 edit box in this area and specify the first line of description. Similarly, click in the Line 2 edit box and specify the second line of description.
- If you want to use description of any component in current drawing or project then click on the **Drawing** button or **Project** button respectively.
- The related dialog boxes will be displayed and you will be prompted to select the description of a component from the list. Select the desired component description and click on the **OK** button from the dialog box.
- You can also select the description from the default description list. To do so, click on the **Defaults** button in this area. The **Descriptions** dialog box will be displayed; refer to Figure-12.

Descriptions (general): c:/users/gaurav/appdata/roa/r20.0/enu/support/wd_desc.wdd	
: Generic description file WD_DESC.WDD. Create project-specific : description files using project name with ".WDD" extension. : This file is accessed from the "Defaults" radio button under EDIT or : INSERT component "List Descriptions" when project-specific WDD ; file is not found. : Use the "I" character to show the break point for a second line : Anything after ":" character is ignored	н н
Generic descriptions for RELAYS MASTER CONTROLIRELAY SYSTEMIENABLED Generic descriptions for PUSH BUTTONS START STOP RESET SYSTEMIRESET EMERGENCYISTOP RUN JOG OPEN CLOSE Generic descriptions for SWITCHES	
Highlight entry above and pick OK, or select Pick File to select a different file and description list.	
Pick File Language Project Family General Add/Edit	
OK->Description 1 OK->Description 2 OK->Description 3 OK Cancel	Help

Figure-12. Descriptions dialog box

• Double click on any of the description in this dialog box. Note that the lines with all capital characters are counted in the description. So, you need to double click only on those lines.

Cross-Reference Area

This is a very important area of the dialog box. Using the options in this area, you can link the pins of your component with the other components the drawing/project. The procedure to use options in this area is given next.

- When we insert a component in AutoCAD Electrical, then based on the already existing components, the inserted component is automatically referenced to existing components. This reference is of a certain reference format. To override this format, click on the **Component override** check box. The **Setup** button next to it will get activated.
- Click on the **Setup** button. The **Cross-Reference Component Override** dialog box will be displayed; refer to Figure-13.

Cross-Reference Fom Same Drawing	nat
%N	Default "%N" "%S-%N"
Between Drawings	
%S.%N	Same "%S-%N"
Cranbical	
 Text Form Graphical Table Form 	Format Setup

Figure-13. Cross Reference Component Override dialog box

• Using the options in this dialog box, you can change the reference style. By default, for same drawing %N is used as reference number and for Between drawings %S.%N is used. Glossary is given next.

%S Sheet number of the drawing

%D Drawing number

%N Sequential or reference-based number applied to the component

%X Suffix character position for reference-based tagging (not present = end of tag)

%P IEC-style project code (default for drawing)

%I IEC-style "installation" code (default for drawing)

%L IEC-style "location" code (default for drawing)

- Specify the desired identifiers.
- You can also change the display format by using the radio buttons in the **Component Cross-Reference Display** area of the dialog box.
- After specifying the desired format style, click on the OK button from the dialog box to exit.
- Each component need to be specified by NC or NO contact points. NC means Normally Closed and NO means Normally Open. Using the Reference NO and Reference NC edit boxes, you can specify the references for the contact types.
- A switch generally has two pins, but if you are working on PLC or other integrated circuit components then you need to setup NC/NO for all the pins of components. To do so, click on the NO/NC Setup button. The Maximum NO/NC counts and/or allowed Pin numbers dialog box will be displayed; refer to Figure-14.

Maximum NO/NC counts and/or allowed Pin numbers	X
Set value to 0 for none allowed, blank for undefined	
Maximum NO contact count	
Maximum NC contact count	
Maximum convertible NO/NC	
Maximum undefined type "4"	
Option: Pre-defined Pin number combinations	
Contact and pin number format is: type,pin,pin,type,pin,pin,type,pin,pin; where type 1 = NO, 2 = NC, 0 = convertible, 3 = Form-C, 4 = Other	Retrieve from peer
ex: 2NO (pins 2,3 and 4,5) and 1NC (pins 6,8) would be 1,2,3;1,4,5;2,6,8	
ex: 2 Form-C, pins 7com,4no,1nc and 8com,5no,2nc would be 3,7,4,1;3,8,5,2 (Form-C order is 3,COM,NO,NC)	
Pin List	
<u>OK</u>	

Figure-14. Maximum NO or NC counts dialog box

- Specify the numbers of contact types for different categories in this dialog box.
- In the **Pin List** edit box, you can define the connectivity of one pin with the other for NC, NO, COM, or others. Check the description in **Option** area of the dialog box to know the method of linking pins for switches.

Installation Code and Location Code

- The edit boxes in these areas are used to specify the installation code and location code for the current component. The installation code is used to specify the line or circuit identifier in which you want to add the component. For example, you can specify Line1 230VAC as installation code.
- Location code is used to specify the identifier for physical location of the component. For example, you can specify Sub-Panel 20 Pin as location code for the component.

Pins area

The options in this area are used to number the pins of the component so that later they can be connected with other components in the line. The procedure to use these options is given next.

- Click on the < button or the > button to decrease or increase the pin number.
- Click on the **OK** button from the dialog box to exit. The component will be displayed with the specified parameters in the drawing.

CATALOG BROWSER

The **Catalog Browser** is the standard library of various components used in electrical engineering. You can insert any desired component using the options in the **Catalog Browser**. The procedure to use the **Catalog Browser** is given next.

 Click on the down arrow below Icon Menu button in the Ribbon, the Component drop-down will be displayed. Click on the Catalog Browser tool from the list; refer to <u>Figure-15</u>. The Catalog Browser will be displayed; refer to <u>Figure-16</u>.



Figure-15. Catalog Browser button

A Catalo	og Browser				X	
Category	PB (Push	buttons) 🔹			?	
Search:	AB *30.5m	nm EXTENDED" RED			• 9	
Results					* 1	
CAT	ALOG	MANUFACTURER	DESCRIPTION			
800H	I-BR6A	AB	PUSH BUTTON - MOMENTARY, NEMA 4/4X			
800H	I-BR6A2	AB	PUSH BUTTON - MOMENTARY, NEMA 4/4X			
800H	800H-BR6B AB		PUSH BUTTON - MOMENTARY, NEMA 4/4X			
800H	I-BR6C	AB	PUSH BUTTON - MOMENTARY, NEMA 4/4X			
800H	H-BR6D1	AB	PUSH BUTTON - MOMENTARY, NEMA 4/4X			
800H	I-BR6H	AB	PUSH BUTTON - MOMENTARY, NEMA 4/4X		*	
٠		m			- F	
Record C	ount: 9	Eilt	er by WDBLKNAM value: PB11	Search Database: Primary	• icel	

Figure-16. Catalog Browser dialog box

• Click on the edit box for Category, a list of various component categories will be displayed; refer to <u>Figure-17</u>.

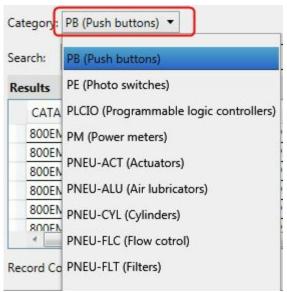


Figure-17. Category drop-down

- Select the desire component type from the list.
- Click in the Search edit box and specify the requirements in keywords separated by space.
- Click on the **Search** button next to **Search** edit box, the list of components matching the keywords will be displayed; refer to Figure-18.

Search:	SIEMENS 16N	MM 1 NO	· · · · · · · · · · · · · · · · · · ·
Results			*
CA	TALOG	MANUFACTURER	DESCRIPTION
358	2202-0AB01	SIEMENS	PUSHBUTTON UNIT w/FLAT BUTTON
3SB	2202-0AD01	SIEMENS	PUSHBUTTON UNIT w/FLAT BUTTON
3SB	2202-0AE01	SIEMENS	PUSHBUTTON UNIT w/FLAT BUTTON
3SB	2202-0AF01	SIEMENS	PUSHBUTTON UNIT w/FLAT BUTTON
3SB	2202-0AG01	SIEMENS	PUSHBUTTON UNIT w/FLAT BUTTON
358	2202-04H01	SIEMENS	PUSHBUTTON UNIT W/FLAT BUTTON

Figure-18. Catalog Browser dialog box with desired components

• Click on the component that you want to include in your drawing, a small toolbar will be displayed; refer to Figure-19.

3SB2202-0AH01	SIEMENS	PUSHBUTTON UNIT w/FLAT BUTTON	
3582206-0A0		ILLUMINATED PUSHBUTTON UNIT w/FLAT BUTTON	
3SB2206-0AEC	12 📔 🍻 🕇	ILLUMINATED PUSHBUTTON UNIT w/FLAT BUTTON	
3SB2206-0A-01	SIEMENS	ILLUMINATED PUSHBUTTON UNIT w/FLAT BUTTON	
35R2206-04H01	STEMENS	THUMINATED PUSHRUITTON UNIT W/ELAT RUITTON	

Figure-19. Toolbar in Catalog Browser

• The is used to specify a symbol for the current selected component. The is used to display the assembly details of the selected component. The is used to display the details of the current selected component in the web browser. Using this button, you will reach to the manufacturer's

website. The 🚺 button is used to add the current component in the favorite components list.

• Click on the subtraction to assign a symbol. The **Insert Component** dialog box will be displayed; refer to Figure-20.

Menu x	JIC: Schematic	Symbols			and an		Recently Used
JC: Schematic Symbols +4- Push Buttons +4- Push Buttons +4- Fuses/ Circuit Breakers/ Ti +4- Fuses/ Contacts +4- Timers +4- Timers +4- Motor Control +4- Pliot Lights +4- PLC //O #+4- Teminals/ Connectors +4- Environment/ Temperature Sw +4- Row/ Level Switches +4- Miscellaneous Switches +4- Miscellaneous +4- One-Line Components	Push Buttons Plot Lights	Selector Switches PLC I/O	Fuses/Crout Breakers/ Terminals/ Connectors	Relaya/ Contacts Limit Switches Macelaneous	Timers Timers Pressure/ Temperatu DOT	Motor Control Notor Control Flow/ Level Switches One-Line Components	Push Button NO
Horizontal	Scale schematic:	1.000	Type It:	(Browse	📰 Always display p	reviously used menu

Figure-20. Insert Component dialog box

- Click on the category for which your component resembles. In our case, Push Buttons. The list of symbols will be displayed.
- Select the desired button from the list of symbols, in our case, Illuminated Push Button NO. The Assign Symbol To Catalog Number dialog box will be displayed (if the catalog number is unassigned); refer to Figure-21.

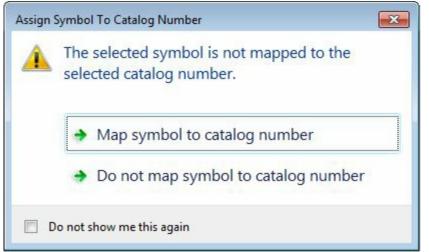


Figure-21. Assign Symbol To Catalog Number dialog box

- Click on the **Map symbol to catalog number** button from the dialog box to map the symbol for the catalog. The symbol will get attached to the cursor.
- Click on the electrical line to which you want to connect the component or click in the drawing area to place the component; refer to <u>Figure-22</u>. Note that after placing the component, the **Insert/Edit Component** dialog box will be displayed as discussed earlier.



Figure-22. Component after placing on line

- Specify the desired parameters and click on the OK button from the dialog box.
- If you again go to **Catalog Browser** and click on the same component, then you will get symbols mapped to the component; refer to Figure-23.

3SB2202-0AG0	PUSHBUTTON UNIT w/FLAT
3SB2202-0AH0	PUSHBUTTON UNIT w/FLAT
3SB2206-0AD0	ILLUMINATED PUSHBUTTON
3SB2206-0AE01 🔩 😭 🙀	ILLUMINATED PUSHBUTTON
3SB2206-0AF01 SIEIVIEINS	ILLUMINATED PUSHBUTTON

Figure-23. Symbols mapped to component

USER DEFINED LIST

The User Defined List tool is used to display the list of components that are collected by user under a common list. The procedure to use this tool is given next.

• Select the User Defined List tool from the Component drop-down. The Schematic Component or Circuit dialog box will be displayed as shown in Figure-24.

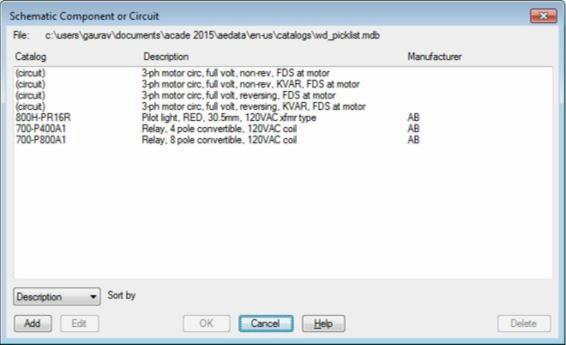


Figure-24. Schematic Component or Circuit dialog box

• Select any component/circuit from the list and click on the **OK** button from the dialog box. The component/circuit will get attached to the cursor. Click to place the component/circuit.

• You can add the desired components/circuits in the list by using the Add button. Click on the Add button. On doing so, the Add record dialog box will be displayed; refer to .

Minimum of Block name (w			Explode (circuit or r Catalog.	panel assembly)
Minimum of Block name (w Block*	th path if required) and (sither Description o	r Catalog.	
Block*				
				Browse
Description				
Catalog		(Catalog not used	d for exploded inserts)	
	In the second second			
Optional values (not used f	or exploded inserts)			
Manufacturer				
Assembly Code				
Text Values				

Figure-25. Add record dialog box

- Select the **Schematic** or **Panel** radio button to specify the type of component we are going to add in the library.
- If it is a single block then select the **Single block** radio button otherwise select the **Explode** (Circuit or panel assembly) radio button.
- Click on the **Browse** button to specify the location of block for component. The **Select Schematic component or circuit** dialog box will be displayed as shown in <u>Figure-26</u>.

.ook in: 🍶 jic125	- 🕝 🧊 📂 🖽 -	
lame ^	Date modified	Preview
1-	11-04-2014 09:36	
Images	23-04-2014 09:57	
ace_cb_marker_block	11-04-2014 09:36	
ace_cb1_Feed_H	11-04-2014 09:36	
ace_cb1_Feed_V	11-04-2014 09:36	
ace_cb1_Feed1_H	11-04-2014 09:36	
are chi Feedi V	11-04-2014 00-26	Eind File
e name:	▼ Qpen	Locate
iles of type: Drawing (*.dwg)	▼ <u>Open</u> ▼ Cancel	Locate

Figure-26. Select Schematic component or circuit dialog box

- Select the drawing file of the symbol that you want to assign for your component. Click on the **Open** button from the dialog box. Note that you can make your own symbol by using the drawing tools and after saving it at desired location, you can add it to the library.
- Click in the **Description** edit box and specify the description from the component.
- Click in the Catalog edit box and specify the catalog identifier for the component.
- Click in the Manufacturer edit box and specify the name of the manufacturer.

- Click in the Assembly Code edit box and specify the desired assembly code for the component.
- Click in the Text Values edit box to specify the text identifiers for the component.
- Click on the **OK** button from the dialog box to place the newly added symbol.

EQUIPMENT LIST

The **Equipment List** tool is used to display or add the components in the drawing. The procedure to use this tool is given next.

• Click on the **Equipment List** tool from the **Component** drop-down. The **Select Equipment List Spreadsheet File** dialog box will be displayed; refer to <u>Figure-27</u>.

Look in: 🍶 User	*	3 🖻 📂 🛄 🕇	
Name		Date modified	Т
詞 ELECTRICAL_BASICS 詞 one_upd 詞 WDDEMO		23-04-2014 09:46 21-04-2014 10:19 17-04-2014 11:59	M M M
	t.		•
<n File name: Files of type: ↓.mdb</n 	1.	Open Cancel	•

Figure-27. Select Equipment List Spreadsheet File dialog box

• Select the desired database file using the options in the dialog box. Click on the **Open** button from the dialog box. The **Table Edit** dialog box will be displayed; refer to <u>Figure-28</u>.

Table Edit	×
Multiple sheets/tables found in the data file. Choose one to edit.	
BLOCK_ATTR BLOCK_NAME COMP COMPLINK COMPPINS FILETIME LADDERS PDS_DWGINDEX PDS_SETTINGS	
PINLIST PLCIO PNLCOMP PNLTERM POSLIST OK Cancel	Ŧ

Figure-28. Table Edit dialog box

• Select the desired data table from the list and click on the **OK** button from the dialog box. The **Settings** dialog box will be displayed; refer to <u>Figure-29</u>.

program's I-coded ault settings. ct a file
rt a file
eviously d settings.
olumns
e settings file for recall.
Help

Figure-29. Settings dialog box

- Click on the **Default settings** button to use the default settings of the program. You can use the settings of an already existing **.wde** file by using the **Read settings** button. *.wde extension file is used to specify Equipment list setup file.
- After specifying the settings file, the Spreadsheet/Table columns button will become active in the View/Edit Settings area of the dialog box. Click on the Spreadsheet/Table columns button. The Equipment List Spread Settings dialog box will be displayed; refer to Figure-30.

)ata									_
Col1 DWGIX	Col2 PAR1_CHL	Col3 FAMILY	Col4 TAGNAME	Col5 DESC1	Col6 DESC2	Col7 DESC3	Col8 REF	Col9 MFG	• 11
222222	1 2 2 2 2	I CBL I CBL I CBL I CBL I CBL	211CBL 207CBL 211CBL 211CBL 211CBL 211CBL	 			211 209 212 212 212 213	I ANIXTER I I I	
	uma aumbora to	data catao	oriae balow						•
Assign col	umn numbers to		ories below	36 -) Item number		5 🕶	Description 1	•
Assign col 9 🗸	Manufacture		ories below	36 -) Item number) Component		5 • 6 •	Description 1 Description 2	Þ
9 🗸	Manufacturer		ories below		1				•

Figure-30. Equipment List Spreadsheet Settings dialog box

• Change the data category of the columns as per the requirement by using the drop-downs in this dialog box. After modifying the category, click on the **OK** button from the dialog box. Click on the **OK** button from the next dialog box. The **Schematic equipment in** dialog box will be displayed;

refer to Figure-	<u>·31</u> .					
Schematic equipment in (C:\Users\	Gaurav\AppData	Roaming\Autod	lesk\15\R20.0\eni	/Support\User\WDDEMO.mdl	s) 🧧	×
Select Component to insert on Schema	atic:				·	
Manufacturer, Catalog, Assembly	Tag	Installation	Location	Description 1,2,3		
ANIXTER, 2MR-1405	211CBL 207CBL 211CBL 211CBL 211CBL 215CBL 215CBL PJ215		MACHINE MACHINE MACHINE MACHINE MACHINE MACHINE MACHINE FLOOR			-
ANIXTER, 2MR-1405	207CBL		MACHINE			
ANIXTER, 2MR-1405 BUSSMANN, FRS-R-5	RECPT229 215CBL PJ207 PJ207 PJ207 PJ207 PJ211 PJ215 PJ215 215CBL FU215		OPSTA3 MACHINE FLOOR FLOOR FLOOR FLOOR FLOOR FLOOR MACHINE MCAB5			
			TAG Options			
Sort List Catalo	g Check		(i) Use auto (i) Use Equip	generated schematic TAG	1 Scale	
	Insert	Go	ise <u>H</u> el	Pick File		

Figure-31. Schematic equipment in dialog box

- Browse through the list of equipment and click on the desired equipment from the list.
- Click on the **Insert** button from the dialog box. If there is no symbol assigned to the component then the **Insert** dialog box will be displayed as shown in <u>Figure-32</u>.

Block Name	Comn	nent
none found		
Icon Me	enu	Select component from icon menu
Icon Me Copy Comp		Select component from icon menu

Figure-32. Insert dialog box

- Click on the Icon Menu button and assign the desired symbol to the component. The symbol will get attached to the cursor.
- Click in the drawing area or on the electrical line to place the component/equipment. The component/equipment will be placed and the **Insert/Edit Component** dialog box will be displayed as discussed earlier.
- Specify the desired parameters and click on the **OK** button from the dialog box to exit.

PANEL LIST

The Panel List tool is used to insert the parts from panels. The procedure to use this tool is given next.

• Click on the **Panel List** tool from the **Component** drop-down. The **Panel Layout List** dialog box will be displayed as shown in Figure-33.

Panel Layout List> Schematic Co	mponents Insert 🛛 🔀
Extract component list for:	Installation Codes to extract:
Project	All
Active drawing	Blank
save list to external file	Named Installation
	Installation
	Drawing
	List: Project
	Location Codes to extract:
	All
	🔘 Blank
	Named Location
	Location
Browse use external file	Drawing
	List: Project
ОК	Cancel <u>H</u> elp

Figure-33. Panel Layout List dialog box

- You can extract the list of components from the current project or active drawing. Select the **Project** radio button or **Active drawing** radio button to get the list of components.
- If you want to save the extracted list of components in an external file, select the save list to external file check box.
- You can also use an external file for equipment list by using the **Browse** button.
- After specifying the desired parameters, click on the **OK** button from the dialog box. If you have selected the **Project** radio button then the **Select Drawings to Process** dialog box will be displayed as discussed earlier.
- Include the drawings from which you want to extract the list of components. Click on the **OK** button from the dialog box. The list of components will display.

Note that the **Panel List** and **Terminal (Panel List)** tools work only if we have panels in our current project or drawing. We will learn more about these tools later in the book.

There are three more categories of components that are available in AutoCAD Electrical; Pneumatic Components, Hydraulic Components, and P&ID Components. The use of these components and their procedure of insertion in drawing is given next.

PNEUMATIC COMPONENTS

Pneumatic components are those components that work because of pressure of the gases flowing through them. In some electrical systems, you might need to deal with pneumatic components also. So, AutoCAD Electrical provides a special database of these components. The procedure to insert the

Pneumatic components is given next.

• Click on the Down arrow next to **Insert Component** panel name; refer to <u>Figure-34</u>. The expanded **Insert Component** panel will be displayed; refer to <u>Figure-35</u>.

	e nojece	Serieri	uu	~		and a	
-O Icon Menu	Circuit Builde	\$ @_	•	調	•		•
	Insert Compor	ients 🔻	1	-		6	

Figure-34. Down arror to be clicked

-	Home	Project	Schematic	Panel	F
-C)- 	Circuit Build	& • ⋣ ⊫ ler	↓・ D₄] ・ 戈	•
	」 凡 In	sert Compo	onents	6	

Figure-35. Expanded Insert Components panel

- Click on the pin button (in red box in the above figure) to keep the panel expanded.
- Click on the **Insert Pneumatic Components** button . The **Insert Component** dialog box will be displayed as shown in <u>Figure-36</u>.

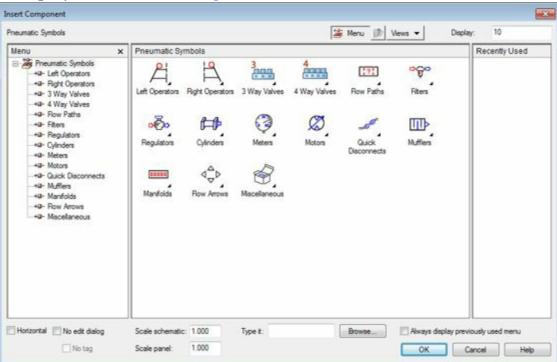


Figure-36. Insert Component dialog box for pneumatic components

• Click on the desired category and select the component that you want to insert in the drawing. The component will get attached to the cursor.

- Click in the drawing area to place the component. The Insert/Edit Component dialog box will be displayed.
- Specify the parameters as discussed earlier and click on the **OK** button from the dialog box. The component will be placed with the specified parameters.

HYDRAULIC COMPONENTS

The hydraulic components are those components that work due to the pressure of fluids flowing through them. The procedure to insert the hydraulic components is given next.

- Click on the Insert Hydraulic Components tool from the expanded Insert Components panel. The **Insert Component** dialog box with hydraulic components will be displayed.
- Rest of the procedure is same as for Pneumatic components discussed earlier.

P&ID COMPONENTS

The P&ID components are those components that are used in Piping and Instrumentation Diagrams. The procedure to insert the P&ID components is given next.

- Click on the Insert P&ID Components tool from the expanded Insert Components panel. The Insert Component dialog box with P&ID components will be displayed.
- Rest of the procedure is same as for Pneumatic components discussed earlier.

SYMBOL BUILDER

AutoCAD Electrical is a very flexible software which can fulfill the need of any designer in the field of electrical control panel designing. One of such example is creating your own symbols for use in drawing. It is not possible to add each and every symbol in the Content library of AutoCAD Electrical, so we need to add few symbols based on our needs. The procedure to add new symbols in library is given next.

• After starting a new document with ACAD Electrical IEC template, click on the Home tab of the **Ribbon**. The basic tools of AutoCAD will be displayed; refer to Figure-37.

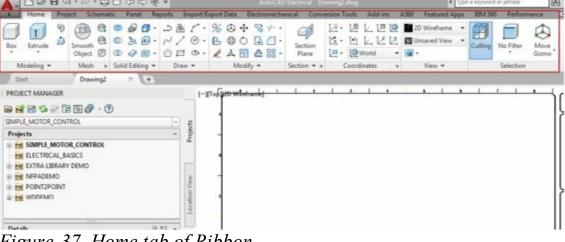


Figure-37. Home tab of Ribbon

• Using the tools in the Draw panel, create sketch for the desired symbol; refer to Figure-38.

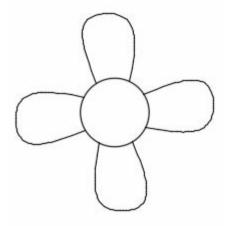


Figure-38. Sketch for symbol

- Click on the Schematic tab in the Ribbon to display tools related to schematics.
- Click on the **Symbol Builder** tool from the **Other Tools** panel in the **Ribbon**; refer to <u>Figure-39</u>. The **Select Symbol/Objects** dialog box will be displayed; refer to <u>Figure-40</u>.



Figure-39. Symbol Builder tool

lymbol to create or e	dit:		
lame: [<unnamed></unnamed>	Browse	
Select from drawing Objects		Attribute template Library path:	
Specify on sc	reen	C:\users\public\doc\jic125	e
		Symbol: Horizontal Parent	•
Insertion point		Type: (GNR) Generic	•
Specify on scr	een	Preview	
Pick point			
X: 0.0000			
Y: 0.0000			
Z: 0.0000			
		OK Cancel	Help

Figure-40. Select Symbol or Objects dialog box

• Click on the **Select objects** button from the dialog box; refer to Figure-41. You will be asked to select the objects.

Object		
Sp Sp	ecify on screen	
-	Select objects	
Nia ah	jects selected	
NO OD	Jects selected	

• Select all the objects from the drawing area; refer to Figure-42.

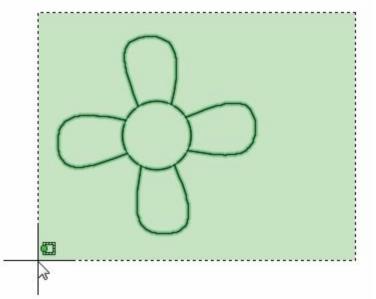
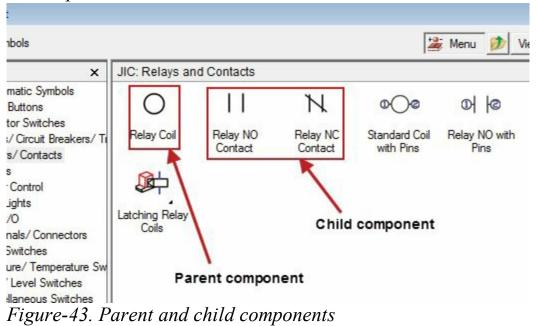


Figure-42. Objects being selected by window selection

- Press ENTER from keyboard, the objects will be displayed as selected.
- Similarly, click on the **Pick point** button is from the dialog box and specify the insertion point for symbol.
- Select the desired option from the Symbol drop-down in the dialog box. There are nine options in the drop-down, Horizontal Parent, Horizontal Child, Vertical Parent, Vertical Child, Horizontal Terminal, Vertical Terminal, Panel Footprint, Panel Nameplate, and Panel Terminal. The Horizontal and Vertical define the orientation of component. Parent means the component can have more child components; refer to Figure-43. Also, the tag are automatically assigned same for the child component as of parent component. To check this, insert a Relay coil in the schematic drawing and specify the parameters in the Insert/Edit Component dialog box. After that insert Relay NO Contact symbol and/or Relay NC Contact symbol; you will not be asked to specify any parameter. Similarly, you can specify the symbol as panel footprint, terminal, or nameplate.



- Select the type for symbol from the **Type** drop-down in the dialog box.
- Click on the **OK** button from the dialog box. The **Symbol Builder** contextual tab will be selected and the **Symbol Builder** environment will be displayed as shown in <u>Figure-44</u>.

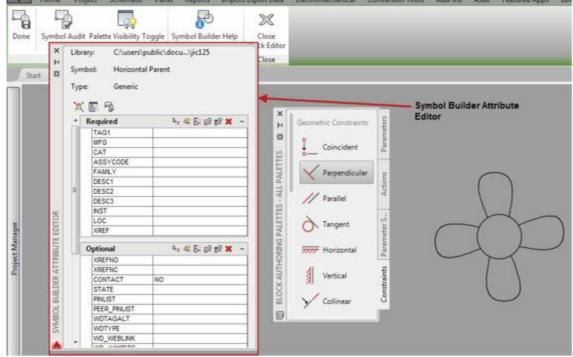


Figure-44. Symbol Builder environment

- Specify the parameters like Tag, Manufacturer, Category, Assembly code etc. in the **Required** rollout of the **Symbol Builder Attribute Editor**; refer to Figure-44.
- Similarly, specify other optional parameters as required.
- Click in the **Direction/Style** drop-down of **Wire Connection** rollout in the **Symbol Builder Attribute Editor**; refer to Figure-45. Select the desired orientation for wire connection from the list displayed. (We will select the **Radial/None** option from the list.)

Syr Tyr	nbol: Horizontal I	Iblic\docu\jic125 Parent NC	
	WD_WEBLINK WD_JUMPERS POS POS1		£ -
	RATING RATING1		6 -
ш	Wire Connection Direction / Style	-O Left/None	No
-	Pins Link Lines Direction Inserted Link Line	 Left / None Top / None Bottom / None Right / None Radial / None 	

Figure-45. Direction or Style drop-down

• Click on the **Insert Wire Connection** button from the **Wire Connection** rollout; refer to <u>Figure-46</u>. You are asked to specify a point on the object for wire connection.

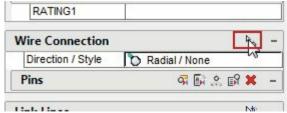


Figure-46. Insert Wire Connection button highlighted

• Click on the object to specify the point; refer to Figure-47.

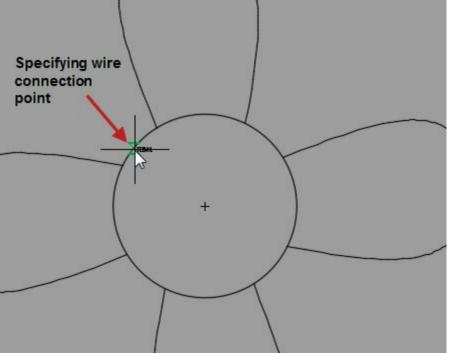


Figure-47. Specifying wire connection point

- Similarly, click to specify the second wire terminal and if the component is 3 Phase then specify third and fourth terminal.
- Press ENTER to exit the wire connection insertion mode. The defined terminals will be displayed in the **Pins** rollout; refer to <u>Figure-48</u>.

	XREFNC		
	CONTACT	NC	
	STATE	2	
	PINLIST		
	PEER_PINLIST		
	WDTAGALT		
	WDTYPE		
	WD_WEBLINK	Terminals defin	ned
	WD_JUMPERS		TENNUS
	POS		
	POS1		
	RATING		C - \
	RATING1		
	Wire Connection		b ₀ -
	Direction / Style	C Fadial / None	
m	Pins	💙 🖓 🕅 🚊	R 🗙 –
	O Radial		
	TERM01		TEXM35
	C Radial	2	
	L TERM02		
1	Link Lines		Ngi -

Figure-48. Terminals created

- Specify the desired label for TERM01 and TERM02, like you can specify TERM01 as Live and TERM02 as Neutral for connections in their corresponding boxes in the **Pin** rollout.
- Click on the **Done** button from the **Symbol Builder** contextual tab. The **Close Block Editor: Save Symbol** dialog box will be displayed; refer to <u>Figure-49</u>.

Symbol	ck	Base point
Orientation: Catalog lookup Symbol name: WDBLKNAM		Pick point X: 0.0000 Y: 0.0000 Z: 0.0000
Type: Contact: Unique identifier:	<not applicable=""></not>	Image Icon image
Symbol name: File path:	HDV1_002	Name (png) HDV1_002 File path:
C:\users\public\docu		OK No Cancel Help

Figure-49. Close Block Editor dialog box

- Click in the **Symbol name** edit box and specify the desired name for component. Like, we have specified name as fan.
- Click on the **OK** button from the dialog box. The **Close Block Editor** dialog box will be displayed; refer to <u>Figure-50</u>.

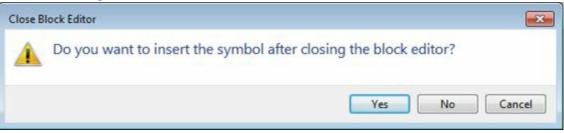


Figure-50. Close Block Editor dialog box

• Click on **Yes** button if you want to insert the newly created symbol in current drawing otherwise select the **No** button.

We have created a new symbol but if we look into the **Icon Menu**, the symbol is not displayed anywhere. The next step is to add the new symbol in Icon Menu.

ADDING NEW SYMBOL IN ICON MENU

• Click on the Icon Menu Wizard button from the Other Tools panel in the Schematic tab of the

Ribbon; refer to <u>Figure-51</u>. The **Select Menu file** dialog box will be displayed as shown in <u>Figure-52</u>.

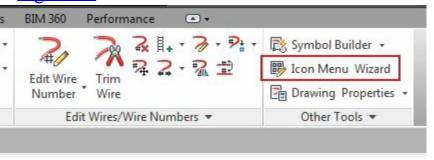


Figure-51. Icon Menu Wizard button

Select Menu file	—X —
ACE_JIC_MENU.DAT	Browse
Schematic Use default: ace_jic_menu.dat Panel Use default: ace_panel_menu.dat	
WD_MENU WD_PMENU OK Cancel	

Figure-52. Select Menu file dialog box

Click on the OK button from the dialog box. Note that you can select desired menu file by using the Browse button. By default, the default menu files are selected in the dialog box. On clicking OK button, the Icon Menu Wizard will be displayed as shown in Figure-53.

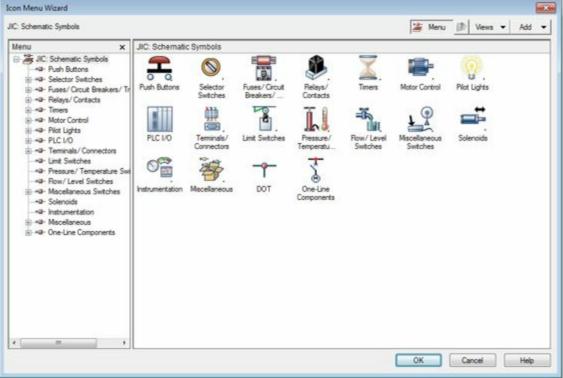


Figure-53. Icon Menu Wizard dialog box

• Click on the Add button top-right corner of the dialog box. A list of tools will be displayed; refer to <u>Figure-54</u>.

	Component	
	Command	- 8
	New circuit	
s	Add circuit	
	New submenu	

• Click on the **Component** option from the menu. The **Add Icon-Component** dialog box will be displayed; refer to Figure-55.

on Details		
Preview	Name:	
	Image file:	
		Browse
	Create PNG from current screen image Zoom <	Pick <
		Active
ock Name to I	nsert	
lock name		Browse
		Pick <
		Active

Figure-55. Add Icon-Component dialog box

- Specify the desired name for the symbol in the Name edit box.
- Click on the **Browse** button next to **Block name** edit box in the **Block Name to Insert** area of the dialog box. The Select File dialog box will be displayed; refer to <u>Figure-56</u>.

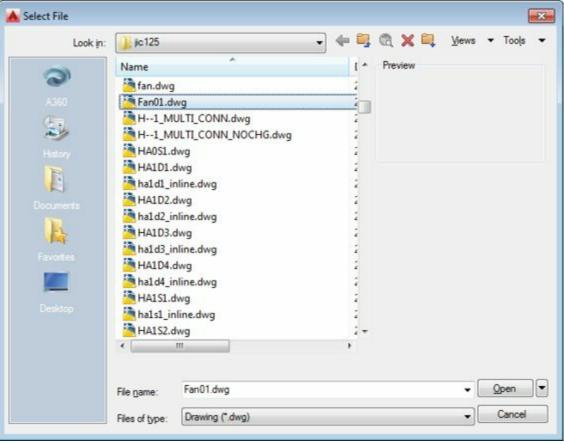


Figure-56. Select File dialog box

- Select the drawing file of the symbol earlier created and click on the **Open** button from the dialog box.
- Click on the **Pick** < button from the **Icon Details** area of the dialog box. You are asked to select the object for creating image.
- Select the sketch of symbol from the drawing area. Note that you must have the symbol drawing open in AutoCAD Electrical to select the sketch of symbol. Preview of symbol will be displayed in the dialog box; refer to <u>Figure-57</u>.

con Details			
Preview	Name:		
Q	Fan		
q٢	Im <mark>age file:</mark> fan		Browse
0	Create PNG from current screen image	Zoom <	Pick <
ocation: C:\U	sers\Gaurav\AppData\Roaming\Autodesk\AutoCAD Electric	cal 2Van.PNG	Active
llock Name to li	nsert		
lock name	C:\Users\Public\Documents\Autodesk\Acade 2016\Lt	hs\iic125\Fan01 dwg	Browse

• Click on the **OK** button from the **Add Icon - Component** dialog box. The Icon will be added in the **Icon Menu Wizard** dialog box; refer to <u>Figure-58</u>.

Menu x	JIC: Schemat	c Symbols						
JIC: Schematic Symbols 	PLC 1/0	Selector Switches Teminala/ Connectors	Fuse/Crout Breakers/ Umt Switches	Relaya/ Contacts Pressure/ Temperatu One-Line Components	Timers Timers Row/Level Switches Fan	Motor Control	Pilot Lights	

Figure-58. Icon added

• You can drag the new icon in the desired folder as per your requirement. Click on the **OK** button from the **Icon Menu Wizard** dialog box to save the icon in **Icon Menu**.

Now, you can use the new symbol in any of the electrical drawing as per your need.

SUMMARY

- AutoCAD Electrical provides us a complete database of electrical components.
- This electrical component database has data like manufacturer, assembly code, catalog etc. which helps to identify the real-world match of component in the industry.
- When we generate the Bill of Material later, the catalog data is taken into account.
- To represent the components, we use schematic symbols which are available by Icon Menu tool. These symbols are mapped to the Component database available in the Catalog Browser.
- You can add the components in database by using the Catalog Browser.

WIRES, CIRCUITS, AND LADDERS

CHAPTER 5

Topics Covered

The major topics covered in this chapter are:

- Inserting Wires
- Applying wire numbers
- Inserting user defined circuits
- Inserting ladders
- Cable Markers
- Circuit Builders

INTRODUCTION

In the previous chapter, we learned to insert various electrical components. These components individually placed do not perform any task. But if connect them in a desired manner then various components perform various tasks. In this chapter, we will learn to add wires. Later, we will learn to create circuits, multiple buses, and ladders.

WIRES

Wires are the life line of any circuit. Wires are used to carry current and make the appliances run. The tools to create wires are available in the **Wire** drop-down in the **Insert Wires/Wire Numbers** panel in the **Schematic** tab of the **Ribbon**; refer to <u>Figure-1</u>.

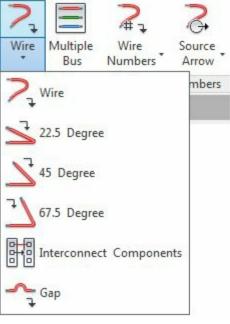


Figure-1. Wire drop-down

The tools in this drop-down are discussed next.

Wire

The **Wire** tool is used to add straight wires in the drawing to connect various components. The procedure to use this tool is given next.

• Click on the **Wire** tool from the **Wire** drop-down. The command prompt will be displayed as shown in <u>Figure-2</u>.



Figure-2. Command prompt for wire insertion

• Click in the **wireType** button in the command prompt or type **T** and press **ENTER** to change the wire type. The **Set Wire Type** dialog box will be displayed as shown in <u>Figure-3</u>.

	Used	Wire Color	Size	Layer Name	Wire Numbering	USER1	USER2	*
47	X	RED	2.5mm^2	RED_2.5mm^2	Yes			
48		RED	4.0mm^2	RED_4.0mm ²	Yes			
49		RED	6.0mm^2	RED_6.0mm^2	Yes			
50		TAN	0.5mm^2	TAN_0.5mm ²	Yes			
51		TAN	0.75mm^2	TAN_0.75mm^2	Yes			
52		TAN	1.0mm^2	TAN_1.0mm^2	Yes			
53		TAN	1.5mm^2	TAN_1.5mm^2	Yes			
54		TAN	10.0mm^2	TAN_10.0mm^2	Yes			-
55		TAN	16.0mm^2	TAN_16.0mm^2	Yes			E
56		TAN	2.5mm^2	TAN_2.5mm^2	Yes			
57		TAN	4.0mm^2	TAN_4.0mm ²	Yes			
58		TAN	6.0mm^2	TAN_6.0mm ²	Yes			
59		VIO	0.5mm^2	VIO_0.5mm^2	Yes			
60		VIO	0.75mm^2	VIO_0.75mm^2	Yes			
61		VIO	1.0mm^2	VIO_1.0mm^2	Yes			-
	1	1.00	1.2 12					
•					··· ·		•	

Figure-3. Set Wire Type dialog box

- Select the desired wire type from the list and click on the **OK** button from the dialog box. The selected wire will be set for insertion.
- Click in the drawing area to specify the start point of the wire. You will be asked to specify the end point of the wire and the command prompt will display as shown in <u>Figure-4</u>.

×	Specify wire start or [wireType/X=show connections]:X= Point or option keyword required. Specify wire start or [wireType/X=show connections]:	
	> Specify wire end or [V=start Vertical H=start Horizontal TAB=Collision off	
	Continue]:	Î

Figure-4. Command prompt after specifying start point

- If you are using the command prompt to specify the length of wire then you can use V=start Vertical or H=start Horizontal button in the command prompt to force AutoCAD Electrical draw only vertical or horizontal wires respectively.
- Click on the Tab=Collision off button to make the wires avoid collision with components. If you click again on this button then the wires will be able to pass through the components (at least in schematic drawings). Figure-5 shows two wirings one with collision OFF and one with collision ON.

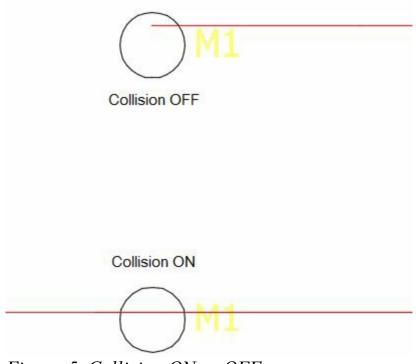


Figure-5. Collision ON or OFF

• Click to specify the end point of the wire. You can go on creating the wires until you end up at a connector of a component. From there you need to start a new wire.

22.5 Degree, 45 Degree, and 67.5 Degree

These tools are used to create wires at their set angles. The procedure to use these tools is given next.

- Click on the **22.5 Degree** or **45 Degree** or **67.5 Degree** tool from the **Wire** drop-down. You will be prompted to specify the starting point of the wire.
- Click at the desired point to start wire. You are asked to specify the end point of the wire.
- Click to specify the end point of the wire.

Interconnect Components

The **Interconnect Components** tool is used to interconnect two components with each other. The procedure to use this tool is given next.

- Click on the **Interconnect Components** tool from the **Wire** drop-down. You are asked to select the first component.
- Select the first component. You will be prompted to select the second component.
- Select the second component. The wire will be created connecting both the components; refer to <u>Figure-6</u>.

Note that the components to be connected using this tool should be aligned properly so that their connection points are in same orientation.



Figure-6. Components interconnected

Gap

This tool is used to create gap in the wiring where the two wires intersect each other. The procedure to use this tool is given next.

- Click on the **Gap** tool from the **Wire** drop-down. You are asked to select the wire that you want to be remained solid while applying this tool.
- Select the desired wire. You are asked to select the crossing wire.
- Select the intersecting wire. Gap in the wires will be created; refer to Figure-7.



Figure-7. Wires on using Gap tool

MULTIPLE BUS

The **Multiple Bus** tool is used to create multiple lines of wires. To create a multiple bus, follow the steps given next.

- Click on the Multiple Bus tool from the Insert Wires/Wire Numbers drop-down. The Multiple Wire Bus dialog box will be displayed as shown in <u>Figure-8</u>.
- Click in the Spacing edit boxes so specify the horizontal and vertical spacing between the wires.
- By default, the Another Bus (Multiple Wires) radio button is selected. As a result, you can create the multiple wires from a point on another wire.
- Select the **Empty Space**, **Go Horizontal** radio button or the **Empty Space**, **Go Vertical** radio button to create multiple wires in horizontal or vertical direction respectively.

Creating of Multiple Buses with various radio button

Multiple Wire Bus	X
Horizontal	Vertical
Spacing: ¹ / ₄ 10 ¹ / ₄	Spacing:
Starting at: Component (Multiple Wires) Another Bus (Multiple Wire) Empty Space, Go Horizont Empty Space, Go Vertical	al
4 Number of Wires	2 3 4 Cancel <u>H</u> elp

Figure-8. Multiple Wire Bus dialog box

Component (Multiple Wires)

- Select the Component (Multiple Wires) radio button from the Multiple Wire Bus dialog box.
- Click on the **OK** button from the dialog box. You are prompted to create a selection window to select the connection ports of devices.
- Select the connection ports that you want to use for creating multiple wire bus; refer to <u>Figure-9</u>. The selected ports will be highlighted as shown in <u>Figure-10</u>.



Figure-9. Window selection of ports



Figure-10. Connection ports highlighted

• Press ENTER at the command prompt. Wires will get attached to the cursor; refer to Figure-11.

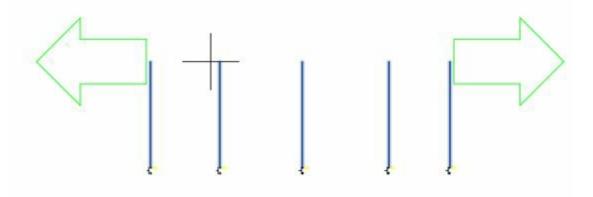


Figure-11. Wires attached to the cursor

• Click to specify the length of the wires. The multiple wire bus will be created.

Another Bus (Multiple Wires)

The Another Bus (Multiple Wires) radio button is used to create a multiple wire bus by using an already existing wire bus. The steps to use this option are given next.

- Select the Another Bus (Multiple Wires) radio button from the Multiple Wire Bus dialog box. Specify the number of wires in the Number of Wires edit box. Note that the number of wires should be equal to the wires in the already existing bus.
- Click on the **OK** button from the dialog box. You are asked to select a wire.
- Select the middle wire from the already existing wire bus. The ends of the current wire bus will get attached to the cursor; refer to Figure-12.

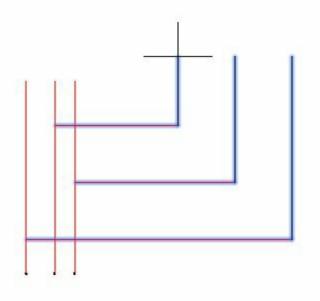


Figure-12. Wire bus from another wire bus

• Click to specify the end point of the wire bus.

Empty Space, Go Horizontal

The **Empty Space**, **Go Horizontal** radio button is used to create a multiple wire bus in horizontal direction starting from the specified start point. The steps to use this option are given next.

- Select the **Empty Space**, **Go Horizontal** radio button from the **Multiple Wire Bus** dialog box. Specify the number of wires in the **Number of Wires** edit box.
- Click on the **OK** button from the dialog box. You are asked to specify the starting point for the bus.
- Click in the drawing area. You are asked to specify the end point of the bus.
- Click to specify the end point.

Empty Space, Go Vertical

The **Empty Space**, **Go Vertical** radio button is used to create a multiple wire bus in vertical direction starting from the specified start point. The steps to use this option are given next.

- Select the **Empty Space**, **Go Vertical** radio button from the **Multiple Wire Bus** dialog box. Specify the number of wires in the **Number of Wires** edit box.
- Click on the **OK** button from the dialog box. You are asked to specify the starting point for the bus.
- Click in the drawing area. You are asked to specify the end point of the bus.
- Click to specify the end point.

LADDERS

In Electrical systems, multiple circuits that are powered by a common power source can be combined in the form of ladders. Ladders are arrangement of wire as shown in <u>Figure-13</u>.

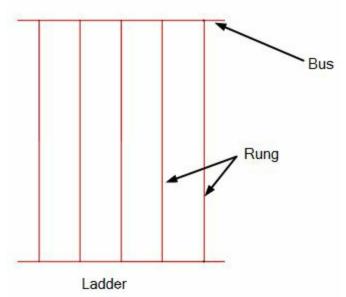


Figure-13. Ladder

Using these Ladders, the Ladder Diagrams are created which are backbone to PLCs in today's world. The tools to create and control ladders are available in the Ladder drop-down; refer to Figure-14. The procedures to use the tools in this drop-down are given next.

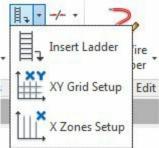


Figure-14. Ladder drop down

Insert Ladder

The **Insert Ladder** tool is used to insert the ladder of wires in the drawing. The procedure to use this tool is given next.

• Click on the **Insert Ladder** tool in the **Ladder** drop-down. The **Sheet 1: Insert Ladder** dialog box will be displayed as shown in <u>Figure-15</u>.

Sheet: 1 - Insert Ladder	
Width	Spacing
140	12
	1st Reference 1 Index Without reference numbers
Phase	Draw Rungs
1 Phase 3 Phase	 No Bus No Rungs Yes
10 Spacing	0 Skip ncel <u>H</u> elp

Figure-15. Sheet1 Insert Ladder dialog box

- Click in the edit box in Width area and specify the distance between two wire buses.
- Click in the edit box in **Spacing** area and specify the distance between two rungs.
- Click in the **Length** edit box and specify the total length of the ladder or click in the **Rungs** edit box and specify the number of rungs in the ladder. Note that you can specify the value in any one of the two edit boxes. Value in the other edit boxes will be calculated automatically.
- Select the desire number of phases for the ladder. If you select the **3 Phase** radio button from the **Phase** area then the ladder will be created with three phase wire lines and a value of distance between phase lines will be required in the **Spacing** edit box.
- You can skip the creation of bus or rung in the ladder by selecting the respective radio button from the **Draw Rungs** area of the dialog box.
- Click on the **OK** button from the dialog box to create the ladder.

XY Grid Setup

This tool is used to setup a grid of wires based on the specified values. This grid can be later used to connect various circuits. The procedure to use this tool is given next.

• Click on the **XY Grid Setup** tool from the **Ladder** drop-down. The **X-Y Grid Setup** dialog box will be displayed as shown in Figure-16.

X-Y Grid Setup		×
Origin Pick>> 87.274 X 100.394 Y	Spacing 10 Horizontal 10 Vertical	
X-Y format Horizontal-Vertical Vertical-Horizontal - Separator	Grid labels: 1st only or complete list (list: separate with commas A,B,C,D, 1) Horizontal
Insert X-Y grid labels Horizontal count 1 OK	Vertical count 1	

Figure-16. X-Y Grid Setup dialog box

- Click on the **Pick**>> button from the dialog box to specify the origin of the grid. You are prompted to pick a point in the drawing area.
- Click in the drawing area to specify the point.
- Specify the spacing between horizontal and vertical grid lines in the edit boxes available in the Spacing area of the dialog box.
- Select the desired radio button from the X-Y format area of the dialog box.
- Select the Insert X-Y grid labels check box to display the labels of the grid.
- After selecting the check box specify the horizontal and vertical counts in the respective edit boxes below the check box.
- Click on the **OK** button from the dialog box. The grid will be created; refer to Figure-17. Note that the grid created is for reference purpose. Using this grid, you can precisely place the components in the drawing.

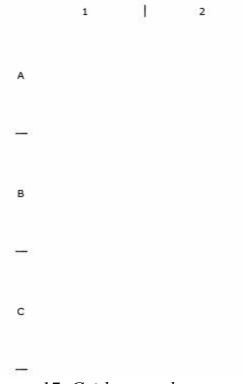


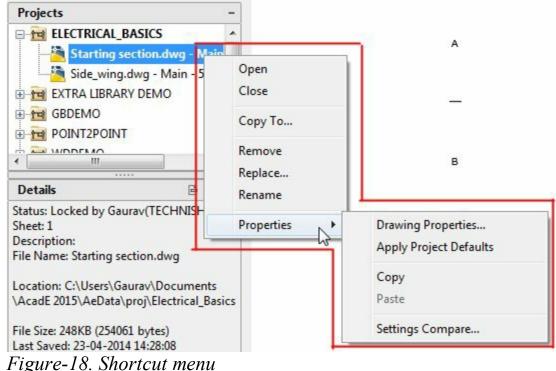
Figure-17. Grid created

X Zones Setup

The X Zones Setup tool is also used to create vertical references in the drawing for inserting components. Note that you can use either the X-Y Grid Setup tool or X Zone Setup tool. Before creating X zones, you need to enable this option. To enable this option, follow the steps given next.

1

• Right-click on the name of current drawing in the **Project Manager**. A shortcut menu will be displayed as shown in <u>Figure-18</u>.



T

3

• Move the cursor to **Properties** option in the shortcut menu. A cascading menu will be displayed.

• Click on the **Drawing Properties** option from the menu. The **Drawing Properties** dialog box will be displayed as shown in Figure-19.

Figure-19. Drawing Properties dialog box

awing Settings	Components	Wire Numbers	Cross-References	Styles	Drawing Form	nat
Drawing: C:\	Users\Gaurav\I		E 2015\AeData\proj	Electric	al_Basics\Sta	rting section.dwg
Drawing File						
Project:	ELECTRICAL	_BASICS				
Description 1:	I				- Pick	>>
Description 2: Pick>>						<>>
Description 3:					- Pick	<>>
For Refere	ence Only					
Installation Code	a :				Drawing	Project
Location Code:						
					Drawing	Project
Sheet Values			Section:	Ma	in	•
-			Sub-Section	: 5		•
Sheet: 1	2		300-360001			
			300-360001			

• Click on the Drawing Format tab in the dialog box. The options in the dialog box will be displayed as shown in <u>Figure-20</u>.

awing Settings Components Wire Numbers Cross	s-References Styles Drawing Format
	5\AeData\proj\Electrical_Basics\Starting section.dwg
Ladder Defaults	
Vertical	Width:
Horizontal	140
Spacing:	Multi-wire Spacing:
20	10
	T
Default: Insert new ladders without reference	95
Format Referencing	Scale
A B C	Feature Scale Multiplier:
X-Y Grid	1.0
X Zones	Inch
Reference Numbers	Inch scaled to mm
	Mm full size
Setup	Combined scale factor: 25.400000
	Wire connection "trap": 0.635000
Tag / Wire Number Order	Layers
Sort Order: No override	▼ Define

Figure-20. Drawing Properties dialog box with Drawing Format tab

- Select the X Zones radio button from the Format Referencing area of the dialog box.
- Note that you can also define the default direction of ladder creation by selecting the desired radio button from the Ladder Defaults area of the dialog box.
- Click on the OK button from the dialog box to apply the specified settings.

Now, we have enabled the **X Zones Setup** tool and we can use it in our drawing. The procedure to use the **X Zones Setup** tool is given next.

• Click on the X Zones Setup tool from the Ladder drop-down in the Insert Wires/Wire Numbers panel in the Ribbon. The X Zones Setup dialog box will be displayed as shown in <u>Figure-21</u>.

Drigin Pick>> 86.89 X 122.006 Y 2 2	Horizontal
86.89 X 122.006 Y	Horizontal
86.89 X	
Zone labels: Enter 1st only or complete list	
if list: separate with commas, ex: 10-1,10-2,10-3,)	
1 Horizonta	al

Figure-21. X Zones Setup dialog box

- Click on the **Pick**>> button from the **Origin** area of the dialog box. You are prompted to select a point in the drawing area to specify the origin.
- Click on the desired point in the drawing area.
- Click in the **Horizontal** edit box in the **Spacing** area of the dialog box and specify the desired distance value.
- Select the Insert zone labels check box to include the labels on the zone.
- Click on the **OK** button from the dialog box. The X zone will be created; refer to Figure-22.



Figure-22. X zones

When we work on real world projects of electrical systems, then we generally require references to insert our components. At the time, XY grids and X Zones are required to create references.

WIRE NUMBERING

Wire numbering is an important aspect of wires. Wire number helps to identify circuits related to that wire, components connected to that wire, total length of the wire and other details. The tools to specify wire numbers are available in the **Wire Numbers** drop-down in the **Insert Wires/Wire Numbers** panel. There are three tools in this drop-down; **Wire Numbers**, **3 Phase**, and **PLC I/O**.

Refer to Figure-23. These tools are discussed next.

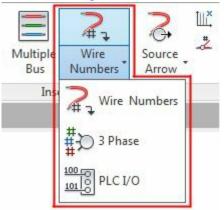


Figure-23. Wire Numbers drop-down

Wire Numbers

This tool is used to specify the wire number for individual wires or project wide. The procedure to use this tool is given next.

• Click on the **Wire Numbers** tool from the **Wire Numbers** drop-down. The **Sheet1 - Wire Tagging** dialog box will be displayed as shown in <u>Figure-24</u>.

Sheet 1 - Wire Tagging		×
To do Tag new/un-numbered only Tag/retag all	Wire tag mode Sequential Start Increment	Format override Number of the tag format Use wire layer format overrides
 ✓ Cross-reference Signals ✓ Freshen database (for Signals) 	XZones	Setup
Project-wide	Pick Individual Wires Cancel	Help Drawing-wide

Figure-24. Sheet1 Wire Tagging dialog box

- Click in the **Start** edit box in the **Wire tag mode** area and specify the starting number for wire tagging(numbering).
- Select the **Tag new/un-numbered only** radio button if you want to specify the wire number to unnumbered wires only otherwise leave on the default.
- Click on the **Setup** button from the dialog box to specify the format of wire numbering. The **Assign Wire Numbering Formats by Wire Layers** dialog box will be displayed as shown in <u>Figure-25</u>.

Vire Layer	Wire Number Format	Sequential start %N	Suffix List	
none-				
List	Wire laye			
List Default	Wire layer (wild card	rname		
	Wire layer (wild card	r name Is OK) number format for layer %N part)		

Figure-25. Assign Wire Numbering Formats by Wire Layers dialog box

• Click on the List button in this dialog box. The Select Wire Layer dialog box will be displayed; refer to Figure-26.

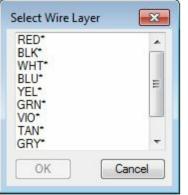


Figure-26. Select Wire Layer dialog box

- Select the desired color layer for the wire.
- Click on the **OK** button from the **Select Wire Layer** dialog box.
- Click on the three **Default** buttons one by one to specify the default values in the related fields.
- Click on the Add button from the dialog box, the wire numbering format will be added.
- Click on the **OK** button from the dialog box.
- Now, we are ready to use this layer format in our wire numbering. So, select the Use wire layer format override check box.
- If you want to apply the wire numbering individually to each wire then click on the **Pick Individual Wires** button from the dialog box. You are prompted to select the wires.
- Select the wires one by one and press ENTER. The numbering will be assigned to the wires; refer to Figure-27.

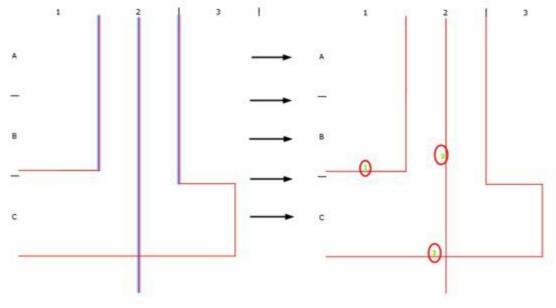


Figure-27. Wire numbering

3 Phase

This tool is used to number three phase wiring. The procedure to use this tool is given next.

• Click on the **3 Phase** tool from the **Wire Numbers** drop-down in the **Ribbon**. The **3 Phase Wire Numbering** dialog box will be displayed as shown in <u>Figure-28</u>.

Prefix:	Base:	Suffix:	Wire Numbers:
			1L1 1L2 1L3
hold	hold) hold	113
increment	increment	increment	
List	< >	List	
	Pick		
			Maximum:
			3 0 4 0 None
	ОК	Cancel	Help

Figure-28. 3 Phase Wire Numbering dialog box

- Specify the desired values in the Prefix, Base, and Suffix edit boxes.
- Select the desired radio button from the **Maximum** area of the dialog box. If you have 3 wires in the connection then select **3** radio button and if you have 4 then select the **4** radio button.
- Click on the **OK** button from the dialog box. You are asked to select first wire of the 3 phase line.
- Select the respective wire. You are asked to select the second wire.
- Select the second wire and similarly select the third wire.
- After selecting the third wire, the dialog box will be displayed again. Keep on selecting the individual wire that you want to be numbers.

• After numbering, click on the Cancel button from the dialog box to exit.

PLC I/O

This tool is used to number the input and output ports of the PLC. The procedure to use this tool is given next.

• Click on the PLC I/O tool from the Wire Numbers drop-down in the Ribbon. The PLC I/O Wire Numbers dialog box will be displayed as shown in <u>Figure-29</u>.

PLC I/O Wire N	umbers	
I/O Wire Tag Fo	mat 📶	
Predefined	"I:%n" (Example "I:10100")	
	"0:%n" (Example "0:255")	
ОК	Cancel <u>H</u> elp	

Figure-29. PLC I O Wire Numbers dialog box

- Specify the desired tag format for the PLC I/O. The % codes have already been discussed.
- Click on the **OK** button from the dialog box. You are prompted to select the PLC.
- Select a PLC, you are asked to select the wires connected to the PLC.
- One by one select the wires that are connected to the PLC.
- The tags defined as per the PLC are extracted and applied to the wires; refer to Figure-30.

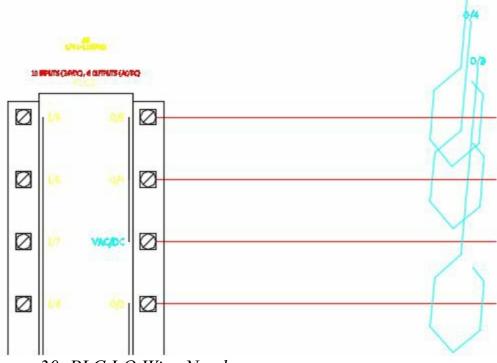


Figure-30. PLC I O Wire Numbers

WIRE NUMBER LEADERS AND LABELS

In the previous figure, the wire number leaders are assigned automatically. We can modify the wire number leaders and we can assign the labels as per our need. The tools to do so are available in the

Wire Number Leader drop-down; refer to Figure-31.

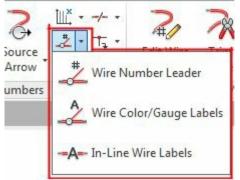


Figure-31. Wire Number Leader drop down

The procedure to use the tools in this drop-down is discussed next.

Wire Number Leader

The Wire Number Leader tool is used to assign leader to a wire number. The procedure to use this tool is given next.

• Click on the **Wire Number Leader** tool from the **Wire Number Leader** drop-down in the **Ribbon**. You will be prompted to select a wire number; refer to <u>Figure-32</u>.

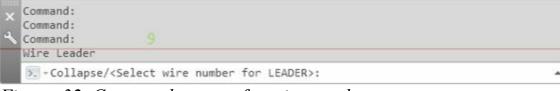


Figure-32. Command prompt for wire numbers

• Select the desired wire number from the drawing. You will be prompted to specify the point for leader end point; refer to Figure-33.

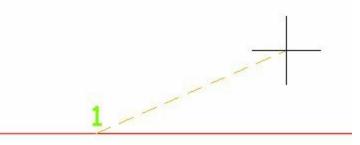


Figure-33. After selecting wire number

- Click on the drawing area to specify the end point of the wire number leader. You will be prompted to specify the next point of the leader.
- Click in the drawing area to specify the point or press ENTER. The wire number leader will be assigned; refer to Figure-34.

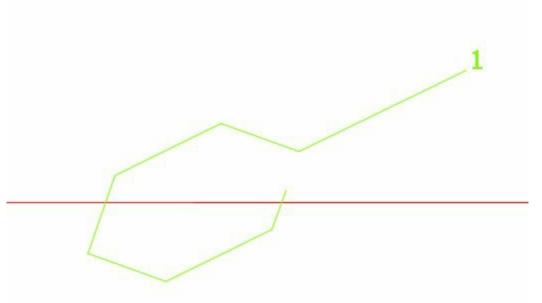


Figure-34. Wire number leader assigned

• Similarly, you can assign leaders to other wire numbers.

Wire Color/Gauge Labels

This tool is used to attach the wire color and/or gauge labels to the wires so that we can easily identify the wires in the circuit. The procedure to use this tool is given next.

- Click on the Wire Color/Gauge Labels tool from the Wire Number Leader drop-down in the Ribbon. The Insert Wire Color/Gauge Labels dialog box will be displayed as shown in Figure-35.
- Click on the **Setup** button to specify the settings. The **Wire label color/gauge setup** dialog box will be displayed as shown in <u>Figure-36</u>.



Figure-35. Insert Wire Color or Gauge Labels dialog box

/ire label color/gaug	e setup		×
Wire Line Layers - Col	or/Gauge Label	Mapping	
File: C:\Users\Gaurav	VA\Support\us	ser\default.wdw	
Wire Layer Name	Color/Ga	auge label	
WHT_12_THHN RED_14_THHN BLK_12_THHN YEL_14_THHN 1- BRN_ GRY_2.5MM^2	#12AWG #14AWG #12AWG #14AWG	RED BLK	•
To and down different and all			
To add/modify the det select the layer name To add new wire layer Wires > Create/Edit W Leader	rom the list abov names, select		
select the layer name To add new wire layer Wires > Create/Edit V	rom the list abov names, select		
select the layer name To add new wire layer Wires > Create/Edit W Leader 2.5 Text Size 2 Arrow Size 1 Leader/Gap Text size follows DIM	rom the list abov names, select lire Type size XT	Arrow Type Closed Filled Closed Blank Closed Dot Architectural Tick	•
select the layer name To add new wire layer Wires > Create/Edit W Leader 2.5 Text Size 2 Arrow Size 1 Leader/Gap Text size follows DIM Arrow size follows DIM	rom the list abov names, select /ire Type o size XT ASZ	Arrow Type Closed Filled Closed Blank Closed Dot	
select the layer name To add new wire layer Wires > Create/Edit W Leader 2.5 Text Size 2 Arrow Size 1 Leader/Gap Text size follows DIM Arrow size follows DIM	rom the list abov names, select lire Type size XT	Arrow Type Closed Filled Closed Blank Closed Dot Architectural Tick	

Figure-36. Wire label color or gauge setup dialog box

- Specify the desired settings in the dialog box and click on the **OK** button from the dialog box.
- Click on the **Manual** button from the dialog box to manually assign the color/gauge labels. Note that you can assign the labels with leaders or without leaders by selecting the **Manual** button from the respective area.
- Click on the Auto Placement button to automatically place the color/gauge labels.
- After selecting the desired button, click on the wire and follow the instructions given by system. Press ENTER to create the labels. The labels will be attached to the wires; refer to <u>Figure-37</u>.

RED_2.5	MM^2
R	ED_2.5MM^2
	RED_2.5MM^2

Figure-37. Wire labels

In-Line Wire Labels

The previous tool is used to insert labels aside the wires. The In-Line Wire Labels tool is used to insert the in-line wire labels. The labels can include informations like color, gauge, and so on. The procedure to use this tool is given next.

• Click on the In-Line Wire Labels tool from the Wire Number Leader drop-down. The Insert Component dialog box will be displayed; refer to Figure-38.

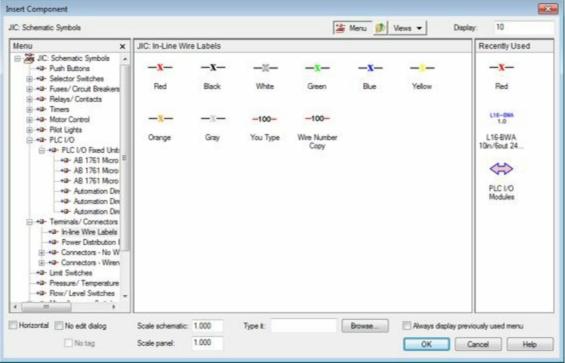


Figure-38. Insert Component dialog box

- Select the desired symbol from the dialog box. You will be prompted to specify the insertion point for the symbol.
- Click on the wire to insert the label. The label will be inserted; refer to Figure-39.



Figure-39. In-Line label

MARKERS

The markers are used to mark the wires for categorizing them. The tools to apply marks are available in the **Cable Markers** and **Insert Dot Tee Markers** drop-down. The procedure to use all these tools are similar. These procedures are discussed next.

Cable Markers

This tool is used to insert cable markers. The procedure is given next.

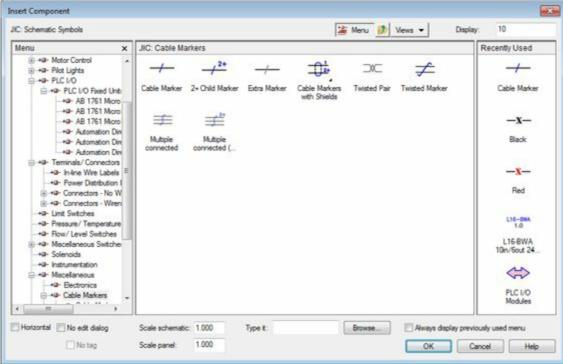


Figure-40. Insert Component dialog box with cable markers

• Click on the desire symbol and then click on the wire to place the symbol. The Insert/Edit Cable Marker (Parent wire) dialog box will be displayed as shown in <u>Figure-41</u>.

Cable Tag	Description
CBL2	Line 1
Use PLC Address	Line 2
Use End Locations	Line 3
Tags: Used so far	List: Drawing Project Defaults Pick
External List	
Wire Color/ID	
D Generic	Child conductor references
	Component override Setup
Drawing Project	Cross Reference
Catalog Data	· · · · · · · · · · · · · · · · · · ·
Manufacturer	
Catalog	Installation code
Catalog	Installation code
Assembly	Installation code Drawing Project
Assembly Count	
Assembly	Drawing Project
Assembly Count	Drawing Project Location code
Assembly Count Next>> 2	Drawing Project
Assembly Count Next>> 2 Lookup Preylous	Drawing Project

Figure-41. Insert or Edit Cable Marker dialog box

• Specify the parameters as desired and click on the **OK** button from the dialog box. The **Insert Some Child Components** dialog box will be displayed; refer to <u>Figure-42</u>.

Insert Some Child Components?	×
You can automatically insert child components that are tied to this parent. Select OK to insert child components now.	
V Hide Tag text	
Hide Location text	
V Hide Description text	
OK Insert Child	Close

Figure-42. Insert Some Child Components dialog box

- If you want to insert child components then click on the **OK Insert Child** button otherwise click on the **Close** button from the dialog box.
- If you click on the **OK Insert Child** button then you need to click on the child wires and specify the tags as desired.

Multiple Cable Markers

The Multiple Cable Markers tool is used to insert multiple cable markers in the drawing. The procedure to use this tool is given next.

• Click on the Multiple Cable Markers tool from the Cable Markers drop-down. The Multiple

Cable Markers dialog box will be displayed as shown in Figure-43.

Multiple Cable Markers
Extract wires for:
Project
 Active drawing (all)
 Active drawing (pick)
List 2 I Freshen wire connection table
Format
OK Cancel <u>H</u> elp

Figure-43. Multiple Cable Markers dialog box

• Select the desired radio button from the dialog box and click on the **OK** button from the dialog box. The cable markers will be inserted automatically.

Insert Dot Tee Markers

The **Insert Dot Tee Markers** tool is used to insert dot tee mark on the wire. The procedure to use this tool is given next.

- Click on the **Insert Dot Tee Markers** tool from the **Insert Dot Tee Markers** drop-down in the **Ribbon**. You will be prompted to click on the wire to create the dot tee mark.
- Click on the wire at desired point. The dot tee mark will be created; refer to Figure-44.



Figure-44. Dot tee mark

Insert Angled Tee Markers

The **Insert Angled Tee Markers** tool is used to convert the tee mark into an angles tee mark. The procedure to use this tool is given next.

- Click on the **Insert Angled Tee Markers** tool from the **Insert Dot Tee Markers** drop-down. You will be prompted to select the tee of wires.
- Click on the tee, it will be converted to angled tee mark; refer to Figure-45.

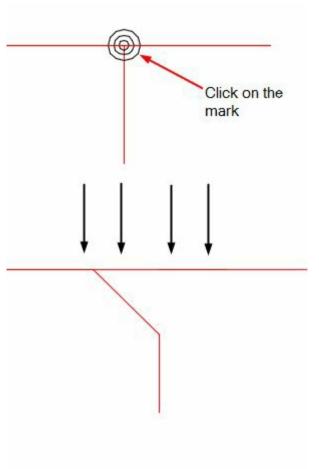


Figure-45. Angled tee

CIRCUIT BUILDER

The **Circuit Builder** tool is used to insert circuits in the drawing. The procedure to use this tool is given next.

• Click on the **Circuit Builder** tool from the **Circuit Builder** drop-down in the **Insert Components** panel in the **Ribbon**; refer to <u>Figure-46</u>. The Circuit Selection dialog box will be displayed as shown in <u>Figure-47</u>.

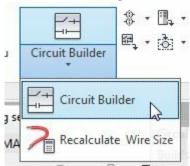


Figure-46. Circuit Builder tool

rcuits:			
- Gircuit	R - non reversing - reversing	g	E
Horizontal - FV Horizontal - Du Vertical - FVNF Vertical - FVR -	NR - non reversin R - reversing al FVNR - non rev R - non reversing	versing	-
Horizontal - FV Horizontal - Du Vertical - FVNF Vertical - FVR Vertical - Dual	NR - non reversing R - reversing al FVNR - non rev R - non reversing reversing FVNR - non rever	versing	•
Horizontal - FV Horizontal - Du Vertical - FVNF Vertical - FVR Vertical - Dual	NR - non reversin R - reversing al FVNR - non rev R - non reversing - reversing	versing sing	•
Horizontal - FV Horizontal - Du Vertical - FVNF Vertical - FVR Vertical - Dual	NR - non reversing R - reversing al FVNR - non rev R - non reversing reversing FVNR - non rever	versing sing Special Annotation	+ List
Horizontal - FV Horizontal - Du Vertical - FVNF Vertical - FVNF Vertical - Dual Scale Circuit scale:	NR - non reversin R - reversing al FVNR - non rev R - non reversing reversing FVNR - non rever	versing sing Special Annotation (None	List
Horizontal - FV Horizontal - Du Vertical - FVNF Vertical - FVNF Vertical - Dual Scale Circuit scale: Component scale:	NR - non reversin R - reversing al FVNR - non rev R - non reversing reversing FVNR - non rever	versing sing Special Annotation	

Figure-47. Circuit Selection dialog box

- Select the desired circuit from the list.
- Click in the edit boxes of Scale area and specify the scale values for circuits and components.
- Specify the spacing between rungs in the **Rung Spacing** area.
- Select the desired radio button from the Special Annotation area of the dialog box.
- Click on the **Insert** button from the dialog box. You will be prompted to specify the insertion point of the circuit.
- Click to specify the insertion point, the circuit will be placed; refer to Figure-48.

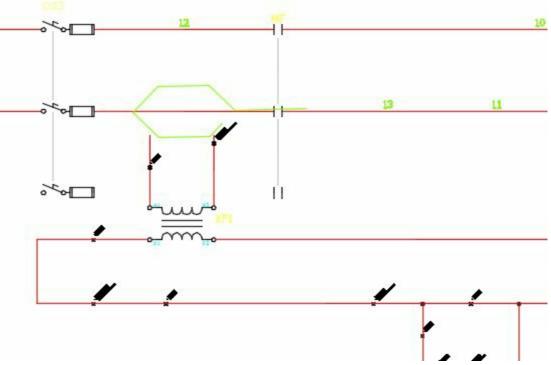


Figure-48. Circuit inserted

PRACTICAL

In this practical, we will create the circuit diagram of an electrical system; refer to Figure-49.

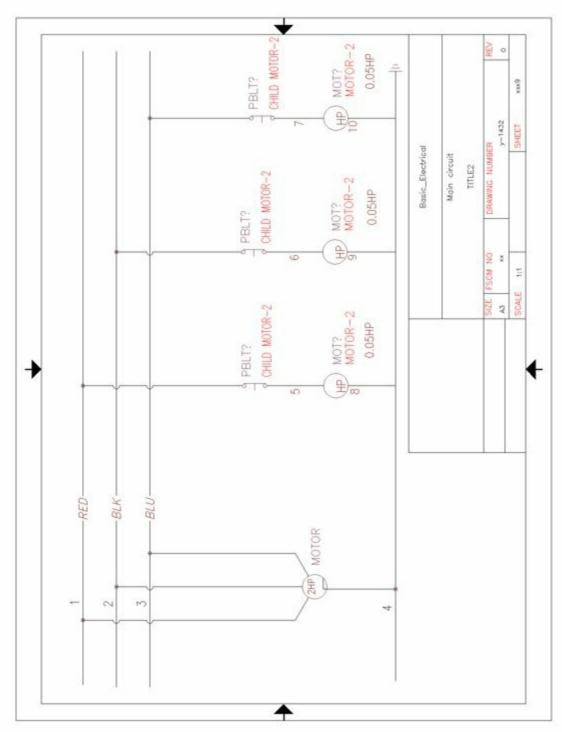


Figure-49. Practical

Starting a New drawing

• Start AutoCAD Electrical and Click on the down arrow below Start Drawing button. A list of templates will be displayed; refer to Figure-50.

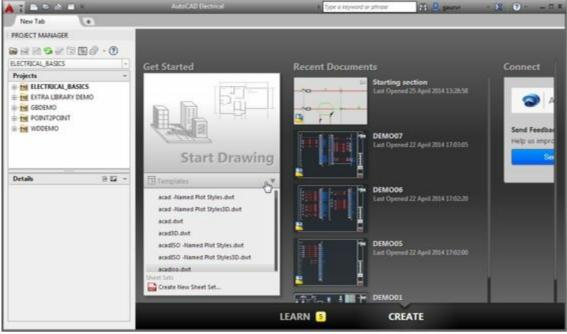


Figure-50. Templates of drawings

• Click on the ACE ANSI A(Landscape) Color.dwt template from the list of templates. A new drawing will open with the selected template; refer to Figure-51.

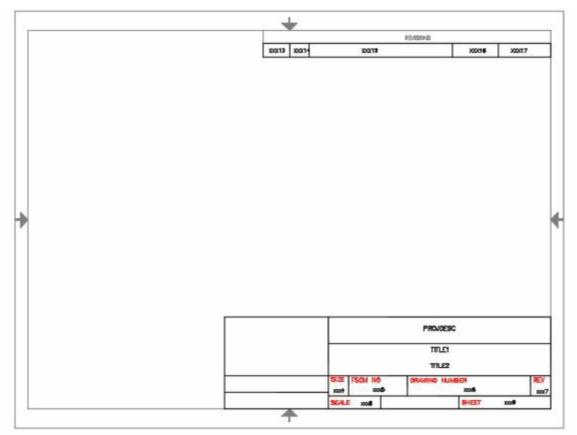


Figure-51. Drawing opened with the template

Editing Title Block

• Double-click on the title block at the bottom right corner. The **Enhanced Attribute Editor** dialog box will be displayed; refer to <u>Figure-52</u>.

Block: ANSI_tblock_desc_A(L) Tag: PROJDESC			Select block	
Attribute	Text Options	Properties		
Tag	Pro	mpt	Value	
PROJ	DESC		PROJDESC	E
TITLE	1		TITLE1	
TITLE	2		TITLE2	
SIZE			xxxx4	-
FOOM			E	
	Value: PROJU)ESC		

Figure-52. Enhanced Attribute Editor dialog box

- Select the desired tag from the list and specify the respective value.
- Click on the **OK** button from the dialog box to exit.

Creating Wires

• Click on the Multiple Bus tool from the Insert Wires/Wire Numbers panel in the Ribbon. The Multiple Wire Bus dialog box will be displayed as shown in <u>Figure-53</u>.

Multiple Wire Bus	×
Horizontal	Vertical
Spacing:	Spacing:
10 4	10
Starting at:	
Component (Multiple V	Vires)
Another Bus (Multiple)	Wires)
Empty Space, Go Hori	zontal
C Empty Space, Go Vert	ical
4 Number of Wire:	s 2 3 4
ОК	Cancel <u>H</u> elp

Figure-53. Multiple Wire Bus dialog box

- Specify the spacing as **0.5** in both the **Spacing** edit boxes.
- Select the Empty Space, Go Horizontal radio button from the dialog box.
- Click on the **3** button to specify the number of wires as **3**.
- Click on the **OK** button. You are asked to specify the starting point of the wire bus.
- Click on the drawing area and create the wire bus as shown in <u>Figure-54</u>.

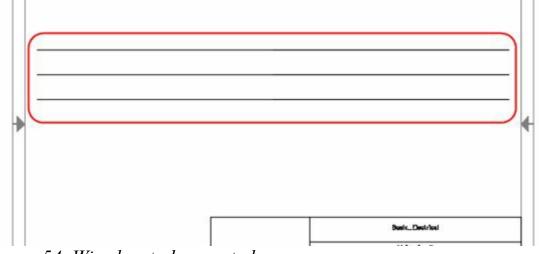


Figure-54. Wire bus to be created

• Similarly, create two more buses each having 3 wires with proper spacing; refer to Figure-55.

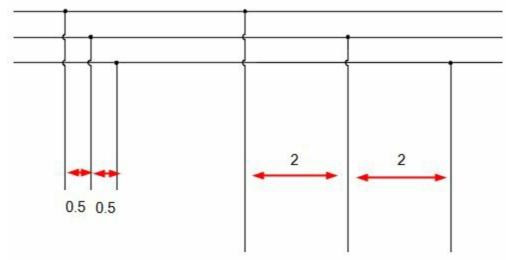


Figure-55. Other two wire buses

• Click on the **Wire** tool from **Insert Wires/Wire Numbers** panel and create a wire for earth; refer to <u>Figure-56</u>.

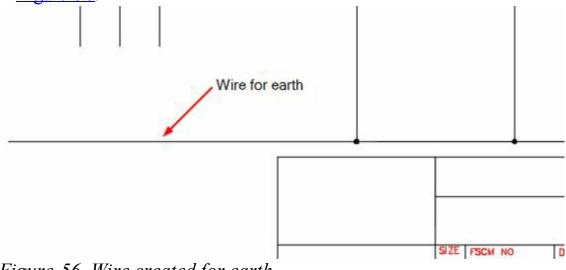


Figure-56. Wire created for earth

Assigning Numbers and Labels to Wires

• Click on the In-Line Wire Labels tool from the Wire Number Leader drop-down; refer to Figure-

57. The Insert Component dialog box with wire labels will be displayed; refer to Figure-58.

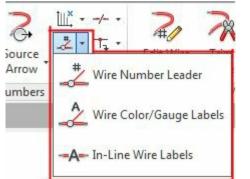


Figure-57. Wire Number Leader drop down

tenu × Har Push Buttons Har Push Buttons Har Push Buttons Har Push Selector Switches Har Relays/Contacts Har Relays/Contacts Har Timers	JIC: In-Line W	re Labels	-2-				Recently Used
+@- Push Buttons = +@- Selector Switches = +@- Fuses/ Circuit Breakers = +@- Relays/ Contacts = +@- Timers		-x-	-10-				
+a- Timers		Black	White	-x-	-x- Blue	Yelow	x Red
+Q- Motor Control	- <u>x</u>	<u>-x</u> -	-100-	-100-			L16-08A
+4a- Pilot Lights -4a- PIC L/O +4a- PIC L/O +4a- AB 1751 Micro -4a- Automation Dir -4a- Connectors -4a- In-line Wire Labels -4a- Connectors - No W -4a- Connectors - No W -4a- Connectors - Wiren -4a- Row/ Level Switches -4a- Row/ Level Switches -4a- Row/ Level Switches	Orange	Gray	You Type	Wire Number Copy			L16-BWA 10h/fout 24 PLC I/O Modules
Horizontal 📃 No edit dialog	Scale schematic	1.000	Type it:		Browse	Always display	previously used menu

Figure-58. Insert Component dialog box

- Select the Red symbol from the dialog box and click on the top wire to specify its color code.
- Similarly, set the middle and bottom wire as **Black** and **Blue** respectively; refer to Figure-59. Note that by default, the tags on wires are displayed in yellow color. To change the color, double click on the color name in the label. The **Enhanced Attribute Editor** dialog box will be displayed; refer to Figure-60.

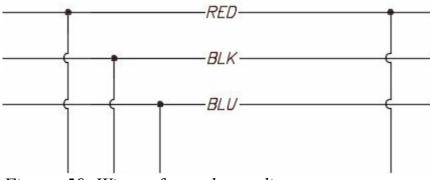


Figure-59. Wires after color coding

	k: HT0_LGE g: COLOR	INERIC		Select block
Attribute	Text Option	ns Properties		
Tag	F	rompt	Value	*
X4_T	INY_D L	eave <mark>d</mark> ot value inta		
COLC			RED	=
	RM01			
X4TE	RM01			-
	Value: REC			

Figure-60. Enhanced Attribute Editor dialog box for color

- Click on the **Properties** tab and change the color of layer as per your requirement.
- Click on the **OK** button from the dialog box.
- Click on the **Wire Numbers** tool from the **Wire Numbers** drop-down. The **Sheet1 Wire Tagging** dialog box will be displayed as shown in <u>Figure-61</u>.

Sheet 1 - Wire Tagging To do	Wire tag mode	Format override
 Tag new/un-numbered only Tag/retag all 	Sequential Sequential Increment	%N Wire tag format Image: Second state Image: Second state
Cross-reference Signals	XZones	Setup
V Freshen database (for Signals)		Insert as Fixed
Project-wide	Pick Individual Wires Cancel	Help Drawing-wide

Figure-61. Sheet1 Wire Tagging dialog box

• Click on the **Drawing-wide** button from the dialog box. The wire numbers will be assigned to the wires; refer to <u>Figure-62</u>.

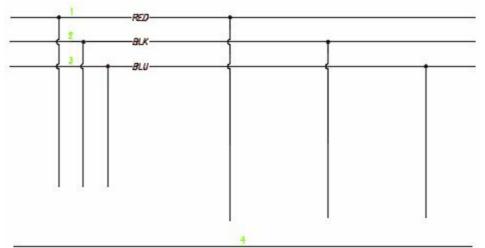


Figure-62. Wire numbers assigned to the wires

• You can change the color of wire numbers as we did for the wire labels.

Inserting 3 Phase Motor

- Click on the Catalog Browser button from the Components drop-down; refer to Figure-63. The CATALOG BROWSER will be displayed.
- Click in the Category drop-down and select the MO (Motors) option from the list.
- Click in the Search edit box and specify 4-Pole in it.
- Click on the **Search** button. The list of motors in the catalog will be displayed as shown in <u>Figure-64</u>.

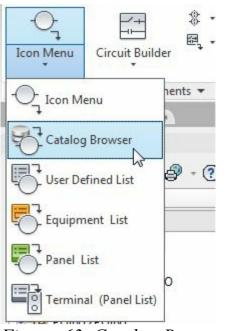


Figure-63. Catalog Browser button

arch:	4-POLE				* Q
esults					* /
	TYPE	HP	VOLTAGE	MISCELLANEOUS1	
	AC MOTOR	1.5HP	400VAC	4-POLES, 400VAC STAR 50Hz, 1410 RPM, FRAME 90S,	BASIC DESIC *
0	AC MOTOR	2HP	400VAC	4-POLES, 400VAC DELTA 50Hz, 1420 RPM, FRAME 90L	BASIC DES
	AC MOTOR	2HP	400VAC	4-POLES, 400VAC STAR 50Hz, 1420 RPM, FRAME 90L, I	BASIC DESIG
1	AC MOTOR	2.5HP	400VAC	4-POLES, 400VAC DELTA 50Hz, 1390 RPM, FRAME 90L	HIGH-OUT
11	AC MOTOR	2.5HP	400VAC	4-POLES, 400VAC STAR 50Hz, 1390 RPM, FRAME 90L, I	HIGH-OUTF
12	AC MOTOR	2 QHP	ANNVAC	4-POLES ANTVAC NELTA SOLA INA ROM FRAME ON	R HIGH-OI

Figure-64. Catalog Browser with list of motors

• Select the Motor as highlighted in the red box in above figure. The panel of buttons will be displayed; refer to Figure-65.

TYPE	HP	VOLTAGE	MISCELLANEOUS1
AC MOTOR	1.5HP		L. course, 400VAC STA
AC MOTOR	2HP	약 🖀 🕻	a 🚯 5, 400VAC DEL
AC MOTOR	2HP	400VAC	4-POLES, 400VAC STA
AC MOTOR	2.5HP	400VAC	4-POLE 400VAC DEL
AC MOTOR		1000110	A DOLEG ADDUAG CTA

Figure-65. Panel of buttons

• Click on the Sutton. The Insert Component dialog box will be displayed; refer to Figure-66.

Schematic Symbols					Menu	news • Us	play: 10
lenu ×	JIC: Schematic	Symbols					Recently Used
JC: Schematic Symbols -40 - Push Buttons -40 - Push Buttons -40 - Push Buttons -40 - Fuses/ Crout Breakers/ Tr -40 - Houses/ Crout Breakers/ Tr -40 - Houses/ Crout Breakers/ Tr -40 - Phot Lights -40 - Photoclareous Switches -40 - Solenoids -40 - Macelaneous -40 - One-Line Components	Push Buttons Pilot Lights Miscellaneous Switches	Selector Switches PLC I/O	Fuses/ Circuit Breakens/	Relays/ Cortects Limit Switches	Timers Pressure/ Temperatu DOT	Motor Control Row/ Level Switches	
Vertical	Scale schematic:	1.000	Type t:	(Browse	🕅 Always display pr	reviously used menu

Figure-66. Insert Component dialog box by default

• Select the **Motor Control** category from the menu and select the icon highlighted by the cursor; refer to <u>Figure-67</u>.

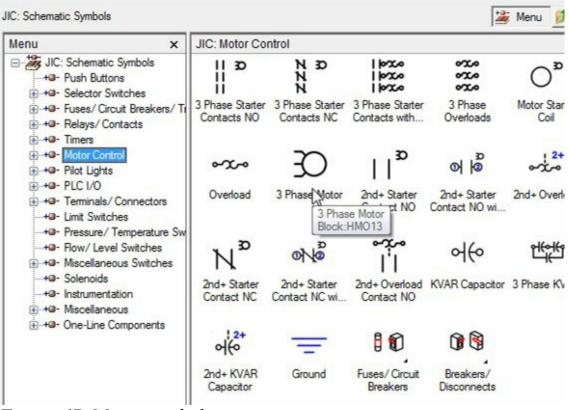


Figure-67. Motor symbol

• On doing so, the Assign Symbol To Catalog Number dialog box will be displayed; refer to Figure-68.

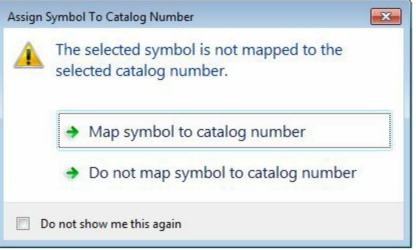
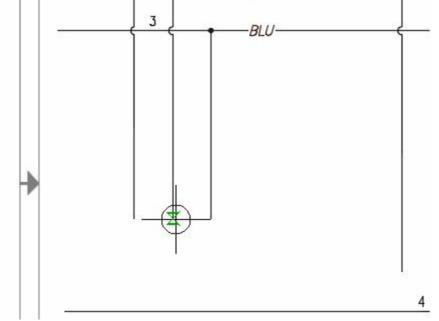
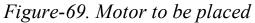


Figure-68. Assign Symbol To Catalog Number dialog box

- Click on the Map symbol to catalog number button. The symbol will get attached to cursor.
- Click on the middle wire as shown in Figure-69. The motor will get attached to the three wires automatically and the Insert / Edit Component dialog box will be displayed as shown in Figure-70.





omponent Tag	Description
NOT? fixed	Line 1
Use PLC Address	Line 2
ags	Line 3
sed: Panel	List: Drawing Project Defaults Pick
External List	
Options	Cross-Reference
atalog Data	Component override Setup
lanufacturer ABB	Reference NO NO/NC Setup
atalog 3GAA092002ASE	Beference NC
ssembly	
em Count	
Next>> 1	Installation code
Lookup Pre <u>v</u> ious	
Drawing Project	Drawing Project Pins
Multiple Catalog	Location code
Catalog Check	
	Drawing Project X S
atings	Show/Edit Miscellaneous
ating	OK-Repeat OK Cancel Help

Figure-70. Insert or Edit Component dialog box

- Click in the edit box in **Component Tag** area and specify the tag as **Motor**.
- Click in the Line 1 edit box and specify description as 3 Phase.
- Click in the **Rating** edit box in **Ratings** area and specify the rating as **2 HP**.

• Click on the **OK** button from the dialog box. The motor will be placed; refer to Figure-71.

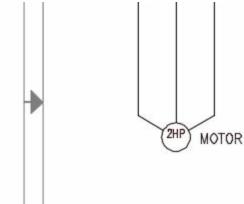


Figure-71. Motor placed

Adding Ground symbol

- Click on the Icon Menu button from the Icon Menu drop-down. The Insert Component dialog box will be displayed.
- Select the Motor Control category from the Menu area and click on the Ground symbol from the right area of the dialog box; refer to Figure-72. You are prompted to specify the location of the ground symbol.

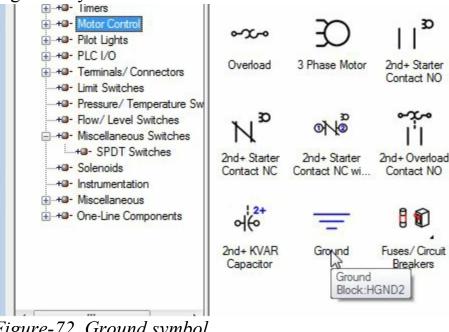


Figure-72. Ground symbol

• Click at the end of wire with 4 wire number; refer to Figure-73.

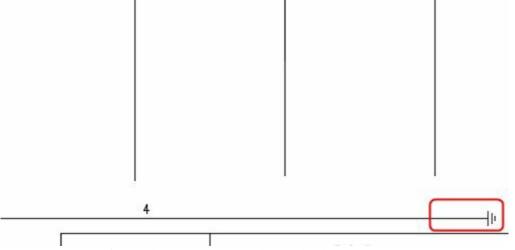


Figure-73. After placing ground symbol

Adding symbols for various components

• Click on the Catalog Browser button and insert the components as shown in Figure-74.

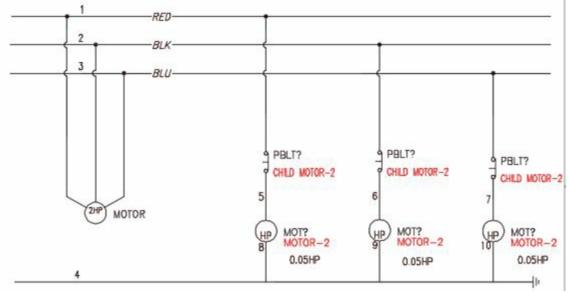


Figure-74. Circuit after connecting components

• Connect the 2 HP Motor to the ground wire using the Wire tool; refer to Figure-75.

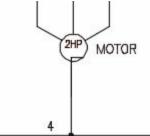


Figure-75. Wire connected to motor

• After adding all the components, the drawing will be displayed as shown in Figure-76.

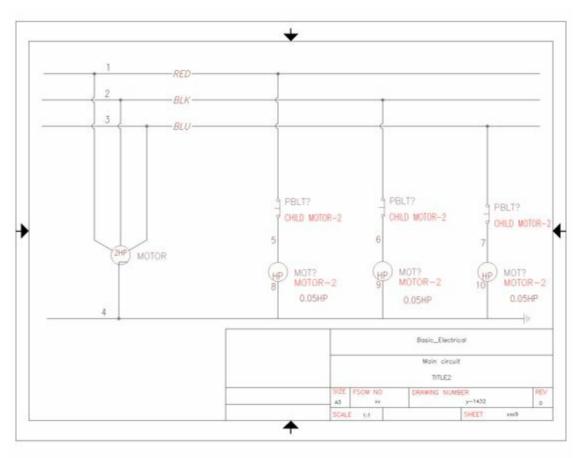


Figure-76. Practical-Model

PROBLEM

Create the circuit diagram as shown in Figure-77.

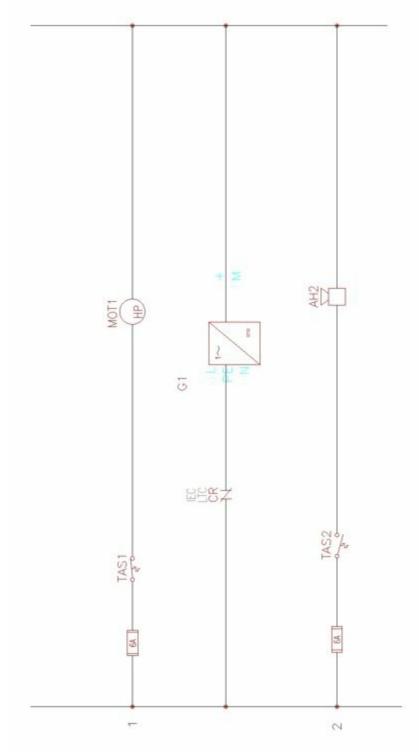


Figure-77. Problem-Model

EDITING WIRES, COMPONENTS, AND CIRCUITS

CHAPTER 6

Topics Covered

The major topics covered in this chapter are:

- Editing Components
- Internal Jumpers
- Editing Components like fixing tags, copying catalog assignments
- Editing Circuits
- Editing Wires and Wire Numbers

INTRODUCTION

Till this point, we have learned to insert components, insert wires, and insert circuits. Now, we are ready to edit the components, wires and circuits for customizing. The tools to edit components are available in three panels; **Edit Components**, **Circuit Clipboard**, and **Edit Wires/Wire Numbers** panel; refer to Figure-1, Figure-2, and Figure-3.

- · · · · · · · · · · · · · · · · · · ·	Paste
— ,.	Cir
77 88 88 ®8 ®8 (20 88) 84 88 84 88	*8
G Edit Components	

Figure-1. Edit Components panel

Paste Cut	р

Figure-2. Circuit Clipboard panel

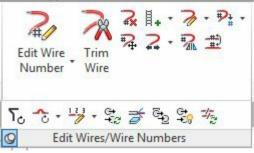


Figure-3. Edit Wires or Wire Numbers panel

EDIT TOOL

The **Edit** tool is available in the **Edit Components** drop-down in the **Edit Components** panel; refer to <u>Figure-4</u>. This tool is used to edit the details of any component inserted in the drawing area. The procedure to use this tool is given next.



Figure-4. Edit components drop-down

• Click on the Edit tool from the Edit Components drop-down. You will be prompted to select the

components/cables/location boxes.

- Select the component. The **Insert/Edit Component** dialog box will be displayed; refer to <u>Figure-5</u>. The options in this dialog box have already been discussed.
- Specify the desired settings in the dialog box and click on the **OK** button from the dialog box.
- If you want to use the component with the specified settings again then click on the **OK-Repeat** button from the dialog box.

Component Tag	Description
MOTOR fixed	Line 1
Use PLC Address	Line 2
Tags Schematic	Line 3
Used: Panel	List: Drawing Project Defaults Pick
External List	
Options	Cross-Reference
Catalog Data	Component override Setup
Manufacturer ABB	Reference ND NO/NC Setup
Catalog 3GAA092002ASE	Reference NC
Assembly Count Next>> 1	Installation code
Lookup Pre <u>v</u> ious	Drawing Project Pins
Drawing Project Multiple Catalog	Location code 1 < > 2 <
Catalog Check	Drawing Project X < >
Ratings	Show/Edit Miscellaneous
Rating 2HP	

Figure-5. Insert or Edit Component dialog box

INTERNAL JUMPER

An Internal Jumper is used to interconnect terminals of the electrical components. Some components in electrical system also have jumpers to change their functionality. For example, you might have seen jumpers in transformers to change the output voltage between 110V and 230V. The **Internal Jumper** tool in the **Edit Components** drop-down is used to edit the functions of internal jumpers. The procedure to use this tool is given next.

- Click on the **Internal Jumper** tool from the **Edit Components** drop-down. You are asked to select a component for editing jumpers.
- Select the component; refer to <u>Figure-6</u>. The **Wire Jumpers** dialog box will be displayed; refer to <u>Figure-7</u>.

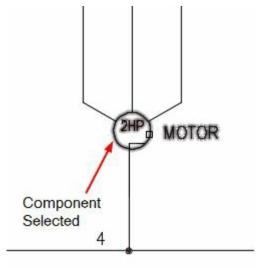


Figure-6. Component selected

100 C 100 C 100	Name	Attribute Value	Assigned Jumpers
14 13 11 12	X0TERM04 X0TERM03 X0TERM01 X2TERM02	-	-none-
Pick to s	i jumper: iminals from the list elect the terminal te dd button Add	xt.	elete

Figure-7. Wire Jumpers dialog box

- Click on the **Pick** button from the dialog box. You are asked to select the jumper points on the component; refer to <u>Figure-8</u>. Note that you can select the terminals directly from the dialog box but in that case you will not be able to identify the wire connections to the jumpers.
- Press ENTER. The **Wire Jumpers** dialog box will be displayed with the jumpers selected; refer to <u>Figure-9</u>. Note that the **Add** button is active now.

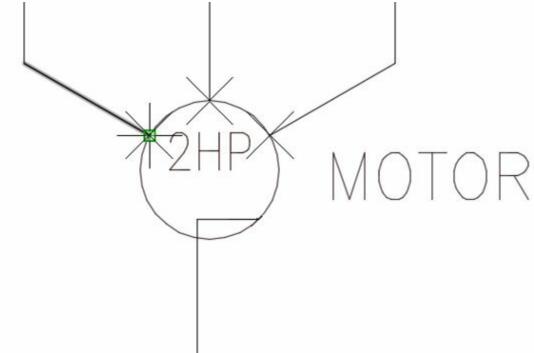


Figure-8. Jumper points selected

Ferminal	Name	Attribute Value	Assigned Jumpers
04	X0TERM04	-	-none-
03	X0TERM03		
01	X0TERM01		
02	X2TERM02	÷	
. Select te Pick to s	erminals from the list select the terminal te		
Pick to s	erminals from the list select the terminal te	ext.	elete
	erminals from the list elect the terminal te dd button	xt.	

Figure-9. Wire Jumpers dialog box with terminals selected

• Click on the Add button from the dialog box. The jumper will be connected to the selected terminals and will be listed in the Assigned Jumpers area of the dialog box; refer to Figure-10.

Wire Jump	ers		×
Terminal	Name	Attribute Value	Assigned Jumpers
04 03 01 02	X0TERM04 X0TERM03 X0TERM01 X2TERM02	-	030201
	rminals from the list elect the terminal te		
	Add	Update D	elete
	Pick	Show Jumper	
	ОК	Cancel	Help

Figure-10. Wire Jumpers dialog box with assigned jumpers

• Click on the **Show Jumpers** button to display the jumper in the drawing area. The jumper will be displayed connecting all the selected terminals; refer to Figure-11.

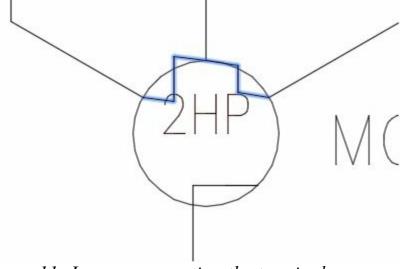


Figure-11. Jumper connecting the terminals

The example use above is just for illustration purpose, in real world we will not be connecting motors like this. We can use PLCs for applying jumpers but they have not been discussed till so we are using the example of motors.

Fix/UnFix Tag

The **Fix/UnFix Tag** tool is used to fix or unfix the tags assigned to the components. Note that if you fix a component tag then it will not get updated automatically when you re-tag the components in the drawing. The procedure to use this tool is given next.

• Click on the Fix/UnFix Tag tool from the Edit Components drop-down. The Fix/UnFix

Component Tag dialog box will be displayed; refer to Figure-12.

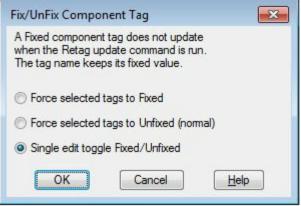


Figure-12. Fix or UnFix Component Tag dialog box

- Select the desired radio button from the dialog box. For example, select the Force selected tags to Fixed radio button; then later all the selected tags will get fixed.
- Click on the **OK** button from the dialog box. You are asked to select the tags that you want to change for their tags fixed/unfixed status.
- Select the tags and press **ENTER**, the properties for selected tags will get modified as per the selected radio button.

COPY CATALOG ASSIGNMENT

The **Copy Catalog Assignment** tool is used to copy the meta data from an existing component and apply it to the other component. The procedure to use this tool is given next.

- Click on the **Copy Catalog Assignment** tool from the **Edit Components** drop-down. You are asked to select the master component.
- Click on the tag of the component from which you want to copy the meta data; refer to <u>Figure-13</u>. The **Copy Catalog Assignment** dialog box will be displayed; refer to <u>Figure-14</u>.

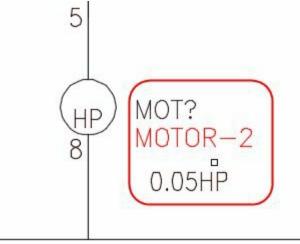


Figure-13. Component tag to be selected

Copy Catalog Assignment		×
Manufacturer AB Catalog TL-A110P-BJ32AA Assembly Catalog Lookup Find: Drawing Only Multiple Catalog Catalog Check OK Cancel	Step 1: Select part number information. Select OK Step 2: Select devices to copy to. Note: child or related devices are not automatically updated. They must be included in the selection.	

Figure-14. Copy Catalog Assignment dialog box

- Edit the details if you want to and then click on the **OK** button from the dialog box. You are asked to select the target component.
- Select the target component. Some of my friends might get the **Update Related Components** dialog box; refer to <u>Figure-15</u>. Click on the **Yes-Update** button if you want to update all similar components in the drawing or choose the **Skip** button to keep others as they are.
- Few of my friends might also get the **Different symbol block names** dialog box; refer to Figure-16. This dialog box comes if you are assigning properties to an incompatible component. For example, if you are coping properties of a motor to a switch then this dialog box will come. If it is need of your drawing to assign such properties then click on the **OK** button and then **Overwrite** otherwise cancel it and take your decision.

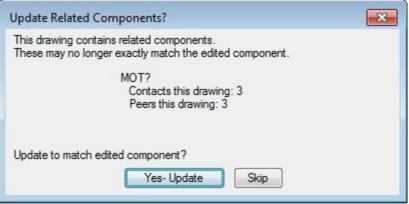


Figure-15. Update Related Components dialog box

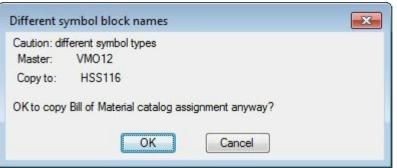


Figure-16. Different symbol block names dialog box

USER TABLE DATA

The User Table Data tool allows you to enter any data that you want to include with the components for their identity or purpose. The procedure to use this tool is given next.

• Click on the User Table Data tool from the Edit Components drop-down. The Edit User Table Data dialog box will be displayed; refer to Figure-17.

These records are s	free-form user data records attached to the selected block insert. stored in a USER database table in the project database file. ord to edit or "Add new" to create a new record.
Record Number	Data (255 char max per record)
	R data records found on this block insert. " to add a new record.
<u>.</u>	
Add New	Delete Record

Figure-17. Edit User Table Data dialog box

• Click on the Add New button from the dialog box. The Add New USER data record dialog box will be displayed; refer to Figure-18.

Add New USER data record	×
Enter record data in the edit box (255 characters max). The record number is a three digit number between 000 and 199. The next available number will pre-fill the Record number edit box. Record Number 000	
Data OK Cancel	

Figure-18. Add New USER data record dialog box

• Enter the desired data in the field and click on the **OK** button from the dialog box. The record will be added for the component; refer to <u>Figure-19</u>.

dit User Table Da	ta	
	free-form user data records attached to the selected block insert. stored in a USER database table in the project database file.	
Select existing reco	rd to edit or "Add new" to create a new record.	
Record Number	Data (255 char max per record)	
000	This motor is meant for pumping oil.	
Edit: Record numb	er 000	
Edit: Record numb		

Figure-19. Edit User Table Data dialog box with record

• Click on the **Save Changes** button from the dialog box. The user record will be added to the component.

DELETE COMPONENT

As the name suggests, the **Delete Component** tool is used to delete the component. The procedure to do so is given next.

- Click on this tool from the Edit Component panel and click on the components that you want to delete.
- After selecting the components, Press ENTER. The components will be deleted and the Search for/ Surf to Children dialog box will be displayed; refer to Figure-20.



Figure-20. Search for or Surf to Children dialog box

• Click on the **OK** button if you want to search for the child components and want to delete them otherwise select the **NO** button from the dialog box.

COPY COMPONENT

The **Copy Component** tool is used to create copies of an existing component. The procedure to use this tool is given next.

- Click on the **Copy Component** tool from the **Edit Components** panel in the **Ribbon**. You are asked to select the component that you want to copy.
- Select the component. You are asked to specify the insertion points of the copied component.
- Click at the desired place in the drawing to create copy and then specify the desired parameters in the Insert/Edit Component dialog box.
- Click on the **OK** button from the dialog box after specifying the parameters. The copy will be created with the specified parameters.

EDIT CIRCUITS DROP-DOWN

The tools in the **Edit Circuits** drop-down are used to edit the circuits. There are three tools in this drop-down; refer to <u>Figure-21</u>. The procedure to use these tools is discussed next.

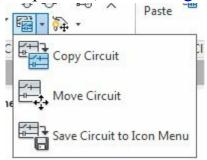


Figure-21. Edit Circuit drop-down

Copying Circuit

- Click on the Copy Circuit tool from the Edit Circuits drop-down. You are asked to select a circuit.
- Select the circuit and its components and then press ENTER. You are asked to specify the insertion point for the copied circuit.
- Click to specify the first point of insertion. You are asked to specify the second point of insertion; refer to Figure-22.

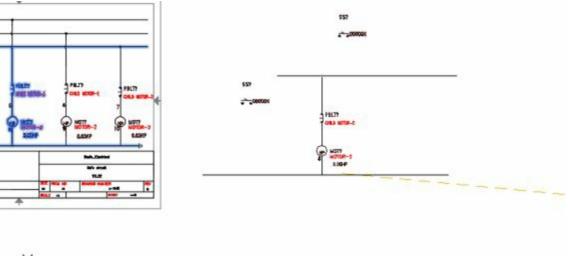


Figure-22. Copying a circuit

- Click to specify the insertion point. The circuit will be placed.
- Note that if you have gaps in the circuit then the **Gapped wire pointer problem** dialog box will be displayed; refer to Figure-23.



Figure-23. Gapped wire pointer problem dialog box

• Click on the **OK** button from the dialog box and modify the circuit as per your requirement.

Moving Circuit

- Click on the Move Circuit tool from the Edit Circuits drop-down. You are asked to select a circuit.
- Select the circuit and its components and then press ENTER. You are asked to specify the new base point for the circuit.
- Click to specify the base point. You are asked to specify the insertion point for the circuit. Set the insertion point and the circuit will be placed accordingly.

Saving Circuit to Icon Menu

• Click on the Save Circuit to Icon Menu tool from the Edit Circuits drop-down. The Save Circuit to Icon Menu dialog box will be displayed; refer to Figure-24.

Schematic Symbols						🏄 Menu	🕖 Vews 🔻	Add -
enu x	JIC: Saved Us	er Circuits						
→ ⊕ Crout Breakers → → ⊕ Breakers / Disconne ⇒ ⊕ Piot Ughts → ⊕ Noster Test → ⊕ Piot Ughts → ⊕ Piot Ughts	User Circut 1	User Circuit 2	User Circuit 3	User Circuit 4	User Circuit 5	User Circuit 6	User Circuit 7	
-+9- In-line Wire Labels -+9- Power Distribution E B-+9- Connectors - No W	User Circuit 8	User Circuit 9	User Circuit 10	User Circuit 11	User Circuit 12	User Circuit 13	User Circuit 14	
+9- Connectors - Wren -9- Limt Switches -9- Pressure/ Temperature -9- Row/ Level Switches	User Circuit 15	User Circuit 16	User Circuit 17	User Circuit 18	User Circuit 19	User Circuit 20	User Circuit 21	
+a- Mscellaneous Switches +a- SPDT Switches +a- Solenoids +a- Instrumentation	1		-					
Macellaneous	User Circuit 22	User Circuit 23	User Circuit 24					
+@- Genetic Baxes *								

Figure-24. Save Circuit to Icon Menu dialog box

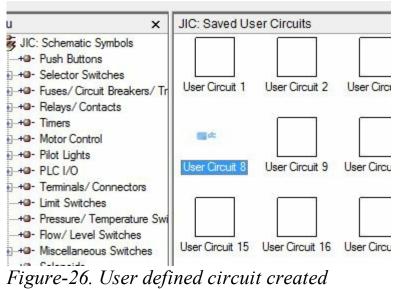
• Right-click on the desired slot from the dialog box. A shortcut menu will be displayed.

• Click on the **Properties** button from the shortcut menu. The **Properties-Circuit** dialog box will be displayed; refer to Figure-25.

review	Name:	
	User Circuit 8	
	Image file:	
	circ8	Browse
	Create PNG from current screen image	Pick <
	Create PNG from current screen image Zoom <	T ISAN N
ocation: C:\U	Isers\Gaurav\AppData\Roaming\Autodesk\AutoCAD Electrical\circ8.PNG	Active
ocation: C:\U ircuit Name to	Isers\Gaurav\AppData\Roaming\Autodesk\AutoCAD Electrical\circ8.PNG	
	Isers\Gaurav\AppData\Roaming\Autodesk\AutoCAD Electrical\circ8.PNG	

Figure-25. Properties Circuit dialog box

• Click on both the Active buttons one by one and click on the OK button from the dialog box. The current drawing will be saved as user defined circuit; refer to Figure-26.



• Click on the OK button from the Save Circuit to Icon Menu dialog box.

TRANSFORMING COMPONENTS DROP-DOWN

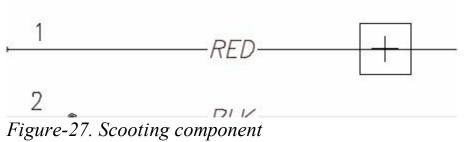
The tools in this drop-down are used to transform the components. For example, you can change position of a component on wire, you can align components, and so on. Various tools in this drop-down are discussed next.

Scooting

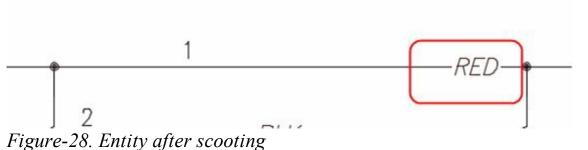
Scooting is the movement of a component, tag, wire number etc. along the connected wire. The

procedure to use this tool is given next.

- Click on the **Scoot** tool from the **Transform Component** drop-down. You are asked to select component, wire or wire number from the drawing area.
- Click on the desired entity. A box will be attached to the cursor representing the component; refer to <u>Figure-27</u>.



• Click at the desire point to specify the new location of the entity; refer to Figure-28.



Aligning Components

- Click on the Align tool from the Transform Component drop-down. You are asked to select an entity as the horizontal/vertical reference for the other components.
- Select the component. The reference line will be created from the center of the selected component; refer to Figure-29. Also, you are asked to selected the to be aligned components.

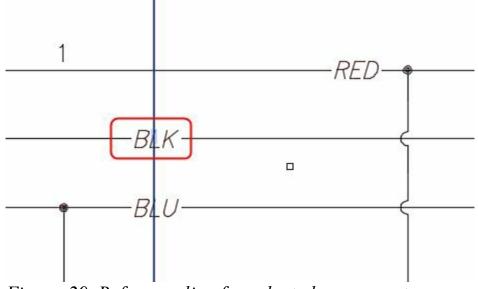


Figure-29. Reference line for selected component

• Click on the entities that you want to align and press **ENTER**. The entities will be aligned; refer to <u>Figure-30</u>.

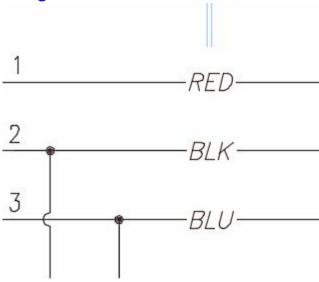


Figure-30. Entities after alignment

Moving Component

You can move components in a circuit without creating gaps in the circuit. The procedure is given next.

- Click on the **Move Component** tool from the **Transform Components** drop-down. You are asked to select a component.
- Click on the component. The component will get attached to the cursor; refer to Figure-31.

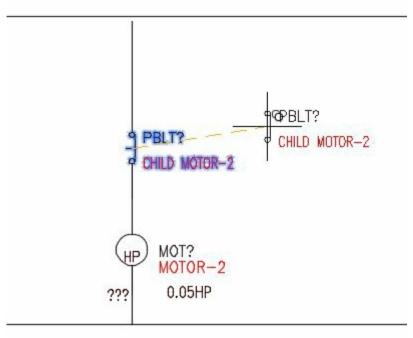


Figure-31. Component attached to the cursor

• Click at the new position to place the component. The component will be placed and the circuit will be modified to fill the gap; refer to <u>Figure-32</u>.

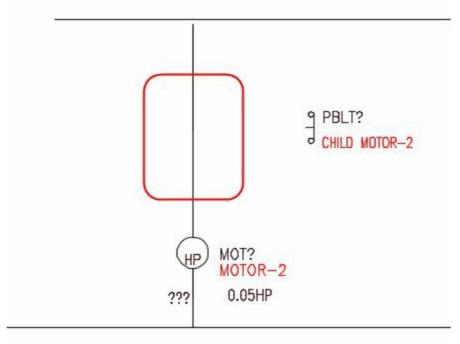


Figure-32. Circuit after moving component

Reversing or Flipping Component

• Click on the **Reverse/Flip Component** tool from the **Transform Components** drop-down. The **Reverse/Flip Component** dialog box will be displayed as shown in <u>Figure-33</u>.

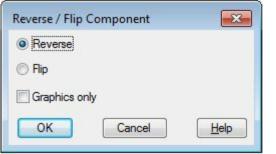


Figure-33. Reverse or Flip Component dialog box

- Select the desired radio button for whether you want to reverse the component or you want to flip the component.
- Click on the **OK** button from the dialog box. You are asked to select the component that you want to flip or reverse.
- Select the component, it will get flipped or reversed as per the selected option. Refer to Figure-34.

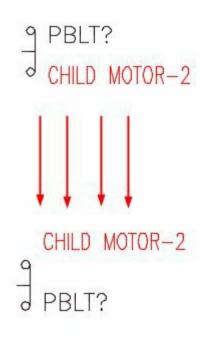


Figure-34. Reverse component

We will discuss about the other two tools in the **Transform Components** drop-down later in the book when we will be discussing PLCs.

RE-TAGGING COMPONENTS

You can assign a new tag to the components by replacing the older one using the **Retag Components** tool. The procedure to use this tool is given next.

 Click on the Retag Components tool from the Retag Components drop-down in the Edit Components panel in the Ribbon; refer to Figure-35. The Retag Components dialog box will be displayed; refer to Figure-36.

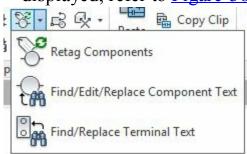


Figure-35. Retag Components drop-down

Retag Components	
Component Retag for:	
Project	
Active drawing (all)	
O Active drawing (pick)	
OK Cancel	Help

Figure-36. Retag Components dialog box

• Select the desired radio button from the dialog box and click on the **OK** button. The components will be re-tagged according to the selected radio button.

TOGGLE NO/NC

You can toggle between **Normally Open(NO)** and **Normally Closed(NC)** variants of components by using this tool. The procedure to use this tool is given next.

- Click on the **Toggle NO/NC** tool **the Edit Components** panel. You are asked to select the component for toggling NC/NO.
- Select the component, its status will be changed; refer to Figure-37.

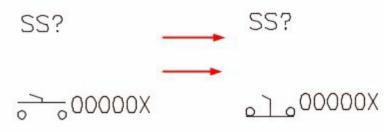


Figure-37. Component after toggling

SWAP/UPDATE BLOCK

This tool is used to swap or update the block of a component. The procedure to use this tool is given next.

Swapping

- Click on the Swap/Update Block tool from the Edit Components panel. The Swap Block/Update Block/Library Swap dialog box will be displayed; refer to Figure-38.
- Click on the desired radio button for **Swap a Block** area, the options related to swap will be activated in the dialog box.
- Select the desired option for source of swapping by selecting **Pick new block icon menu**, **Pick new block "just like"**, or **Browser to new block from file selection dialog** radio button.
- Click on the **OK** button from the dialog box. If you have selected the **Browser to new block from file selection dialog** radio button, then the dialog box will be displayed prompting you to select the

blocks.

- Select the drawing of block. You are asked to select the component.
- Select the component and it will be swapped with the selected block.

Swap Block / Upda	ite Block / Library Swap 🧮	3
Option A: Swap Bl	lock (swap to different block name)	
Swap a Block:	One at a time	
	O Drawing wide	
	Project wide	
Pick new bl	ock from icon menu	
Pick new bl	ock "just like"	
Browse to n	ew block from file selection dialog	
Retain old a	attribute locations	
Retain old b	lock scale	
Allow undef	ined Wire Type line reconnections	
Auto retag if	f parent swap causes FAMILY change	
Option B: Update	Block (revised or different version of same block name)	
O Update a Block	k - substitute new version for selected block	
🔘 Library Swap -	substitute new versions for all blocks	
Attribute Mapping		
() Use Same Attri	ibute Names (default)	
🔘 Use Attribute N	Napping File	
Mapping File	Browse	
	OK Cancel Help	

Figure-38. Swap Block or Update Block or Library Swap dialog box

Updating

- Click on the desired radio button from the Option B: Update area of the dialog box. If you select the **Update a Block** radio button then new block will be placed for selected component. If you select the **Library Swap** radio button then all the blocks will be updated.
- After selecting the desired radio button, click on the **OK** button from the dialog box.
- If you selected the Update a Block radio button then you will be prompted to select an example of block. Select the block of component(or component) from the drawing area and press ENTER. The Update Block dialog box will be displayed; refer to Figure-39. Click on the Browse button and select the desired component block. Click on the Project button if you want to update the block for all project drawings or click on the Active Drawing button to update the block in current drawing only.

Update Block - New block's path\filename	×
Below is the path/filename of the block that will be substituted for all instances of the selected block. If you want to use a different path/filename, enter its path (or select "Browse").	
Path/filename of new block	Browse
ers\public\documents\autodesk\acade 2016\Libs\jic125\HSS116.dwg	blowse
1.000 1.0 Configuration Scale 25.4	1/25.4
Retain old block scale	
Retain old attribute locations	
Allow undefined Wire Type line reconnections	
Copy old block's attribute values to new swapped block	
Yes, copy all, old to new	
No, discard all old values	
Copy old to new only if new value is blank	
Project Active Drawing Cancel <u>H</u> elp	
	_

Figure-39. Update Block dialog box

• If you have selected Library Swap radio button in the Swap Block/Update Block/Library Swap dialog box then the Library Swap dialog box will be displayed; refer to Figure-40. Click on the Browse button and select the directory of component blocks. Click on the Project button if you want to update the block for all project drawings or click on the Active Drawing button to update the block in current drawing only.

Library Swap All Drawing
The path pointing to the symbol library is shown below. This path will be referenced for block substitution. For a different library, enter its path (or select "Browse"). Path to new block library
C:\Users\Public\Documents\Autodesk\Acade 2016\Libs\jic125\ Browse
Include subfolders
Insertion scale 1.000 1.0 Configuration Scale 25.4 1/25.4 Retain old block scale Retain old attribute locations Allow undefined Wire Type line reconnections
Copy old block's attribute values to new swapped block Yes, copy all, old to new No, discard all old values Copy old to new only if new value is blank
Project Active Drawing Pick Cancel Help

EDIT ATTRIBUTE DROP-DOWN

The options in the **Edit Attribute** drop-down are used to edit the attributes of the components; refer to Figure-41. These tools are common to all the AutoCAD platform software. An attribute is used to relate the blocks with the real word information. These tools perform the action as their names suggest. You can also perform all these tasks by using the Properties Manager. To use the Properties Manager, click on the component's attribute and enter **PROPERTIES** at the Command Prompt. The Properties Manager will be displayed with the relative options; refer to Figure-42. Click in the desired field and change the attributes as required.

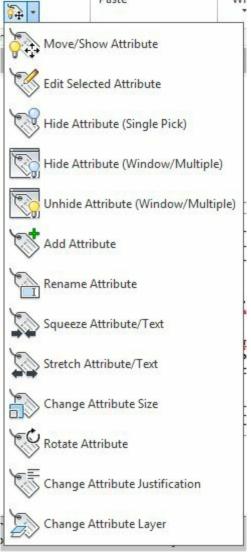


Figure-41. Edit Attribute drop-down

	Block Reference	- 🗗 + 📲
	Scale Y	1.0000
	Scale Z	1.0000
	Misc	-
	Name	VMO12
	Rotation	0
	Annotative	No
	Block Unit	Unitless
1	Unit factor	1.0000
L	Attributes	-
L	WDTAGALT	
	INST	
	DESC3	
	RATING4	0.05HP
	RATING3	
	RATING2	HP
Į,	RATING1	
	DESC1	MOTOR-2
	DESC2	
	LOC	
	TAG1	MOT?

Figure-42. Properties Manager

CROSS REFERENCES DROP-DOWN

The tools in this drop-down are used to manage cross-references for the components; refer to <u>Figure-43</u>. The tools in this drop-down are discussed next.

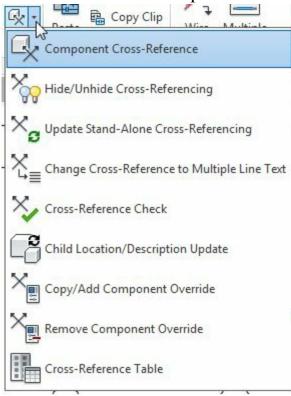


Figure-43. Cross References drop-down

Component Cross-Reference

This tool is used to update cross-reference text of a component. The procedure is given next.

• Click on the **Component Cross-Reference** tool from the **Cross References** drop-down. The Component Cross-Reference dialog box will be displayed; refer to <u>Figure-44</u>.

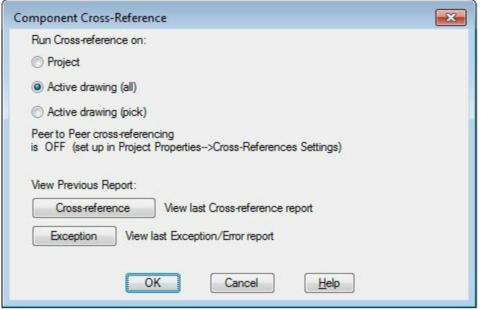
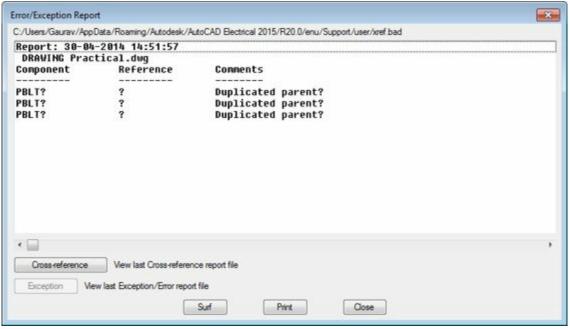


Figure-44. Component Cross-Reference dialog box

• Select the desired radio button from the dialog box and click on the **OK** button. The **Error/Exception Report** dialog box will be displayed; refer to <u>Figure-45</u>.

Figure-45. Error or Exception Report dialog box



- From the above result, we can find out that the three motors are duplicated and are not referenced to any other component or circuit.
- Click on the **Cross-reference** button from the dialog box. The **Cross-Reference Report** dialog box will be displayed; refer to Figure-46.

ross-Reference R	eport			×
:/Users/Gaurav/A	ppData/Roaming/Au	todesk/AutoCAD Elect	trical 2015/R20.0/enu/Support/user/xref.rep	
Report: 30- DRAWING Pr Component	04-2014 14:51 actical.dwg NO USED/MAX	NC Con	vertible Reference list	
\$\$?	1	0	N0=?	
PBLT?	0	1	NC=?	
•				•
Cross-reference	e View last Cro	oss-reference report file		,
	e View last Cro View last Exception/			,

Figure-46. Cross Reference Report dialog box

- From the above result, we can find the components and their respective references in the drawing/project.
- After checking the results, click on the Close button to exit.

Hide/Unhide Cross-Referencing

The **Hide/Unhide Cross-Referencing** tool is used to hide or unhide the cross reference of a component in the drawing. Click on this tool from the **Cross References** drop-down and select the component of which you want to change the hide/unhide status.

Update Stand-Alone Cross-Referencing

The **Update Stand-Alone Cross-Referencing** tool is used to update the cross-references in the drawing or project. The procedure is given next.

 Click on Update Stand-Alone Cross-Referencing tool from the Cross References drop-down. The Update Wire Signal and Stand-Alone Cross-Reference dialog box will be displayed; refer to Figure-47.

-	Wire Signals Update source/destination Cross-References
	Update source/destination Wire Number Tags
]	Stand-Alone Cross-reference symbols
	Update Stand-Alone cross-reference symbols

Figure-47. Update Wire Signal and Stand-Alone Cross-Reference dialog box

• Click on the **Drawing-wide** or **Project-wide** button to update all the cross-references in the drawing or project respectively. You can individually update the cross-references by selecting the Pick button from the dialog box.

In this same way, you can use the other tools in the **Cross References** drop-down. Rest of the tools in the **Edit Components** panel will be discussed in the chapter for PLCs.

Circuit Clipboard panel

The tools in this panel are used to manipulate circuits; refer to <u>Figure-48</u>. Click on the **Cut** or **Copy Clip** tool to copy any circuit in the drawing and using the **Paste** tool, you can paste the copied or cut circuits.



Figure-48. Circuit Clipboard panel

EDITING WIRES OR WIRE NUMBERS

The tools to edit wires/wire numbers are available in the **Edit Wires/Wire Numbers** panel in the **Ribbon**; refer to <u>Figure-49</u>. The tools in this panel are discussed next.

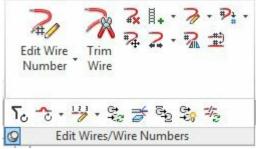


Figure-49. Edit Wires or Wire Numbers panel

Edit Wire Number

The Edit Wire Number tool is used to manually change the wire number. The procedure to use this tool is given next.

• Click on the down arrow below Edit Wire Number button in the Ribbon. The Edit Wire Number drop-down will be displayed; refer to <u>Figure-50</u>.

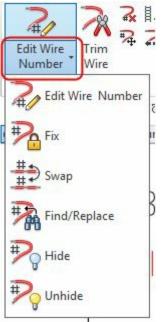


Figure-50. Edit Wire Number drop-down

- Click on the **Edit Wire Number** button from the drop-down. You are asked to select a wire or wire number.
- Select the wire or wire number that you want to change. The Modify/Fix/UnFix dialog box will be displayed; refer to Figure-51.

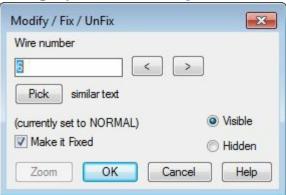


Figure-51. Modify or Fix or UnFix dialog box

- Click in the **Wire number** edit box and specify the desired value. You can use the < or > buttons to decrease or increase the wire number. Note that if the number is existing then you will be prompted to enter a different wire number.
- Clear the Make it Fixed check box, if you want to unfix the wire number.
- Select the Hidden radio button if you want to hide the wire number.
- Click on the **OK** button to apply the specified parameters.

Fix

The **Fix** tool is used to make a wire number fixed. To do so, click on the **Fix** tool from the **Edit Wire Number** drop-down. You are asked to select a wire number that you want to be fixed. Select the wire number and it will get fixed. Also, the color of the wire number will change to **CYAN** color.

Swap

The **Swap** tool is used to swap the wire numbers. Click on this tool from the **Edit Wire Number** drop-down and select two wire numbers one by one. The wire numbers will be swapped.

Find/Replace

The **Find/Replace** tool is available in the **Edit Wire Number** drop-down. This tool is used to find and replace the wire numbers in the drawing. The procedure to use this tool is given next.

• Click on the **Find/Replace** tool from the drop-down. The **Find/Replace Wire Numbers** dialog box will be displayed; refer to <u>Figure-52</u>.

Find/Replace Wir	e Numbers	×
Fill in up to three se find/replace wire n		
Mode:		
All,exact match		
Part substring n	natch	
First occurre	ence only	
Find		
Replace		
Find		
Replace		
Find		
Replace		
Go	Cancel	<u>H</u> elp

Figure-52. Find or Replace Wire Numbers dialog box

- Click in the Find edit box and specify the wire number to be replaced.
- Click in the **Replace** edit box and specify the wire number with which it is to be replaced.
- Click on the Go button and then click on the OK button, the wire numbers will be replaced.

Hide and Unhide

The Hide tool is used to hide the wire numbers and Unhide tool is used to unhide the wire numbers. Click on the Hide tool and select the wire number that you want to hide. To unhide the wire number, click on the **Unhide** tool from the **Edit Wire Number** drop-down. You are asked to select a wire.

Select the wire, the hidden wire number for that wire will be displayed.

Trim Wire

The **Trim Wire** tool is used to trim a wire connected between wire connections. The procedure to use this tool is given next.

- Click on the **Trim Wire** tool from the **Edit Wires/Wire Numbers** panel. You are asked to select the wire that is to be trimmed.
- Select the wire that you want to be trimmed; refer to Figure-53.

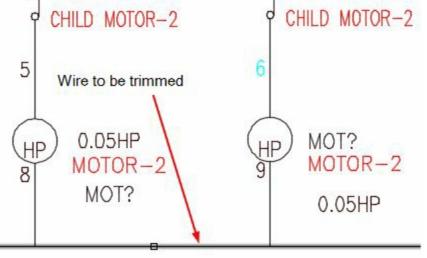


Figure-53. Wire to be trimmed

• On selecting the wire, it will be trimmed between the connecting ends; refer to Figure-54. Also, the wire numbering will be modified accordingly.

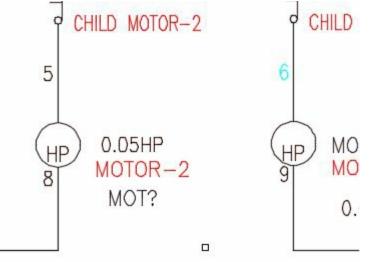


Figure-54. After trimming wire

Delete Wire Numbers

The **Delete Wire Numbers** tool is used to delete the wire numbers. Note that the remaining wire numbers are not modified on using this tool. To delete the wire numbers, click on this tool and then click on the wire numbers that you want to be deleted. The selected wire numbers will be deleted.

Move Wire Number

The **Move Wire Number** tool is used to move the wire numbers. To do so, click on **Move Wire Number** tool from the **Edit Wires/Wire Numbers** panel; you will be prompted to select a new location for the wire number. Click on the wire at the desired position. The wire number of that wire will move to the location you clicked on the wire.

Add Rung

The **Add Rung** tool is used to add a rung in any circuit or ladder. A rung is a wire connecting two parallel wiring lines. The procedure to use this tool is given next.

- Click on the Add Rung tool from the Ladder Editing drop-down; refer to Figure-55. You are asked to click at the desired location to add rung.
- Click between the two parallel wires. A rung will be created connecting both the wires; refer to <u>Figure-56</u>.

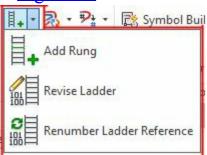


Figure-55. Ladder Editing drop-down

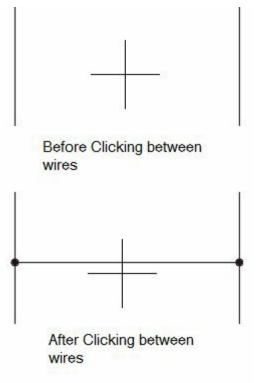


Figure-56. Rung connected

Revise Ladder

The **Revise Ladder** tool is available in the **Ladder Editing** drop-down. This tool is used to modify the ladder numbering. The procedure to use this tool is given next.

• Click on the **Revise Ladder** tool from the **Ladder Editing** drop-down. The **Modify Line Reference Numbers** dialog box will be displayed; refer to <u>Figure-57</u>.

Rung Spacing	Rung Count	Reference Start	ce Numbers End	Index	Redo	Wire Number Format
0.7500	6	4	9	1		%N
0.7500	4	10	13	1		%N

Figure-57. Modify Line Raferece Number dialog box

- Specify the desired parameters for the ladder numbering in the current drawing and click on the **OK** button from the dialog box. The ladder numbering will be modified accordingly.
- Note that to use this tool, you must have ladders in the drawing area.

Renumber Ladder Reference

The **Renumber Ladder Reference** tool is used to specify the reference point for the ladder renumbering. The procedure to use this tool is given next.

• Click on the **Renumber Ladder Reference** tool from the **Ladder Editing** drop-down. The **Renumber Ladders** dialog box will be displayed; refer to <u>Figure-58</u>.

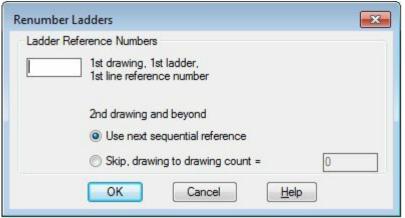


Figure-58. Renumber Ladders dialog box

• Click in the edit box and specify the desired reference number. Next, click on the **OK** button from the dialog box. The **Select Drawings to Process** dialog box will be displayed; refer to <u>Figure-59</u>.

	rawings to Process			X
			Drawing Oescription	
Ref	Subfolder	Section Sub-Section	Project Drawing List	
			F:\My Data\Books_Fina\C05_Wires_Circuits_Ladders\Pra C:\Users\Gaurav\Documents\a\proj\Electrical_Basics\Pro	
		ш		•
Do A	Process	Reset 4	n-select by Section/sub-section by Subfo	lder
Ref	Subfolder	Section Sub-Section	Project Drawing List	
				,

Figure-59. Select Drawings to Process dialog box

• Select the drawing and click on the **Process** button on which you want to apply the numbering. To select all click on the **Do All** button and then click on the **OK** button from the dialog box. The ladders will be renumbered as per the specified value.

Wire Editing

The tools in the **Wire Editing** drop-down are used to modify wires; refer to <u>Figure-60</u>. The tools in this drop-down are discussed next.

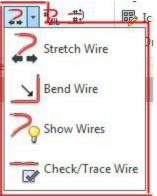
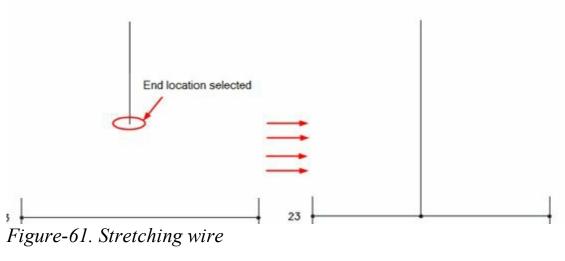


Figure-60. Wire Editing drop-down

Stretch Wire tool

The **Stretch Wire** tool is used to stretch the end point of a wire to connect it to the next intersecting wire. The procedure to use this tool is given next.

- Click on the **Stretch Wire** tool from the **Wire Editing** drop-down. You are asked to select the end point of the wire.
- Click on the wire near the end point. The wire will stretch till it intersect with the facing wire; refer to <u>Figure-61</u>.



Bend Wire tool

The **Bend Wire** tool is used to bend the wire at desired points. The procedure to use this tool is given next.

- Click on the **Bend Wire** tool from the **Wire Editing** drop-down. You are asked to select the point on first wire from which the bending will start.
- Click on the wire at desired point; refer to Figure-62.

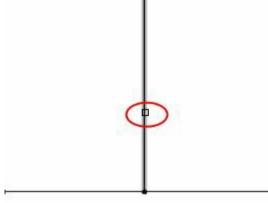


Figure-62. First point of bending

• Click on the second wire to specify the end point of bend. The wire bend will be created refer to <u>Figure-63</u>.

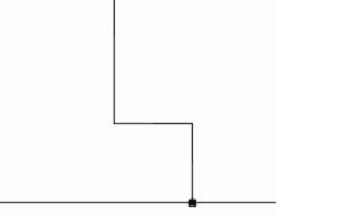


Figure-63. Wire bend after selecting second point

Show Wires

The **Show Wire** tool is used to display all the wire in the drawing. The procedure to use this tool is given next.

• Click on the Show Wires tool from the Wire Editing drop-down. The Show Wires and Wire Number Pointers dialog box will be displayed; refer to Figure-64.

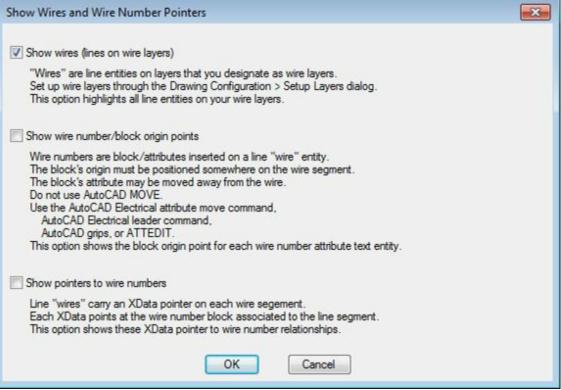


Figure-64. Show Wires and Wire Number Pointers dialog box

- Select the desired check boxes to highlight the respective entities in the drawing.
- Click on the **OK** button from the dialog box. The **Drawing Audit** dialog box will be displayed; refer to <u>Figure-65</u>.

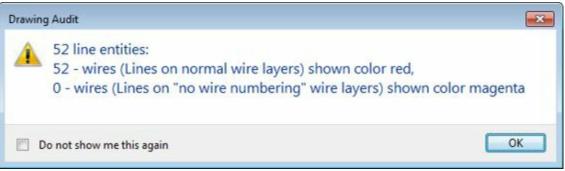


Figure-65. Drawing Audit dialog box

• Click on the **OK** button from the dialog box. The wires will be highlighted; refer to Figure-66.

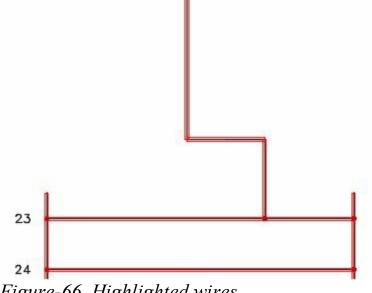


Figure-66. Highlighted wires

Check or Trace Wire tool

The **Check/Trace Wire** tool is used to highlight a wire in the drawing. The procedure to use this tool is given next.

- Click on the Check/Trace Wire tool from the Wire Editing drop-down. You are asked to select a wire segment.
- Click on the wire, its full length will be highlighted.
- Press the **SPACEBAR** to highlight the connected wire. Keep on pressing the **SPACEBAR** from keyboard and the next connected wire will be highlighted; refer to Figure-67.

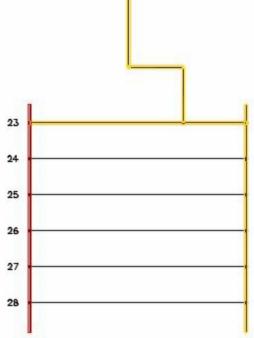


Figure-67. Wire highlighted

Wire Type Editing drop-down

The tools in the **Wire Type Editing** drop-down are used to edit the wire types; refer to <u>Figure-68</u>. These tools and their operations are discussed next.



Figure-68. Wire Type Editing drop-down

Create/Edit Wire Type

The **Create/Edit Wire Type** tool is used to create or edit wire types. The procedure to use this tool is given next.

- Click on the **Create/Edit Wire Type** tool from the **Wire Type Editing** drop-down. The **Create/Edit Wire Type** dialog box will be displayed as shown in <u>Figure-69</u>.
- The fields in the table of this dialog box are used to specify parameters of common type of wires. If you want to modify the wire type then click on the desired field and specify the desired values. Note that **Layer Name** is automatically assigned on the basis of **Wire Color** and **Size** values.
- To add a new wire type, slide down the bottom of table and click in the **Wire Color** field; refer to <u>Figure-70</u>.

	Used	Wire Color	Size	Layer Name	Wire Numbering	USER1	USER2
	Х	BLK	10AWG	BLK_10AWG	Yes		2
		BLK	12AWG	BLK_12AWG	Yes		
		BLK	14AWG	BLK_14AWG	Yes		1
	1	BLK	16AWG	BLK_16AWG	Yes		
		BLK	18AWG	BLK_18AWG	Yes	1	2
		BLK	20AWG	BLK_20AWG	Yes		
		BLK	4AWG	BLK_4AWG	Yes		1
	1	BLK	5AWG	BLK_5AWG	Yes		8
)		BLK	6AWG	BLK_6AWG	Yes		
0		BLK	7AWG	BLK_7AWG	Yes		20
1	X	BLK	8AWG	BLK_8AWG	Yes		
2		BLK	9AWG	BLK_9AWG	Yes		
3		BLU	10AWG	BLU_10AWG	Yes		4
14		BLU	12AWG	BLU_12AWG	Yes		
15		BLU	14AWG	BLU_14AWG	Yes		1
Č.			1		1	20	
0							
Op	tion			Layer			
1000	Make All	Lines Valid Wires		Layer Name F	omat	%C_%S	
-	Import			Color		etype	Lineweight
			a				
				Add	Existing Layer	F	Remove Layer

Figure-69. Create or Edit Wire Type dialog box

	Used	Wire Color	Size	Layer Name	Wire Numbering	USER1	USER2	
96		WHT	9AWG	WHT_9AWG	Yes			-
97				WIRES	Yes			-
98 99		YEL	10AWG	YEL_10AWG	Yes			
99		YEL	12AWG	YEL_12AWG	Yes			-
100		YEL	14AWG	YEL_14AWG	Yes			
101		YEL	16AWG	YEL_16AWG	Yes			
102		YEL	18AWG	YEL_18AWG	Yes			-
103		YEL	20AWG	YEL_20AWG	Yes			5
104		YEL	4AWG	YEL_4AWG	Yes			-
105		YEL	5AWG	YEL_5AWG	Yes			
106		YEL	6AWG	YEL_6AWG	Yes			
105 106 107		YEL	7AWG	YEL_7AWG	Yes			
108		YEL	8AWG	YEL_8AWG	Yes			1
109		YEL	9AWG	YEL_9AWG	Yes			-=
110					3 () () () () () () () () () () () () ()	1		

Figure-70. Wire Color field

- Specify the desired color. For example, **ORNG**.
- Click in the Size field next to it and specify the desired size. For example, 4AWG.
- Click on the desired button in the Layer area and specify the related properties for the layers.
- After setting the desired parameters, click on the **OK** button from the dialog box. The wire type will be created.

Change/Convert Wire Type

The **Change/Convert Wire Type** tool is used to change the wire type of wires in the drawing. The procedure to use this tool is given next.

• Click on the Change/Convert Wire Type tool from the Wire Type Editing drop-down. The Change/Convert Wire Type dialog box will be displayed as shown in Figure-71.

U	sed Wire	Color Size	Layer Name	Wire Numbering	USER1	USER2	
X	BLK	10AWG	BLK_10AWG	Yes		1	
	BLK	12AWG	BLK_12AWG	Yes			-13
	BLK	14AWG	BLK_14AWG	Yes		6	
	BLK	16AWG	BLK_16AWG	Yes			
	BLK	18AWG	BLK_18AWG	Yes		7	
	BLK	20AWG	BLK_20AWG	Yes			1
X	BLK	4AWG	BLK_4AWG	Yes			
	BLK	5AWG	BLK_5AWG	Yes			1
	BLK	6AWG	BLK_6AWG	Yes			
0	BLK	7AWG	BLK_7AWG	Yes			
1 X	BLK	8AWG	BLK_8AWG	Yes			
2	BLK	9AWG	BLK_9AWG	Yes			1
3	BLU	10AWG	BLU_10AWG	Yes			
4	BLU	12AWG	BLU_12AWG	Yes			
5	BLU	14AWG	BLU_14AWG	Yes		1	٦,
Pick	<			vert I Wire(s) in the Network ne(s) to Wire(s)		,	

Figure-71. Change or Convert Wire Type dialog box

- Select the desired wire type from the list and click on the **OK** button from the dialog box. You are asked to select a wire.
- Select the wire from the drawing area. All the similar wires will be converted to the wire type selected in the dialog box.

Flip Wire Number

The **Flip Wire Number** tool is used to flip the wire number on the other side of the wire. The procedure to use this tool is given next.

- Click on the Flip Wire Number tool 🛣 from the Edit Wires/Wire Numbers panel in the Ribbon. You are asked to select a wire number.
- Select the wire number and it will be flipped to the other side of wire; refer to Figure-72.

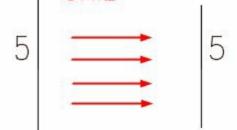


Figure-72. Wire number flipped

Toggle Wire Number In-Line

The **Toggle Wire Number In-Line** tools works in the same way as the **Flip Wire Number** tool works. After using this tool, the wire number gets inserted in the middle of the wire; refer to <u>Figure-</u>

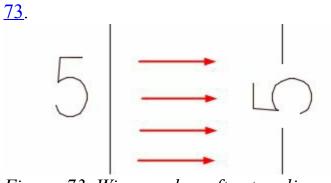


Figure-73. Wire number after toggling

Till this point, we have discussed all the general tools used in editing components, circuits and wires. In the next chapter, we will discuss PLC and its components.

PLCS AND COMPONENTS

CHAPTER 7

Topics Covered

The major topics covered in this chapter are:

- Introduction
- Inserting Parametric PLCs
- Inserting PLCs (Full Unit)
- Inserting Connectors
- Inserting Terminals

INTRODUCTION

PLC is a solid state/ computerized industrial computer that performs discrete or sequential logic in a factory environment. It was originally developed to replace mechanical relays, timers, counters. PLCs are used successfully to execute complicated control operations in a plant. Its purpose is to monitor crucial process parameters and adjust process operations accordingly. A sequence of instructions is programmed by the user to the PLC memory and when the program is executed, the controller operates a system to the correct operating specifications.

PLC consists of three main parts: CPU, memory and I/O units.

CPU is the brain of PLC. It reads the input values from inputs, runs the program existed in the

program memory and writes the output values to the output register. Memory is used to store different types of information in the binary structure form. The memory range of S7-200 is composed of three main parts as program, parameter, and retentive data fields. I/O units provide communication between PLC control systems.

Application of PLCs in manufacturing process

In an industrial set up PLCs are used to automate manufacturing and assembly processes. By 'Process' we mean a step-by step procedure whereby a product is manufactured and assembled. It is the responsibility of the product engineering department to plan for manufacture of new or modified products. Other processes might involve the filling and capping of bottles, the printing of newspapers, or the assembly of automobiles etc. in many such manufacturing situations, PLC plays an important role in carrying out the various processes.

Examples of PLC Applications

Internal Combustion Engine Monitoring

A PLC acquires data recorded from sensors located at the internal combustion engine. Measurements taken include water temperature, oil temperature, RPMs, torque, exhaust temperature, oil pressure, manifold pressure, and timing.

Carburetor Production Testing

PLCs provide on-line analysis of automotive carburetors in a production assembly line. The systems significantly reduce the test time, while providing greater yield and better quality carburetors. Pressure, vacuum, and fuel and air flow are some of the variables tested.

Monitoring Automotive Production Machines

The system monitors total parts, rejected parts, parts produced, machine cycle time, and machine efficiency. Statistical data is available to the operator anytime or after each shift.

Power Steering Valve Assembly and Testing

The PLC system controls a machine to ensure proper balance of the valves and to maximize left and right turning ratios.

CHEMICAL AND PETROCHEMICAL

Ammonia and Ethylene Processing

Programmable controllers monitor and control large compressors used during ammonia and ethylene manufacturing. The PLC monitors bearing temperatures, operation of clearance pockets, compressor speed, power consumption, vibration, discharge temperatures, pressure, and suction flow.

Dyes

PLCs monitor and control the dye processing used in the textile industry. They match and blend colors to predetermined values.

Chemical Batching

The PLC controls the batching ratio of two or more materials in a continuous process. The system determines the rate of discharge of each material and keeps inventory records. Several batch recipes can be logged and retreived automatically or on command from the operator.

Fan Control

PLCs control fans based on levels of toxic gases in a chemical production environment. This system effectively removes gases when a preset level of contamination is reached. The PLC controls the fan start/stop, cycling, and speeds, so that safety levels are maintained while energy consumption is minimized.

Gas Transmission and Distribution

Programmable controllers monitor and regulate pressures and flows of gas transmission and distribution systems. Data is gathered and measured in the field and transmitted to the PLC system.

Pipeline Pump Station Control

PLCs control mainline and booster pumps for crude oil distribution. They measure flow, suction, discharge, and tank low/high limits. Possible communication with SCADA (Supervisory Control and Data Acquisition) systems can provide total supervision of the pipeline.

Oil Fields

PLCs provide on-site gathering and processing of data pertinent to characteristics such as depth and density of drilling rigs. The PLC controls and monitors the total rig operation and alerts the operator of any possible malfunctions.

GLASS PROCESSING

Annealing Lehr Control

PLCs control used to remove the internal stress from glass products. The system controls the operation by following the annealing temperature curve during the reheating, annealing, straining, and rapid cooling processes through different heating and cooling zones. Improvements are made in the ratio of good glass to scrap, reduction in labor cost, and energy utilization.

Glass Batching

PLCs control the batch weighing system according to stored glass formulas. The system also controls the electromagnetic feeders for in feed to and outfeed from the weigh hoppers, manual shut-off gates, and other equipment.

Cullet Weighing

PLCs direct the cullet system by controlling the vibratory cullet feeder, weight-belt scale, and shuttle conveyor. All sequences of operation and inventory of quantities weighed are kept by the PLC for future use.

Batch Transport

PLCs control the batch transport system, including reversible belt conveyors, transfer conveyors to the cullet house, holding hoppers, shuttle conveyors, and magnetic separators. The controller takes action after the discharge from the mixer and transfers the mixed batch to the furnace shuttle, where it is discharged to the full length of the furnace feed hopper.

MANUFACTURING/MACHINING

Production Machines

The PLC controls and monitors automatic production machines at high efficiency rates. It also monitors piece-count production and machine status. Corrective action can be taken immediately if the PLC detects a failure.

Transfer Line Machines

PLCs monitor and control all transfer line machining station operations and the interlocking between each station. The system receives inputs from the operator to check the operating conditions on the line-mounted controls and reports any malfunctions. This arrangement provides greater machine efficiency, higher quality products, and lower scrap levels.

Wire Machine

The controller monitors the time and ON/OFF cycles of a wiredrawing machine. The system provides ramping control and synchronization of electric motor drives. All cycles are recorded and reported on demand to obtain the machine's efficiency as calculated by the PLC.

Tool Changing

The PLC controls a synchronous metal cutting machine with several tool groups. The system keeps track of when each tool should be replaced, based on the number of parts it manufactures. It also displays the count and replacements of all the tool groups.

Paint Spraying

PLCs control the painting sequences in auto manufacturing. The operator or a host computer enters style and color information and tracks the part through the conveyor until it reaches the spray booth. The controller decodes the part information and then controls the spray guns to paint the part. The spray gun movement is optimized to conserve paint and increase part throughput.

MATERIALS HANDLING

Automatic Plating Line

The PLC controls a set pattern for the automated hoist, which can traverse left, right, up, and down through the various plating solutions. The system knows where the hoist is at all times.

Storage and Retrieval Systems

A PLC is used to load parts and carry them in totes in the storage and retrieval system. The controller tracks information like a lane numbers, the parts assigned to specific lanes, and the quantity of parts in a particular lane. This PLC arrangement allows rapid changes in the status of parts loaded or unloaded from the system. The controller also provides inventory printouts and informs the operator of any malfunctions.

Conveyor Systems

The system controls all of the sequential operations, alarms, and safety logic necessary to load and circulate parts on a main line conveyor. It also sorts products to their correct lanes and can schedule lane sorting to optimize palletizer duty. Records detailing the ratio of good parts to rejects can be obtained at the end of each shift.

Automated Warehousing

The PLC controls and optimizes the movement of stacking cranes and provides high turnaround of materials requests in an automated, high-cube, vertical warehouse. The PLC also controls aisle conveyors and case palletizers to significantly reduce manpower requirements. Inventory control figures are maintained and can be provided on request.

METALS

Steel Making

The PLC controls and operates furnaces to produce metal in accordance with preset specifications. The controller also calculates oxygen requirements, alloy additions, and power requirements.

Loading and Unloading of Alloys

Through accurate weighing and loading sequences, the system controls and monitors the quantity of coal, iron ore, and limestone to be melted. It can also control the unloading sequence of the steel to a torpedo car.

Continuous Casting

PLCs direct the molten steel transport ladle to the continuous- casting machine, where the steel is poured into a water-cooled mold for solidification.

Cold Rolling

PLCs control the conversion of semifinished products into finished goods through cold-rolling mills. The system controls motor speed to obtain correct tension and provide adequate gauging of the rolled material.

Aluminum Making

Controllers monitor the refining process, in which impurities are removed from bauxite by heat and chemicals. The system grinds and mixes the ore with chemicals and then pumps them into pressure containers, where they are heated, filtered, and combined with more chemicals.

POWER

Plant Power System

The programmable controller regulates the proper distribution of available electricity, gas, or steam. In addition, the PLC monitors powerhouse facilities, schedules distribution of energy, and generates distribution reports. The PLC controls the loads during operation of the plant, as well as the automatic load shedding or restoring during power outages.

Energy Management

Through the reading of inside and outside temperatures, the PLC controls heating and cooling units in a manufacturing plant. The PLC system controls the loads, cycling them during predetermined cycles and keeping track of how long each should be on or off during the cycle time. The system provides scheduled reports on the amount of energy used by the heating and cooling units.

Coal Fluidization Processing

The controller monitors how much energy is generated from a given amount of coal and regulates the coal crushing and mixing with crushed limestone. The PLC monitors and controls burning rates, temperatures generated, sequencing of valves, and analog control of jet valves.

Compressor Efficiency Control

PLCs control several compressors at a typical compressor station. The system handles safety interlocks, startup/shutdown sequences, and compressor cycling. The PLCs keep compressors running at maximum efficiency using the nonlinear curves of the compressors.

PULP AND PAPER

Pulp Batch Blending

The PLC controls sequence operation, ingredient measurement, and recipe storage for the blending process. The system allows operators to modify batch entries of each quantity, if necessary, and provides hardcopy printouts for inventory control and for accounting of ingredients used.

Batch Preparation for Paper-Making Processing

Applications include control of the complete stock preparation system for paper manufacturing. Recipes for each batch tank are selected and adjusted via operator entries. PLCs can control feedback logic for chemical addition based on tank level measurement signals. At the completion of each shift, the PLC system provides management reports on materials use.

Paper Mill Digester

PLCs control the process of making paper pulp from wood chips. The system calculates and controls the amount of chips based on density and digester volume. Then, the percent of required cooking liquors is calculated and these amounts are added to the sequence. The PLC ramps and holds the cooking temperature until the cooking is completed.

Paper Mill Production

The controller regulates the average basis weight and moisture variable for paper grade. The system manipulates the steam flow valves, adjusts the stock valves to regulate weight, and monitors and controls total flow.

RUBBER AND PLASTIC

Tire-Curing Press Monitoring

The PLC performs individual press monitoring for time, pressure, and temperature during each press cycle. The system alerts the operator of any press malfunctions. Information concerning machine status is stored in tables for later use. Report generation printouts for each shift include a summary of good cures and press downtime due to malfunctions.

Tire Manufacturing

Programmable controllers are used for tire press/cure systems to control the sequencing of events that transforms a raw tire into a tire fit for the road. This control includes molding the tread pattern and curing the rubber to obtain road-resistant characteristics. This PLC application substantially reduces the space required and increases reliability of the system and the quality of the product.

Rubber Production

PLCs provide accurate scale control, mixer logic functions, and multiple formula operation of carbon black, oil, and pigment used in the production of rubber. The system maximizes utilization of machine tools during production schedules, tracks in-process inventories, and reduces time and personnel required to supervise the production activity and the shift-end reports.

Plastic Injection Molding

A PLC system controls variables, such as temperature and pressure, which are used to optimize the injection molding process. The system provides closed-loop injection, where several velocity levels can be programmed to maintain consistent filling, reduce surface defects, and shorten cycle time.

I know that the above list of applications is quite long but it is important to know the applications of PLC thoroughly before we start working on PLCs in AutoCAD Electrical.

Specifications of PLCs

In real-world, the PLCs are specified by the following parameters.

• Input Voltages

- Output Voltages
- Number of I/O terminals

Now, we are ready to work on the electrical drawings containing PLCs.

INSERTING PLCS (PARAMETRIC)

There are two tools in AutoCAD Electrical to insert PLCs; **PLC (Parametric)** and **PLC (Full Units)**. These tools are available in the **Insert PLCs** drop-down in the **Insert Components** panel; refer to Figure-1. The **PLC (Parametric)** tool allows you to insert the PLCs based on your inputs whereas the **PLC (Full Units)** allow you to insert the ready made PLC modules in the drawing. The procedure to use the **PLC (Parametric)** tool is given next.



Figure-1. Insert PLCs drop-down

- Click on the Insert PLC (Parametric) tool from the Insert PLCs drop-down in the Insert Components panel. The PLC Parametric Selection dialog box will be displayed; refer to Figure-2.
- Click on the + signs to expand the categories and select the desired type for your PLC.
- Select the desired PLC from the table displayed at the bottom in the dialog box.
- Click on the desired radio button from the **Graphic Style** area displayed on the left in the dialog box. Note that the preview of displayed style is also displayed in the thumbnail.

⊡ Dis	R ELECTRIC IS alog Input htroller crete Combination wer Supply 6EP1 321-1SH01 6EP1 331-1SH01 6EP1 332-1SH41		Graphics Style:
Table: siemens_LOG	TYPE POINTS	RATING	DESCRIPTION
6EP1 322-1SH01			LOGO! POWER 12 V/4.5 A
List	ОК	Ca	ancel <u>H</u> elp

Figure-2. PLC Parametric Selection dialog box

- Click in the **Scale** edit box and specify the desired scale factor to make the PLC smaller or larger.
- Click on the **OK** button from the dialog box. The PLC will get attached to the cursor; refer to <u>Figure-3</u>.



Figure-3. PLC attached to the cursor

• Click in the drawing area to place the PLC. The **Module Layout** dialog box will be displayed; refer to Figure-4.

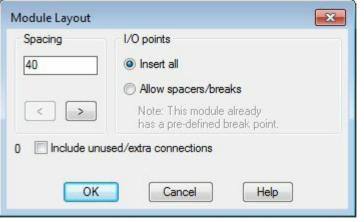


Figure-4. Module Layout dialog box

- Specify the desired spacing between the consecutive input and output points in the PLC by using the **Spacing** edit box in this dialog box.
- Select the Allow spacers/breaks radio button if you want to add spacers or break lines at the predefined break points in the PLC.
- If you want to display all the terminals whether they are used or unused then select the **Include unused/extra connections** check box.
- Click on the **OK** button from the dialog box. The **I/O Point** dialog box will be displayed; refer to <u>Figure-5</u>.

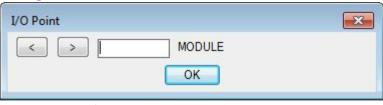


Figure-5. I/O Point dialog box

• Specify a number to the module by using the **MODULE** edit box of this dialog box and click on the **OK** button from the dialog box. The PLC will be placed. Note that AutoCAD Electrical 2016 stores preferences of PLC insertion and next time when you will choose this tool, it will prompt you whether to continue previous session or not.

INSERT PLC (FULL UNITS)

The **Insert PLC (Full Units)** tool is used to insert the full PLC units as per the requirement. Note that in this case, you cannot control the number of connections, display style and so on for the selected PLC. The procedure to use this tool is given next.

• Click on the **Insert PLC (Full Units)** tool from the **Insert PLCs** drop-down. The **Insert Component** dialog box will be displayed with the PLC components; refer to <u>Figure-6</u>.

JIC: Schematic Symbols + +- Push Buttons	AB 1761						Recently Used
+0- Selector Switches +0- Fuses/Circuit Breakers +0- Fuses/Circuit Breakers +0- Fuses/Contacts +0- As 1751 Macro +0- As 17	0.5 AB 1761	AB 1751 AB 1751 MeroLogix (3/	AB 1761 1.0 AB 1761 MicroLogix (Automation Direct DL10	Automation Direct DL10	Automation Direct DL1	User Orout 8 User Orout 8 O 1 Phase Motor 6 Position NO -100- You Type N Relay NC Contact

Figure-6. Insert Component dialog box

- Click on the desired category and select a plc of your requirement. The PLC will get attached to the cursor; refer to Figure-7.
- Click in the drawing area to place the PLC. The Edit PLC Module dialog box will be displayed; refer to Figure-8.

	100	
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0 0 0	4	Ø
Ø		Ø
Ø	1	Ø
Ø		Ø
Ø	1 1	0 0
		ً
000	l i	Ø
Ø	2	ø
Ø		Ø
0		Ø
Ø		Ø

Figure-7. PLC full unit attached to the cursor

Addressing		I/O Point	Description			
address	1/9	Address	1/9	1/0	point (1 of 16)	
	V9 V8 V7 V6 V5 V5 V4 V3 •	Desc 1 Desc 2 Desc 3 Desc 4				
Used:	Drawing Project	Desc 5	Pick	Pick der	rice to capture Desc text	
Tag	-04PLC1	List descr	iptions:	1/0	Wired Devices	External File
fixed	Options	(1/9) (1/8) (1/7)				
Line1 Line2		Installati	on/Location	Location	Pins Pin 1	
Manufacturer	AB				Pin 2	
Catalog	1761-L16AWA	Dra	wing	Drawing		
Assembly		Pro	oject	Project	Show/Edit	Miscellaneous
X	Catalog Lookup			<u> </u>	R	latings
Description	10 INPUTS (24VD	-	_			

Figure-8. Edit PLC Module dialog box

• Specify the desired parameters in the dialog box and click on the **OK** button from the dialog box. The options in this dialog box are discussed next (its very important to understand the options in this dialog box).

Addressing Area

The options in this area are used to manage input or output addresses of the PLC.

First Address

Specifies the first I/O address for the PLC module. The addresses with I are meant for input like I/9,I/8, and so on. The addresses with O are meant for output like O/3, O/4, and so on. Select the desired address from the list to specify it as first I/O address.

Used Area

The buttons in this area are used to select I/O addresses used in earlier drawings or projects. The procedure to use these options is given next.

• Select the **Drawing** button from the area. The **PLC I/O Point List (this drawing)** dialog box will be displayed with the list of I/O points assigned already; refer to Figure-9.

I/O Addr H	Pin	Tag Name	Inst,Loc	I/O Point Description	
		-04PLC1			
1/0		-04PLC1			
1/1		-04PLC1			
1/2		-04PLC1			1
1/3		-04PLC1			
1/4		-04PLC1			
1/5		-04PLC1			
1/6		-04PLC1			
1/7		-04PLC1			
1/8		-04PLC1			
1/9		-04PLC1			
0/0		-04PLC1			
0/1		-04PLC1			
0/2		-04PLC1			
0/3		-04PLC1			
0/4		-04PLC1			
i l					•
Show All					
) Tag Name:	-04P	PLC2			

Figure-9. PLC IO Point List dialog box

- Select the desired tag name from the list to use it for the PLC.
- In the similar way, you can use **Project** button.

Note that editing the first address, I/O point address, or catalog information for a plc module that was imported using the Unity Pro Export to Spreadsheet tool may result in problems when you export the data back to Unity Pro. An alert displays to ask whether you want to proceed with the changes.

Tag

The **Tag** edit box is used to specify a unique identifier assigned to the module. The tag value can be manually typed in the edit box.

Options

The **Options** button is used to change the default format of tags for PLCs. On selecting this button, the **Option: Tag Format "Family" Override** dialog box is displayed; refer to <u>Figure-10</u>. Note that you can insert a fixed text string for the %F part of the tag format. Retag Component can then use this override format value to calculate a new tag for the PLC module. For example, a certain PLC module must always have an "IO" family tag value instead of "PLC" so that retag, for example, assigns IO-

100 instead of PLC100. To achieve this tag override you would enter "IO-%N" for the tag override format.

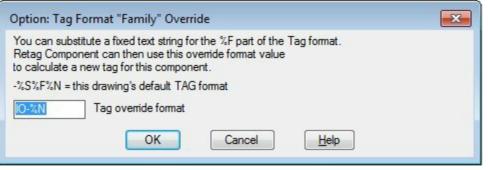


Figure-10. Option dialog box

Line1/Line2

These edit boxes are used to specify optional description text for the module. May be used to identify the relative location of the module in the I/O assembly (example: Rack # and Slot #).

Manufacturer

The **Manufacturer** edit box is used to list the manufacturer number for the module. Enter a value or select one by using the **Catalog Lookup** tool.

Catalog

Lists the catalog number for the module. Enter a value or select one from the Catalog Lookup.

Assembly

Lists the assembly code for the module. The Assembly code is used to link multiple part numbers together.

Catalog Lookup

The **Catalog Lookup** tool is used to display the data in catalog related to the selected component. Click on the **Catalog Lookup** tool and the **Catalog Information** dialog box will be displayed; refer to <u>Figure-11</u>. The options of this dialog box have already been discussed.

Catalog Inform	mation 🔀]
Manufacturer	AB]
Catalog	1761-L16AWA]
Assembly		1
ltem	Next	
	Catalog Lookup	
Find Dr	Project	
	Multiple BOM	
	Catalog Check	
	OK Cancel	

Figure-11. Catalog Information dialog box

Description

Specify the optional line of description text in the **Description** edit box. May be used to identify the module type (for example, "16 Discrete Inputs - 24VDC")

I/O Point Description Area

Address

This edit box is used to specify the I/O address assignment.

Description 1-5

These edit boxes are used to specify the optional description text. Enter up to five lines of description attribute text.

Next/Pick

The Next button is used to select the next I/O Point for specifying the description. Pick button is used to select the desired I/O point directly from the drawing.

List descriptions

The options in this area are used to list the I/O point descriptions currently assigned to each I/O point on the module or connected, wired devices in a pick list.

Pins

The edit boxes in this area are used to assign pin numbers to the pins that are physically located on the module.

Show/Edit Miscellaneous

The **Show/Edit Miscellaneous** button is used to view or edit any attributes that are not predefined AutoCAD Electrical attributes.

Ratings

This edit box is used to specify values for each ratings attribute. You can enter up to 12 ratings attributes on a module. Select **Defaults** to display a list of default values.

Note: If Ratings is unavailable, the module you are editing does not carry rating attributes.

CONNECTORS

Connectors are the parts that are used to connect wirings from sources to equipment. The tools to add or modify the connectors are available in the **Insert Connectors** drop-down in the **Insert Components** panel; refer to Figure-12. Various tools in this drop-down are discussed next.

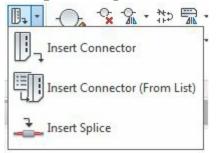


Figure-12. Insert Connector drop-down

Insert Connector

The **Insert Connector** tool is used to insert connectors in the drawing. The procedure to use this tool is given next.

• Click on the **Insert Connector** tool from the **Insert Connectors** drop-down. The **Insert Connector** dialog box will be displayed; refer to Figure-13.

Type Displ	lay Size
Plug / Receptacle Combination Conn	nector: Receptacle 6
Wire Number Change Verti	ical Plug: 6
Add Divider Line Plug:	
Left	▼ Top: 6
Plug Only Pins:	Bottom: 6
Receptacle Only	Side Radius: 3

Figure-13. Insert Connector dialog box

- Click in the **Pin Spacing** edit box and specify the space between two consecutive pins of the connector.
- Click in the **Pin Count** edit box and specify the number of pins. Alternatively, click on the **Pick**
button and draw a construction line of desired length. The number of pins will be automatically
assigned based on the length of line and space between two pins.
- Select the At Wire Crossing radio button if you want to set the pins of connector at the crossing of wires with the connector.
- Click on the **Details**>> button to expand the dialog box.
- From the **Type** area, select the desired radio button to change the type of connector. After selecting the radio button from this area, you can check the preview in the thumbnail in this dialog box.
- If you want the wire numbers to be changed after the insertion of the connectors, then select the **Wire Number Change** check box.
- Select the desired options from the **Display** area to change the display style of the connector.
- The edit boxes in the Size area are used to change the size of connector.
- After specifying the desired parameters, click on the **Insert** button from the dialog box. The connector will get attached to the cursor.
- Click in the drawing area to place the connector. If you click on the ladder's wire then the pins of connector will automatically adjust according to the ladder; refer to Figure-14.

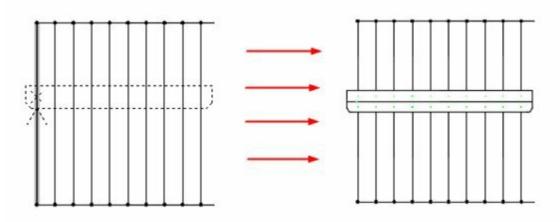


Figure-14. Placing connectors on a ladder

Insert Connector (From List)

The **Insert Connector (From List)** tool is used to insert the connectors from an XML file created by Inventor. In Inventor, you can create model of the connector and then you can export it into XML format. The procedure to use this tool is given next.

Click on the Insert Connector (From List) tool from the Insert Connectors drop-down. The Autodesk Inventor Professional Import File Selection dialog box will be displayed; refer to Figure-15.

Look in:	My Documents		Views 🔻 Tools
~	Name	Date modified	Туре
	📕 Acade 2015	11-04-2014 09:38	File folder
360	Autodesk Application Manager	09-04-2014 11:52	File folder
	J BitLord	09-04-2014 13:59	File folder
	Books_Final Books	21-03-2014 12:06	File folder
	😹 Calibre Library	21-03-2014 17:22	File folder
	🍌 Camtasia Studio	13-01-2014 10:06	File folder
	Custom Office Templates	24-03-2014 11:32	File folder
	📕 CyberLink	02-04-2014 15:23	File folder
	🍌 Downloads	07-04-2014 12:20	File folder
	lnventor Server SDK ACAD 2015	04-04-2014 12:43	File folder
	Inventor Server SDK ACADE 2015	11-04-2014 09:58	File folder
	Aarriage 🔒	03-12-2013 21:34	File folder
	🔒 Mold_Design	13-01-2014 10:10	File folder
	🍌 Outlook Files	02-05-2014 14:04	File folder
	🍌 pdfs	01-09-2013 11:35	File folder
	🍌 samsung	15-06-2012 22:15	File folder
	۰ (m		

Figure-15. Autodesk Inventor Professional Import File Selection dialog box

- Select the desired file and click on the **Open** button. List of connectors will be displayed.
- Select the desired connector and place it in the drawing.

Insert Splice

The **Insert Splice** tool is used to insert splice in the wiring of connection points of connectors. Click on this tool to insert splice, the **Insert Component** dialog box will be displayed. The procedure to use this dialog box have already been discussed.

TERMINALS

Terminals are used to connect wires to the devices. In real world, terminals are used to connect wires so that they do not cause sparking at high load. You can use the **Insert Component** dialog box to insert terminals in the drawing.

The tools to edit terminals are available in the expanded **Edit Components** panel. Various tools related to terminals are discussed next.

Inserting Terminals from Catalog Browser

- Click on the **Catalog Browser** tool from the **Insert Components** panel in the **Ribbon**. The **Catalog Browser** will be displayed.
- Select the **TRMS** category, or any category with terminals.
- Enter a search criteria and click on the Search button.
- Click on a field in the results pane.

Do one of the following:

- Click one of the symbols associated to the catalog value.
- Click **Browse** to locate the symbol on disk. The symbol selected is automatically associated to that catalog value for future insertions.

You can double-click the row in the results pane to insert the default or only symbol associated to the catalog value.

• Specify the insertion point in the drawing.

The symbol orientation matches the underlying wire. If there is no underlying wire, the selected orientation is inserted. The wire breaks automatically if the symbol lands on it.

Associate Terminals on the Same Drawing

You can use the **Associate Terminals** tool to associate two or more terminal symbols together. Associating schematic terminals combines the terminals into a single terminal block property definition. The number of schematic terminals that can be combined is limited to the number of levels defined for the block properties.

Associating a panel terminal provides a way to define a particular panel footprint to represent a schematic block property definition. The procedure to use this tool is given next.

- Click Schematic tab > Edit Components panel > Associate Terminals tool([]]).
- Select a terminal symbol to use as the master. It is used as the basis for any terminal property definition.

Note that your terminal symbol must have block properties defined. To define block properties, right-click on the symbol and select Edit Component. In the Insert/Edit Terminal Symbol dialog box, click Block Properties.

- Select additional terminal symbols to add to the association of the master terminal.
- Press Enter to associate the terminals.
- The catalog data, block properties, Tag strip value, Installation code and Location code are copied from the master terminal and added to the terminals in the association.

Note: If the number of selected terminals exceeds the total number of levels defined in the block properties, an alert displays and the extra terminals are not added to the association.

You can use the other tools related to terminals in the same way.

PRACTICAL AND PRACTICE

CHAPTER 8

Topics Covered

The major topics covered in this chapter are:

- Introduction
- Practical 1
- Practical 2
- Practical 3
- Practice 1
- Practice 2
- Practice 3
- Practice 4
- Practice 5

INTRODUCTION

In this chapter, we will create various electrical circuits and at the end of chapter a complete collection of electrical drawings is given for practice.

PRACTICAL 1

Create a schematic for 3 phase motor starter as shown in Figure-1.

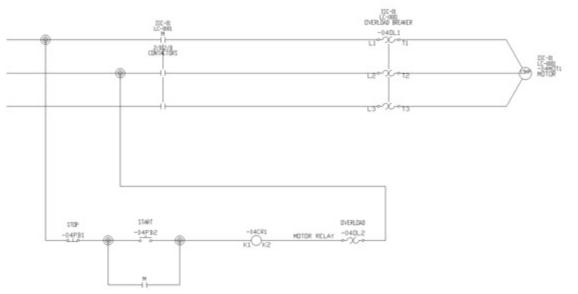


Figure-1. Practical 1

Starting AutoCAD Electrical drawing

• Click on the AutoCAD Electrical icon from the desktop or start AutoCAD Electrical by using the **Start** menu; refer to Figure-2.

Figure-2. Starting AutoCAD Electrical using Start menu



- AutoCAD Electrical will open.
- Click on the down arrow below **Start Drawing** button from the template area. The list of drawing templates will be displayed; refer to Figure-3.

Get Started	Re
Start Drawing	YEST
🖬 Templates 🔹 🔻	
acad -Named Plot Styles.dwt acad -Named Plot Styles3D.dwt acad.dwt acad3D.dwt acadISO -Named Plot Styles.dwt acadISO -Named Plot Styles3D.dwt	
Sheet Sets	
Create New Sheet Set	

Figure-3. Drawing templates

- Select the ACAD ELECTRICAL IEC.dwt template from the list. A new drawing will be created with the selected template.
- Click on the buttons displayed in <u>Figure-4</u> to hide the grid and off the grid snap.



Inserting wires

• Click on the Multiple Bus tool from the Insert Wires/Wire Numbers panel in the Ribbon. The Multiple Wire Bus dialog box will be displayed as shown in <u>Figure-5</u>.

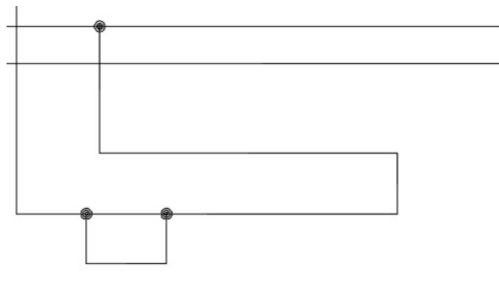
Multiple Wire Bus	X
Horizontal	Vertical
Spacing:	Spacing:
Starting at:	
O Another Bus (Multiple Wires)	
 Empty Space, Go Horizontal Empty Space, Go Vertical 	
3 Number of Wires	2 3 4
OK	ncel <u>H</u> elp

Figure-5. Multiple Wire Bus dialog box

- Click in the **Spacing** edit box in **Horizontal** area of the dialog box and specify the spacing as **5** in the edit box.
- Select the **Empty Space**, **Go Horizontal** radio button and specify the number of wires as 3 in the **Number of Wires** edit box.
- Click on the **OK** button from the dialog box. You are asked to specify the start point of the wires.
- Click in the drawing area at desired position to start wiring. You are asked to specify the end point of the wires.
- Click in the drawing area to specify the end point; refer to Figure-6.



- Click in the Wire tool from the Wire drop-down in the Insert Wires/Wire Numbers panel in the Ribbon. You are asked to specify the start point of the wire.
- Click on the top wire to specify the start point of the wire. You are asked to specify the next point of the wire.
- Click to specify the next point. Similarly, create all the wires of the circuit; refer to <u>Figure-7</u>. *Figure-7*. *Complete wiring for current circuit*



Inserting Components

- Click on the **Icon Menu** button from the **Insert Components** drop-down in the **Insert Components** panel in the **Ribbon**. The **Insert Component** dialog box will be displayed.
- Click on the **Motor Control** category from the dialog box. The components related to motor control will be displayed; refer to <u>Figure-8</u>.

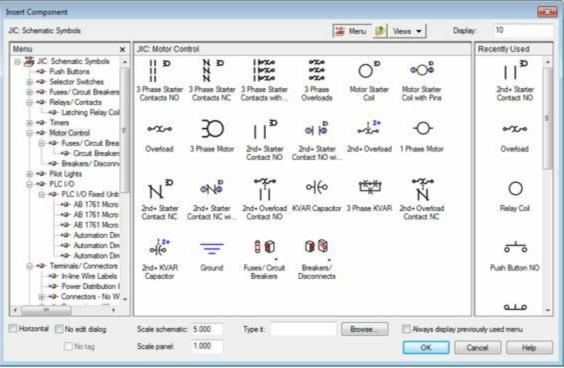


Figure-8. Insert Component dialog box

- Click on the **3 Phase Motor** component from the dialog box. The component will get attached to the cursor.
- Click at the end point of the center line of the wire bus; refer to <u>Figure-9</u>. The motor will be placed and the **Insert/Edit Component** dialog box will be displayed; refer to <u>Figure-10</u>.

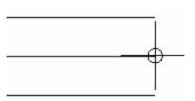


Figure-9. motor placement

Component T	ag	Description
04MOT1	Fixed	Line 1
Use F	LC Address	Line 2
Fags	Schematic	Line 3
Jsed:	Panel	List: Drawing Project Defaults Pick
Ext	emal List	
(Options	Cross-Reference
atalog Data		Component override Setup
Manufacturer		Beference ND NO/NC Setup
Catalog		
ssembly		Reference NC
em	Count	
Next>>		Installation code
Lookup	Previous	
Drawing	Project	Drawing Project Pins
		Location code
Multiple		2 <>
Cata	log Check	Drawing Project X C >
Ratings		Show/Edit Miscellaneous
Rating		

Figure-10. Insert or Edit Component dialog box

- Click on the Lookup tool from the Catalog Data area of the dialog box. The Catalog Browser will be displayed.
- Select the CM111-FC1F518GSKCA field under the CATALOG column from the Catalog Browser; refer to Figure-11. Note that this is a 3 Phase 1.5 HP motor with 1800 RPM speed.

tegory: MO (Motors) 🔹				C
arch: Enter search text suc	h as catalog number	, manufacturer, color and style.		• 0
sults				1
CATALOG	MANUFACTURER	DESCRIPTION		
CM111-FC1F536GSKCA	AB	SEVERE DUTY SE AC MOTOR, ENC:	TEFC, C FACE FOOT MO	UNTED, CM1
CM111-FC1F536AEKC5A	AB	SEVERE DUTY EE AC MOTOR, ENC:	TEFC, C FACE FOOT MO	UNTED, CM1
CM111-FC1F536AEKC4A	AB	SEVERE DUTY EE AC MOTOR, ENC:	TEFC, C FACE FOOT MO	UNTED, CM1
CM111-FC1F536APMCA	AB	SEVERE DUTY PE AC MOTOR, ENC.	TEFC, C FACE FOOT MC	UNTED, CM1
CM111-FC1F518GSKCA	AB	SEVERE DUTY SE AC MOTOR, ENC:	TEFC, C FACE FOOT MO	UNTED, CM1
CM111-FC1F518AEKC5A	AB	SEVERE DUTY EE AC MOTOR, ENC:	TEFC, C FACE FOOT MO	UNTED, CM1
cord Count: 54706	Eilter by W	DBLKNAM value: MO13	Search Database:	Primary
			QK	Cancel

Figure-11. Motor to be selected

- Click on the **OK** button from the **Catalog Browser**.
- The catalog data will be updated automatically in the Catalog Data area of the Insert/Edit Component dialog box.
- Click on the Show All Ratings button from the Ratings area of the dialog box. The View/Edit Rating Values dialog box will be displayed; refer to Figure-12.
- Click in the **Rating 1** edit box and specify the value as **1.5HP** and remove the **Rating 4** edit box.
- Click on the **OK** button from the dialog box. The value will be displayed in the **Rating** edit box.

iew/Edit Rating Values		
	Rating 1	Defaults
	Rating 2	Defaults
	Rating 3	Defaults
1.5HP	Rating 4	Defaults
		Defaults

Figure-12. View or Edit Rating Values dialog box

• Click in the Line 1 edit box in the Description area of the dialog box and specify the value as

MOTOR.

- Click in the Installation Code edit box and specify the value as ISC-01.
- Click in the Location Code edit box and specify the value as LC-0001.
- Click on the **OK** button from the dialog box. If the **Assign Symbol To Catalog Number** dialog box is displayed (refer to <u>Figure-13</u>) then click on the **Map symbol to catalog number** button from it.

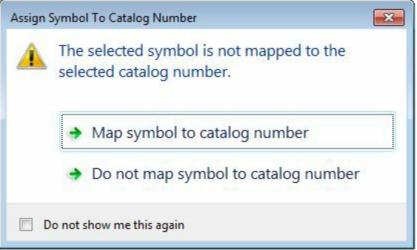


Figure-13. Assign Symbol To Catalog Number dialog box

• The motor after placement will be displayed as shown in Figure-14.

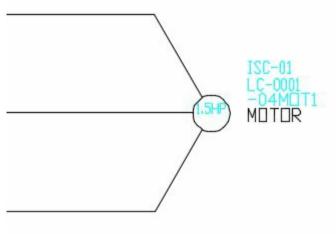


Figure-14. Motor after placement

Inserting 3 Phase Overload Circuit Breaker

- Click on the **Icon Menu** button from the **Insert Components** drop-down. The **Insert Component** dialog box will be displayed.
- Click on the **Motor Control** category and select the **3 Phase Overloads** icon from the dialog box; refer to <u>Figure-15</u>. The icon will get attached to the cursor; refer to <u>Figure-16</u>.

Schematic Symbols				1	Menu 🥬 🛛	Views 👻 Dis	splay: 10
tenu x	JIC: Motor Con	trol		N 00			Recently Used
JC: Schematic Symbols 40- Push Buttons 40- Push Buttons 40- Selector Switches 40- Relays/ Contacts 40- Relays/ Contacts 40- Relays/ Contacts 40- Besolver, Disconn 40- Pict Lights 40- Pict No 40- AB 1761 Mcro 40- ALtomation Die 40- Automation Die 40- Rutomation Die 40- Connectors 40- Nower Distribution 1 40- Connectors -No W	III 3 Phase Starter Contacts NO 0 Verload V 2nd+ Starter Contact NC 12+ 0 (c 2nd+ KVAR Capacitor	3 Phase Stater Cortacts NC 3 Phase Motor 3 Phase Motor 2nd+ Stater Contact NC will.	Contacts with	Overloads	Motor Starter Col ase Overloads hand wid Jaunt H 2nd+ Overload Col 2nd+ Overload 3 Phase KVAR		3 Phase Motor 3 Phase Motor 2nd + Starter Contact NO 0 Verload Overload Relay Coll Push Button NO
Horizontal 📃 No edit dialog	Scale schematic	5.000	Type it:		Browse	Always display p	reviously used menu

Figure-15. 3 Phase Overloads component

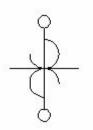


Figure-16. Icon attached to the cursor

• Click on the top wire of the wire bus; refer to <u>Figure-17</u>. The **Build Up or Down?** dialog box will be displayed; refer to <u>Figure-18</u>.

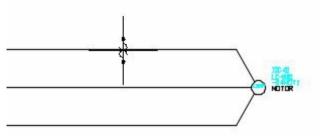


Figure-17. Placement of overload circuit breaker

Up	
Down	

Figure-18. Build Up or Down dialog box

- Click on the **Down** button from the dialog box. The **Insert/Edit Component** dialog box will be displayed.
- Click on the Lookup button from the Catalog Data area. The Catalog Browser dialog box will be displayed.
- Click on the 193-A1A1 field in the CATALOG column from the dialog box; refer to Figure-19.

arch: Enter search tex	t such as catalog number	, manufacturer, color and style.	6	*	C
esults				*	6
CATALOG	MANUFACTURER	DESCRIPTION			
193-B1A1	AB	OVERLOAD RELAY AUTO/MAN	UAL RESET, CLASS 10,15,20),30	
193-A1A1	AB	OVERLOAD RELAY MANUAL R	ESET, CLASS 10		C
193-A4A1	AB	OVERLOAD RELAY AUTO/MAN	VUAL RESET, CLASS 10		Ĩ
193-A2A1	AB	OVERLOAD RELAY MANUAL R	ESET, CLASS 20		ĩ
3RB10 16-1RB0	SIEMENS	OVERLOAD RELAY, CLASS 10			1
3RB10 26-1RB0	SIEMENS	OVERLOAD RELAY, CLASS 10		Þ	
cord Count: 2203	Filter by W	/DBLKNAM value: OL1	Search Database:	Primany	

Figure-19. Catalog Browser with Overloads components

- Click on the **OK** button from the **Catalog Browser**. The details will appear in the **Catalog Data** area of the dialog box.
- Click in the Line 1 edit box in the Description area of the dialog box. Specify the value as **OVERLOAD BREAKER**.
- For the **Installation Code** and **Location Code**, click on the **Drawing** button and select the earlier specified code.
- Click on the **OK** button from the dialog box. If the **Assign Symbol To Catalog Number** dialog box is displayed then click on the **Map symbol to catalog number** button. The breaker will be placed in the circuit; refer to <u>Figure-20</u>.

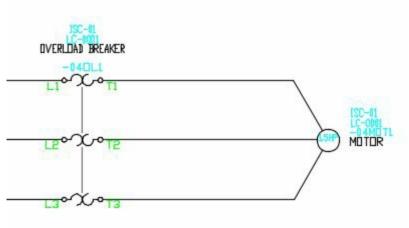


Figure-20. Overload Breaker

Inserting the Starter Contact

- Click on the Icon Menu button and select the Motor Control category.
- Click on the **3 Phase Starter Contacts NO** icon from the **Insert Component** dialog box. You are asked to specify the location of the contacts.
- Click on the top wire of the bus as did before; refer to Figure-21. The Build Up or Down? dialog box will be displayed.
- Click on the **Down** button from the dialog box. The contacts will be placed and the **Insert/Edit Child Component** dialog box will be displayed; refer to <u>Figure-22</u>.
- Click in the Line 1 edit box in the Description area of the dialog box and specify the value as CONTACTORS.

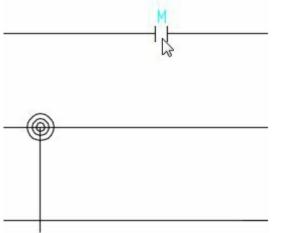


Figure-21. Contact symbol placement

Component Tag	Description		
Fag M	Line 1		Pick
Drawing Project	Line 2		
Parent/Sibling	Line 3		
	Cross-reference		
	Installation code		
		Pins	
	Drawing Project	Pin 1 <	>
	Location code	Pin 2 <	>
Ratings		Pin <	>
	Drawing Project	< > List	
Show All Ratings	Show/Edit Miscellaneous		
Show All Ratings			

Figure-22. Insert or Edit Child Component dialog box

- For **Installation** and **Location** codes, click on the **Drawing** buttons and select the earlier specified values.
- Click on the **OK** button from the dialog box.

Similarly, insert the other components with the required descriptions. The schematic drawing after inserting all the components will be displayed as shown in <u>Figure-23</u>.

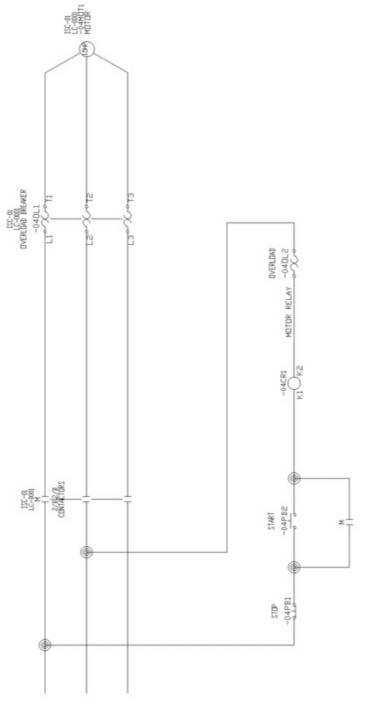


Figure-23. practical 1

PRACTICAL 2

In this practical, we will create a schematic drawing of circuit as shown in <u>Figure-24</u>. This circuit mainly emphasize on connector.

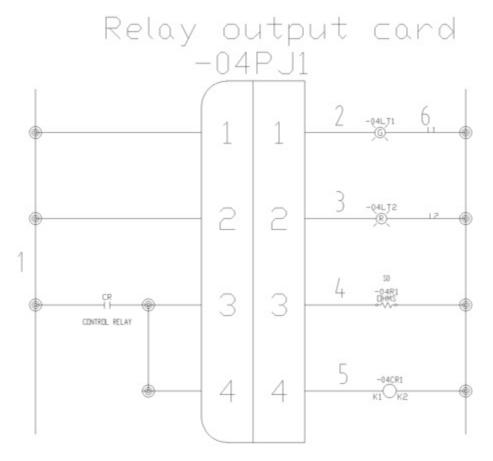


Figure-24. Practica 2

Starting AutoCAD Electrical drawing

- Click on the AutoCAD Electrical icon from the desktop or start AutoCAD Electrical by using the **Start** menu.
- AutoCAD Electrical will open.
- Click on the down arrow below **Start Drawing** button from the template area. The list of drawing templates will be displayed; refer to <u>Figure-25</u>.

Get Started	Re
Start Drawing	YEST
Templates 🔹	
acad -Named Plot Styles.dwt acad -Named Plot Styles3D.dwt acad.dwt acad3D.dwt acadISO -Named Plot Styles.dwt acadISO -Named Plot Styles3D.dwt	
Sheet Sets	
Create New Sheet Set	

Figure-25. Drawing templates

- Select the ACAD ELECTRICAL IEC.dwt template from the list. A new drawing will be created with the selected template.
- Click on the buttons displayed in Figure-26 to hide the grid and off the grid snap.



Inserting ladder

• Click on the Insert Ladder tool from the Insert Ladders drop-down in the Insert Wires/Wire Numbers panel. The Insert Ladder dialog box will be displayed; refer to Figure-27.

Sheet: 04 - Insert Ladder	×
Width	Spacing
Length	1st Reference 1 Index Without reference numbers
Phase 1 Phase 3 Phase Spacing 	Draw Rungs No Bus No Rungs Yes Skip

Figure-27. Insert Ladder dialog box

- Specify the Width value and Spacing value as 50 and 10, respectively.
- Click in the **Rungs** edit box and specify the value as **4**.
- Click on the **OK** button from the dialog box. You are asked to specify the insertion point for the ladder.
- Click in the drawing area to place the ladder at the desired position. If your ladder is placed with horizontal orientation as shown in <u>Figure-28</u>, then rotate the complete ladder by 90 degree using the **Rotate** tool from the **Modify** panel in the **Home** tab of the **Ribbon**.



Figure-28. Ladder placed horizontally oriented

• After rotating the ladder, it will be displayed as shown in Figure-29.

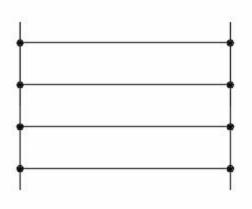
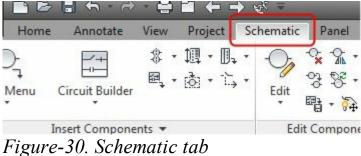


Figure-29. Rotated ladder

Inserting the Connector

• Click on the Schematic tab if you still in the Home tab; refer to Figure-30.



• Click on the **Insert Connector** tool from the **Insert Connectors** drop-down in the **Insert Components** panel. The **Insert Connector** dialog box will be displayed as shown in <u>Figure-31</u>.

Layout				Orientatio	n	
Pin Spacing: 10 Pixed Spacing At Wire Crossir Pin List:	Pin Count: 4 Pick <	Start C Child	NI Spacers/Breaks onnector as int with Break		1 2 3	
1					U.	
			Display		Size	
1 Type	cle Combination		Display Connector:		Size Receptacle	6
1 Type			Sector Constraints	-	Receptacle	
1 Type Plug / Recepta	er Change		Connector:	-	Receptacle Plug:	6
1 Type Ilug / Recepta	er Change		Connector: Vertical	•	Receptacle	
1 Type Plug / Recepta	er Change		Connector: Vertical Plug:	•	Receptacle Plug:	6

Figure-31. Insert Connector dialog box

• Click in the **Pin Spacing** edit box and specify the value as **10** (this is also the spacing between two

consecutive rungs in the ladder earlier created).

- Click in the **Pin Count** edit box and specify the value as **4** (this is also the number of rungs in the ladder earlier created).
- Click in the **Connector** drop-down in the **Display** area of the dialog box and select the **Vertical** option from the list displayed if not selected.
- Click on **Insert** button from the dialog box. The connector will get attached to the cursor.
- Click on the top rung of the ladder as shown in <u>Figure-32</u> to place the connector.

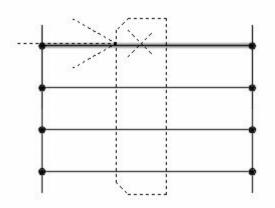


Figure-32. Placing the connector

• Select the connector and right click on it. A shortcut menu will be displayed as shown in Figure-33.

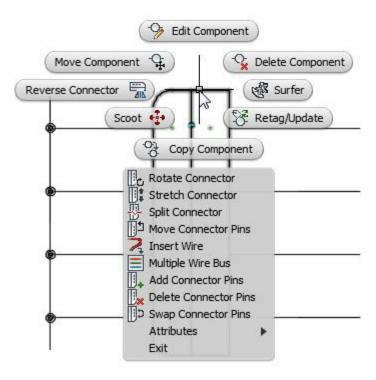


Figure-33. Menu for connector

• Move the cursor on the Attributes option in the menu. A cascading menu will be displayed; refer to <u>Figure-34</u>.

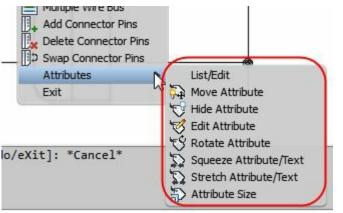


Figure-34. Cascading menu for attributes

• Click on the Attribute Size option from the cascading menu. The Change Attribute Size dialog box will be displayed; refer to Figure-35.

Change A	ttribute Size
Size	Pick>>
Size	2.5 Papely
Width	1 Apply
Sing	le By Name Type It
	Cancel Help

Figure-35. Change Attribute Size dialog box

- Make sure the size is **2.5** and width is **1**. Click on the **Single** button from the dialog box. You are asked to select the annotation objects.
- Click on the connector numbers and tags displayed in very small font to increase their size. Refer to <u>Figure-36</u>.

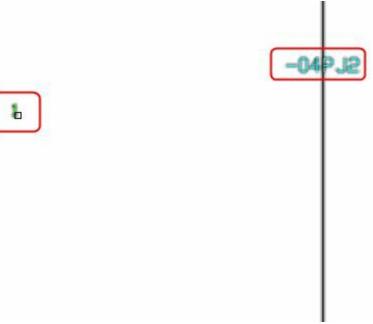


Figure-36. Numbers and tags in small font

• After increasing the size of annotations, the drawing will be displayed as shown in Figure-37.

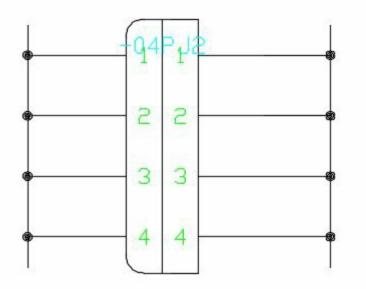


Figure-37. After increasing size of annotations

• Move the overlapping annotations to their proper places.

Connecting Wires

- Click on the **Wire** tool from the **Wires** drop-down in the **Insert Wires/Wire Numbers** panel. You are asked to specify the starting point of the wire.
- Click on the wire connected to connector number **3** in the left and connect it to the wire connected to connector number **4**; refer to Figure-38.

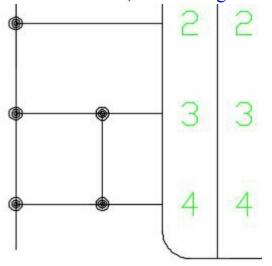


Figure-38. Wire connected

- Click on the **Trim Wire** tool from the **Edit Wires/Wire Numbers** panel in the **Ribbon**. You are asked to select the wire to be trimmed.
- Click on the wire as shown in Figure-39. Press ENTER to exit the Trim Wire tool.

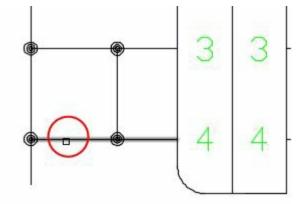


Figure-39. Wire to be trimmed

Inserting Components

- Click on the **Icon Menu** from the **Insert Components** drop-down in the **Insert Components** panel. The **Insert Component** dialog box will be displayed.
- Click on the **Relays/Contacts** category from the dialog box. The components related to relays and contacts will be displayed; refer to Figure-40.

IC: Schematic Symbols				1	Menu 👔 🕅	Views - Dis	iplay: 10
Menu x	JIC: Relays and	d Contacts					Recently Used
JIC: Schematic Symbols +0- Push Buttons +0- Push Buttons +0- Selector Switches +0- Fuest/Crout Breakers +0- Relays/Contacts +0- Relays/Contacts	Relay Col Relay Latching Relay Colls	I I Relay NO Contact	N Relay NC Contact	0 0 0 Standard Coll with Pins	만 /@ Relay NO with Pins	Pins Pins	C Relay Coll Fixed Resistor with Pins C Red Standard C Green Standard C Green Standard
Horizontal 🔲 No edit dialog	Scale schematic: Scale panel:	5.000	Type it:		Browse	Always display pr	reviously used menu Cancel Help

Figure-40. Insert Component dialog box with Relay and Contacts

- Click on the **Relay NO Contact** component from the dialog box. The component will get attached to the cursor.
- Place the component on the wire connected to Connector **3**; refer to Figure-41. The Insert/Edit Child Component dialog box will be displayed; refer to Figure-42.

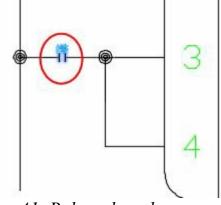


Figure-41. Relay placed

Component Tag	Description	
Tag CR	Line 1	Pick
Drawing Project	Line 2	
Parent/Sibling	Line 3	
	Cross-reference Installation code	Pins
	Drawing Project	Pin 1 < >
	Location code	Pin 2 < >
Ratings		Pin < >
Rating	Drawing Project) < > List
Show All Ratings	Show/Edit Miscellaneous	

Figure-42. Insert or Edit Child Component dialog box for relay

- Click in the Line 1 edit box and specify the value as Control Relay.
- Click on the **OK** button from the dialog box.
- Similarly, place the other components in the circuit. The schematic after placing all the components will be displayed as shown in <u>Figure-43</u>.

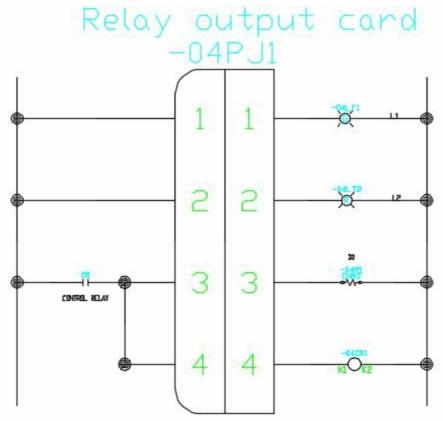


Figure-43. Schematic after placing the components

Assigning Wire Numbers

• Click on the Wire Numbers button from the Wire Numbers drop-down in the Insert Wires/Wire Numbers panel. The Wire Tagging dialog box will be displayed; refer to Figure-44.

Sheet 04 - Wire Tagging		
To do Tag new/un-numbered only Tag/retag all	Wire tag mode Sequential Start Sta	Format override %S.%N Wire tag format Image: Use wire layer format overrides
 ✓ Cross-reference Signals ✓ Freshen database (for Signals) 	O Ar dia	Setup
Project-wide	Pick Individual Wires Cancel	Help Drawing-wide

Figure-44. Wire Tagging dialog box

- Select the Format override check box. The edit box below it will become active.
- Click in the edit box and remove **%S.** from the edit box so that **%N** is left in the box; refer to <u>Figure-45</u>.

	V Format override
Start	Wire tag format
ement	Use wire layer format overrides
	✓ Insert as Fixed

Figure-45. Format override

• Click on the **Drawing-Wide** button from the dialog box to assign the wire numbers to all the wires in the current drawing. The schematic after assigning the wire numbers will be displayed as shown in <u>Figure-46</u>.

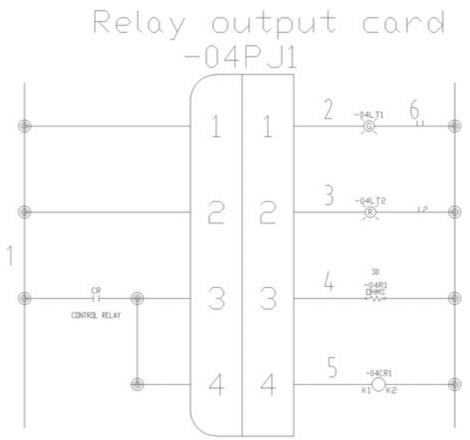


Figure-46. Practical 2

PRACTICAL 3

Create a PLC circuit as shown in Figure-47.

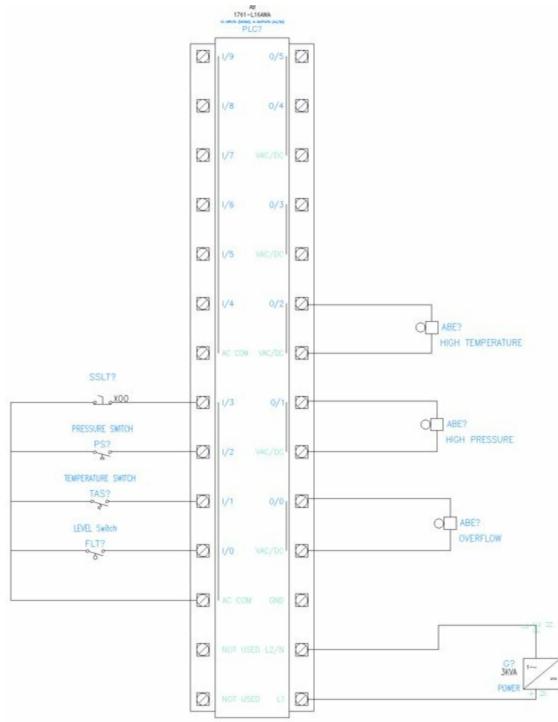


Figure-47. Practical 3

Starting AutoCAD Electrical drawing

- Click on the AutoCAD Electrical icon from the desktop or start AutoCAD Electrical by using the **Start** menu.
- AutoCAD Electrical will open.
- Click on the down arrow below **Start Drawing** button from the template area. The list of drawing templates will be displayed; refer to Figure-48.

Get Started	Re
Start Drawing	YEST
Templates 🔹	
acad -Named Plot Styles.dwt acad -Named Plot Styles3D.dwt acad.dwt acad3D.dwt acadISO -Named Plot Styles.dwt acadISO -Named Plot Styles3D.dwt	
Sheet Sets	

Figure-48. Drawing templates

- Select the ACAD ELECTRICAL IEC.dwt template from the list. A new drawing will be created with the selected template.
- Click on the buttons displayed in Figure-49 to hide the grid and off the grid snap.



Inserting PLC (Full Units)

- In this tutorial, we are going to use Allen Bradley's AB 1761-L16AWA model PLC. We recommend you to know the working of this PLC by browsing through the Allen Bradley's website.
- Click on the **Insert PLC (Full Units)** tool from the **Insert PLCs** drop-down in the **Insert Components** panel. The **Insert Component** dialog box will be displayed; refer to <u>Figure-50</u>.

C: Schematic Symbols				14	Menu 🕖 We	ews 🔻 Dis	iplay: 10
Menu x	JIC: PLC Fixed	Units					Recently Used
→ JIC: Schematic Symbols +0- Runnaked Selector +0- Burnnaked Selector +0- Runnaked Selector +0- Runnaked Selector +0- Relays/Contacts +0- Relays/Contracts +0- Relays/Contracts +0- Relays/Contracts +0- Breakers/Disconne +0- Pict Lights +0- PiCL I/O +0- PiCL I/O +0- PiCL I/O +0- PiCL I/O +0- Alt This I Micro +0- Alt This I Micro +0- Automation Dire +0- Automation Dire +0- Limt Switches	AB 1761 AB 1761 Mcrelogix (1/	AB 1761 0.75 AB 1761 MicroLogix (3/	48 1761 1.0 AB 1761 MicroLoger (Automation Direct DL10	Automation Direct DL10	Automation Direct DL1	Bel Bel 3 Phase Motor 3 Position NC 3 Position NC Pressure Switch. NO Gate valve
Vertical 🔝 No edit dialog	Scale schematic Scale panel:	5.000	Type It:	6	Browse	Aways display p	reviously used menu Cancel Help

Figure-50. Insert Component with PLC components

- Click on the **AB 1761 Micrologix (1" Spacing)** category from the dialog box. The list of **PLCs** will be displayed; refer to <u>Figure-51</u>.
- Click on the L16-AWA 10in/6out AC-DC/115AC-DC component from the list. You are asked to specify the insertion point for the PLC.
- Click in the drawing area to place the PLC. The Edit PLC Module dialog box will be displayed; refer to Figure-52.

IC: Schematic Symbols				12	Menu 🗊	Views 👻 Dis	aplay: 10
Menu x	JIC: AB 1761 M	licroLogix (1" F	RUNG SPACING	G)			Recently Used
→ JIC: Schematic Symbols +	L16-AWA 1.0 L16-AWA 10n/fout AC L32-AWA 1.0 L32-AAA 20n/12out 11	L32-AWA	L32-BNA 1.0 L32-BWA	L16-849 L16-849 10n/6out 24	1.0 1.0 1.24.AWA 12h/12out A	124-884 120/12012	Bell 3 Phase Motor 3 Postion NC 3 Postion NC Pressure Switch, NO Gate valve
Vertical No edt dialog	Scale schematic Scale panel:	5.000	Type It:		Browse	Aways display p	reviously used menu Cancel Help

Figure-51. Insert Component with PLCs listed

Addressing			I/O Point	Descriptio	n			
First address	1/9		Address	ddress 1/9 1/0 point			(1 of 16)	
	1/9 1/8 1/7 1/6 1/5 1/4 1/3	•	Desc 1 Desc 2 Desc 3 Desc 4					
Used:	Drawi Proje		Desc 5	P	ck Pid	k device to	capture Desc text	
Tag	PLC?		List descri	ptions:	1/0		Wired Devices	External File
Fixed		Options) (1/9) (1/8) (1/7)					
Line1 Line2			17322	on/Locati on	on codes Location		Pins Pin 1	
Manufacture	r AB						Pin 2	
Catalog	1761-L	16AWA	Dra	wing	Draw	ing		
Assembly			Pro	ject	Proje	ect	Show/Edit	t Miscellaneous
	Catalog Look	up					F	latings
Description	10 INPI	JTS (24VDC), 6		1	OK		ncel He	elo

Figure-52. Edit PLC Module dialog box

- You can specify descriptions for each input/output address as desired.
- Click on the **OK** button from the dialog box. The PLC will be placed with the specified descriptions; refer to Figure-53.



Figure-53. PLC placed in drawing

Adding Multiple Wire Bus

• Click on the **Multiple Bus** tool from the **Insert Wires/Wire Numbers** panel in the **Ribbon**. The Multiple Wire Bus dialog box will be displayed; refer to <u>Figure-54</u>.

Multiple Wire Bus	— ו
Horizontal	Vertical
Spacing:	Spacing:
Starting at:	
Component (Multiple Wires)	
O Another Bus (Multiple Wires)	
💿 Empty Space, Go Horizontal	
Empty Space, Go Vertical	
2 Number of Wires	2 3 4
OK	cel <u>H</u> elp

Figure-54. Multiple Wire Bus dialog box with Component radio button selected

- Make sure that the Component (Multiple Wires) radio button is selected in the dialog box.
- Click on the **OK** button from the dialog box. You are asked to make a window selection to select the ports of the component for connecting wires.
- Select the Input ports and AC COM as shown in Figure-55.
- Press ENTER from the keyboard and move the cursor. End point of the wire bus will get attached to the cursor; refer to Figure-56.
- Click at the desired distance to create the wire bus.

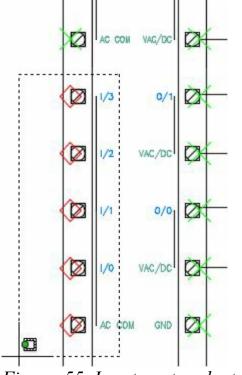


Figure-55. Input ports selected

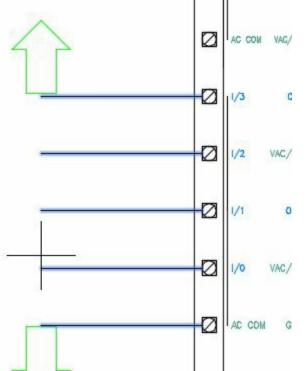


Figure-56. End point of wire bus attached to cursor

- Click on the **Wire** tool from the **Wires** drop-down in the **Insert Wires/Wire Numbers** panel. You are asked to specify the start point of the wire.
- Connect all the end points of the wire bus by creating a wire; refer to Figure-57.

-	
Ц	
Ι	
Ц	
Т	
Γ	
-	

Figure-57. Wire connecting end points

Connecting Components

- Click on the Icon Menu button from the Insert Components drop-down in the Insert Components panel. The Insert Component dialog box will be displayed.
- Click on the **Selector Switches** category in the dialog box. The components in the dialog box will be displayed as shown in <u>Figure-58</u>. Note that you might need to change the scale of the component to properly display it in the drawing by using the edit boxes highlighted in a box in <u>Figure-58</u>.
- Select the 3 Position NC component. The component will get attached to the cursor.
- Click on the top wire of wire bus connected to I/3 address of PLC. The Insert/Edit Component dialog box will be displayed.

• Specify the desired parameters and click on the OK button from the dialog box.

Schematic Symbols				🎽 Menu	Views	 Displa 	y: 10
lenu x	JIC: Selector Switch	es				-	Recently Used
JIC: Schematic Symbols + +9- Push Buttons +9- Selector Switches +9- Illuminated Selector	2 Position Maintain NO	2 Position	2 Position NO Return From Left	2 Postion NC	2 Postion NO	2 Postion NC Return Fro	1.0 1.0 L16-AWA 10n/Sout AC
Hater Fuses/ Orout Breakers Hater - Forout Breakers/ D Hater - Relays/ Contacts Hater - Timers	1-2-3 0 0	123		ver a	1.300		8
→ 40- Motor Control	3 Position NO	3 Position NC	3 Position NO Return From Left	3 Position NC Return From Left	3 Position NO Return Fro	3 Position NC Return Fro	Bell
-+@- Naster Test -+@- Neon	verso o o	Ser al	1324	132 4	200	234	Œ
	3 Position NO Return Fro	3 Position NC Return Fro	4 Position NO	4 Position NC	6 Position NO	6 Postion NC	3 Phase Motor
-+@- AB 1761 Micro +@- AB 1761 Micro +@- Automation Dire	2000	5	2+	2+	* *		불
+9- Automation Dire +9- Automation Dire +9- Terminals/ Connectors +9- Limit Switches	8 Position NO	8 Position NC	2nd+ NO Contact	2nd+ NC Contact	Illuminated Selector		3 Position NC
Vertical No edit dialog	Scale schematic: 5.00 Scale panel: 5.00		et.	Brow	90	iways display previ	iously used menu

Figure-58. Insert Component dialog box with Selector Switches

• Similarly, you can add the other components in the wire bus. After connecting all the components in the wire bus, the schematic will be displayed as shown in <u>Figure-59</u>.

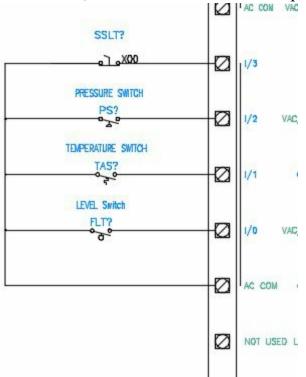


Figure-59. Wirebus after connecting components

Connecting Output Devices

• The right side of PLC is meant for output and power supply. Click on the **Wire** tool and build the circuit as shown in <u>Figure-60</u>.

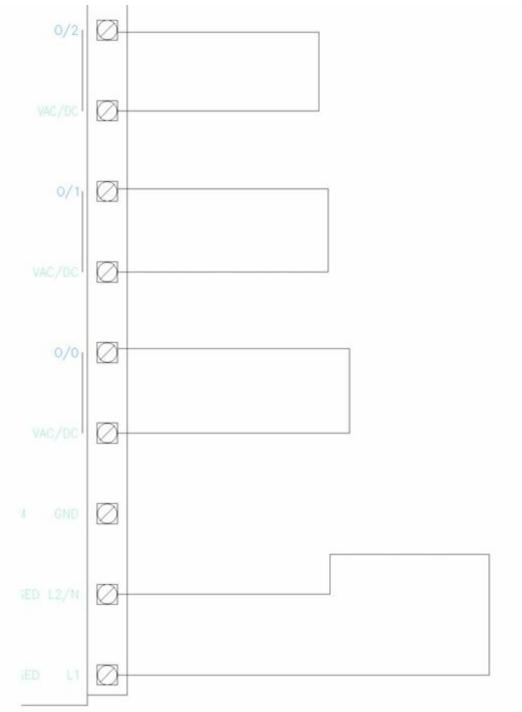


Figure-60. Circuit for output

• Using the **Icon Menu** tool, connect all the components to the circuit; refer to Figure-61.

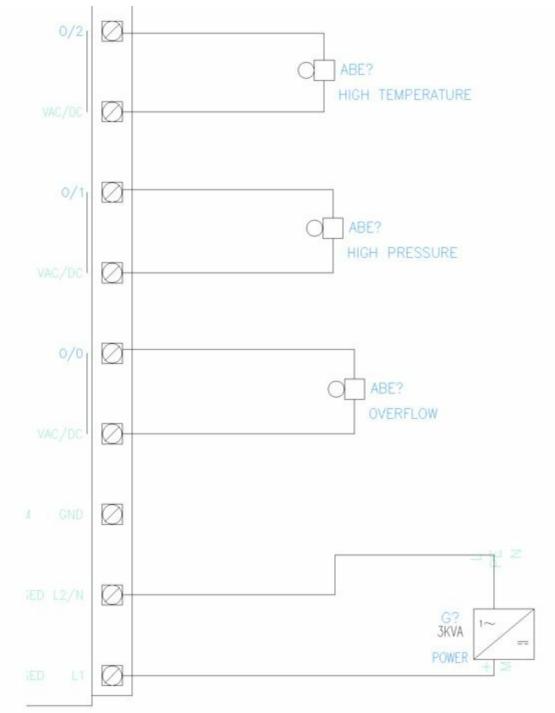


Figure-61. Adding components to the output

• After connecting all the components, the complete circuit will be displayed as shown in Figure-62.

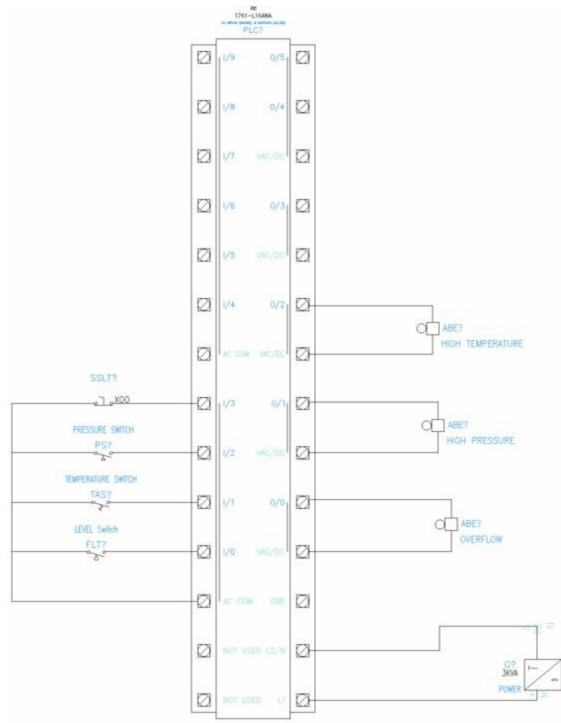


Figure-62. Practical 3

Create the schematic drawing as shown in Figure-63.

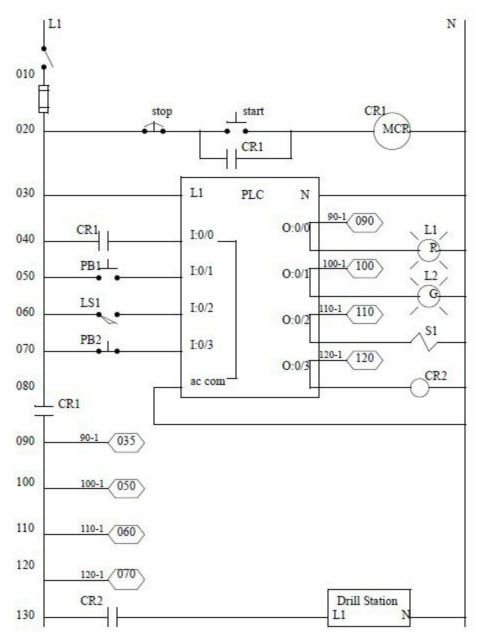


Figure-63. Practice 1

Create the schematic drawing as shown in Figure-64.

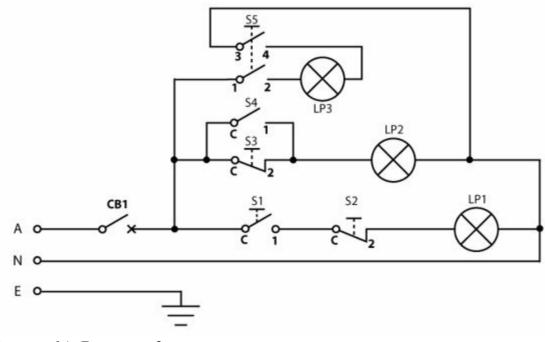


Figure-64. Practice 2

Create the schematic drawing as shown in Figure-65.

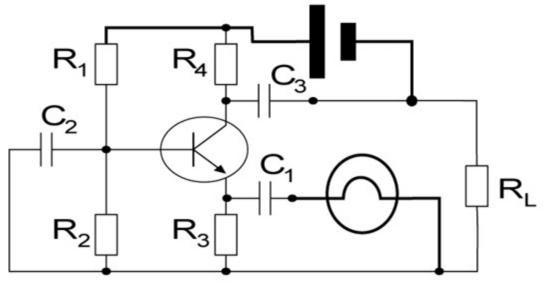


Figure-65. Practice 3

PRACTICE 4

Create the schematic drawing as shown in Figure-66.

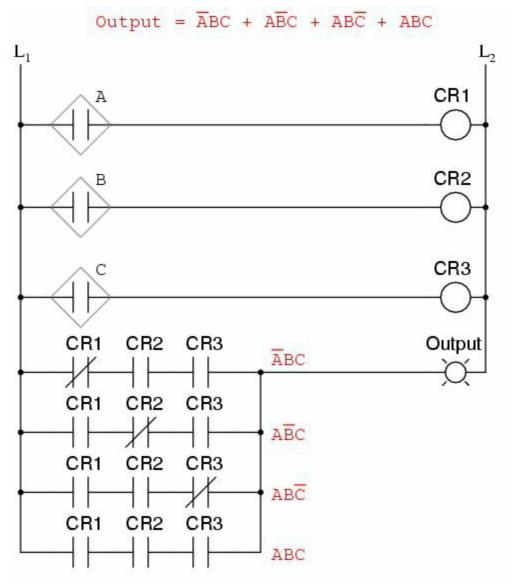


Figure-66. Practice 4

Create the schematic drawing as shown in Figure-67.

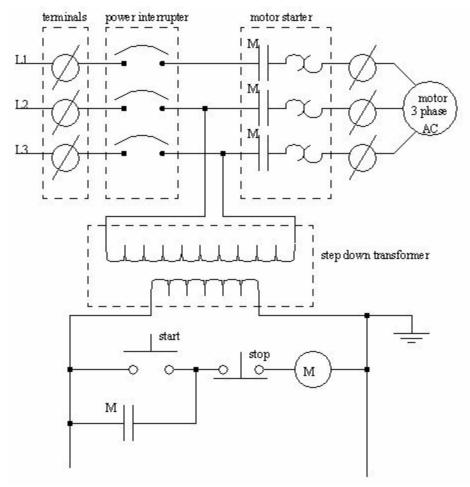


Figure-67. Practice 5

PANEL LAYOUT

CHAPTER 9

Topics Covered

The major topics covered in this chapter are:

- Introduction
- Icon Menu for panels
- Schematic List
- Manual
- Manufacturers Menu
- Balloon
- Wire Annotation
- Panel Assembly
- Editor
- Table Generator
- Terminals
- Editing

INTRODUCTION

In the previous chapters, you have learnt to create schematic circuit diagrams. After creating those circuit diagrams, the next step is to create panels. A panel is the box consisting of various electrical switches and PLCs to control the working of equipment. Refer to Figure-1. Note that the panel shown in the figure is back side panel of a machine. This panel is generally hidden from the operator. What an operator see is different type of panel; refer to Figure-2. We call this panel as User Control panel. In both the cases, the approach of designing is almost same but the interaction with the user is different. The User Control Panel is meant for Users so it can have push buttons, screen, sensors, key board and so on. On the other side, the back panel will be having relays, circuit breakers, sensors, connectors, plcs, switches and so on.



Figure-1. Panel



Figure-2. User Control panel

If we start linking the schematic drawings with the panel drawings then the common platform is the component tag and the location code. Suppose we have created a push button in the schematic with tag -04PB2 then in the panel layout you should insert the same push button with the same tag. The location of the Push button will be decided on the Location code. The components that are having same location code should be placed at the same place in the panel.

In AutoCAD Electrical, there is a separate tab for the tools related to Panel Layout designing with the name **Panel**; refer to <u>Figure-3</u>. The procedures of using various tools of the panel are discussed next.

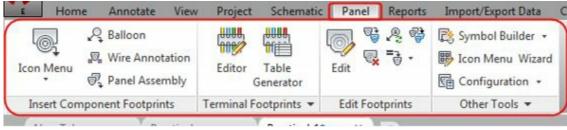


Figure-3. Panel tab

ICON MENU

The **Icon Menu** tool works in a similar way as it does for Schematic drawings. The only difference is representation of components in the panel layout. The procedure to use this tool is given next.

• Click on the **Icon Menu** tool from the **Insert Component Footprints** drop-down in the **Insert Components Footprints** panel in the **Panel** tab of the **Ribbon**; refer to <u>Figure-4</u>. The Insert Footprint dialog box will be displayed; refer to <u>Figure-5</u>.



Figure-4. Icon Menu tool



Figure-5. Insert Footprint dialog box

• Click on the desired category (Push Buttons in our case). The symbols related to the selected category will be displayed; refer to <u>Figure-6</u>.

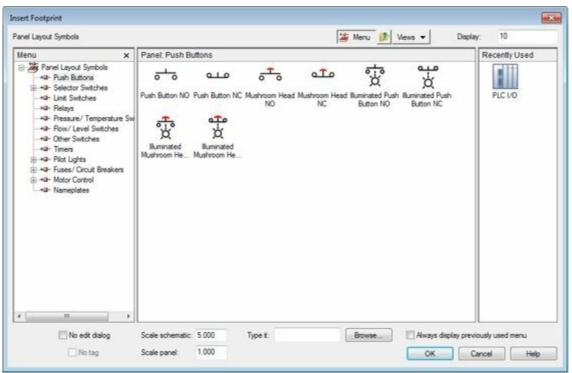


Figure-6. Insert Footprint dialog box with Push Buttons

• Click on the desired symbol from the dialog box (**Push Button NC** in our case). The **Footprint** dialog box will be displayed; refer to Figure-7.

Footprint	
Choice A	Choice B
Make catalog assignment for automatic footprint selection	Manual footprint selection or creation
Manufacturer	Use generic marker only (wd_ptag.dwg)
Catalog	Draw shapes
Assembly	Pick "just like" footprint
Catalog lookup	Description
Drawing Only	Browse Footprint file dialog selection Pick Select non-AutoCAD Electrical block
Catalog Check	ABECAD Link to user's own "ABECAD" install
Choice C	
1) Add Entry to Manufacturer	Add a new entry to the manufacturer-specific table (table name: AB) and match it with an existing footprint block or drawing file
	Add a new entry to miscellaneous table
2) Add Entry to Miscellaneous	and match it with an existing footprint block. or drawing file
ОК	Cancel <u>H</u> elp

Figure-7. Footprint dialog box

• Click on the **Catalog lookup** button to check the catalog for current symbol. The **Catalog Browser** dialog box will be displayed; refer to <u>Figure-8</u>.

arch: AB *30.5	imm EXTENDED" REI	2		10
sults		, 		10
CATALOG	MANUFACTURER	DESCRIPTION		
800H-BR6A	AB	PUSH BUTTON - MOMENTARY, NEMA 4/4X		
800H-BR6A4	AB	PUSH BUTTON - MOMENTARY, NEMA 4/4X		
800H-BR6B	AB	PUSH BUTTON - MOMENTARY, NEMA 4/4X		1
800H-BR6C	AB	PUSH BUTTON - MOMENTARY, NEMA 4/4X		
800H-BR6D2	AB	PUSH BUTTON - MOMENTARY, NEMA 4/4X		
800H-BR6H	AB	PUSH BUTTON - MOMENTARY, NEMA 4/4X		
cord Count: 9	V F	ilter by WDBLKNAM value: PB12	Search Database: Primary	

Figure-8. Catalog Browser dialog box

- Select the desired component from the catalog and click on the **OK** button from the dialog box.
- If you have created a block for the component in your local drive then click on the **Browse** button and select the desired component block from the dialog box; refer to Figure-9.

A Pick		
Look in: 🔒 PB-PUSHBUTTONS	- 🕝 🎓 🖾-	
Name	Date modified	▲ Preview
ab_800MR_2Y Abpb2 Abpb2a Abpb2b	19-02-2014 22:06 19-02-2014 22:06 19-02-2014 22:06 19-02-2014 22:06	
ABPB2BGY Abpb2bl	19-02-2014 22:06 19-02-2014 22:06	
	10_02_2014 22:00	+ Find File
File name: ABPB2BGY	- Open	Locate
Files of type: Drawing (*.dwg)	✓ Cancel	

Figure-9. Pick dialog box

- After selecting the desired component, click on the Open button from the dialog box. The symbol will get attached to the cursor.
- Click at the desired place in the drawing to place the symbol. You are asked to specify the rotation angle for the symbol.
- Specify the desired angle or press ENTER to use the default angle (i.e. 0 degree). The **Panel** Layout-Component Insert/Edit dialog box will be displayed; refer to Figure-10.

Tag Schematic List Description Line 1 START Line 2 Line 3	Ed	emal List File	
Description Line 1 START Line 2	Ed	emal List File	
Line 1 START			
Line 2			
line 3			
List: Drawi	ng Project	Defaults	
Installation / Location	on codes (for reports	a)	
Installation	Location	Mount	Group
Drawing	Drawing	Drawing	Drawing
Project	Project	Project	Project
			riojeci
	Installation / Location Installation	Installation / Location codes (for reports Installation Location Drawing Drawing	Installation / Location codes (for reports) Installation Location Mount Drawing Drawing Drawing

Figure-10. Panel Layout Component Insert or Edit dialog box

- This dialog box is similar to the **Insert/Edit Component** dialog box as discussed earlier. Specify the tags for the component.
- Click on the Schematic List button below Tag edit box in the Component Tag area to display the list of tags used in the drawing/project. The Schematic Tag List dialog box will be displayed; refer to <u>Figure-11</u>.
- Select the tag related to the symbol being inserted and click on the **OK** button from the dialog box.
- Click on the **OK** button from the dialog box. The symbol will be placed with the corresponding tag attached. If you want to insert more instances of the component then click on the **OK-Repeat** button from the dialog box.

Schematic Tag Lis Select from schema The various dialogs			Sort	*
Tag	Installation,Location	Description 1,2,3	Tag Installation	Location
04CR1 04CR1 04LT1 04LT2 04MOT1 04OL2 04PB1 × 04PB2 04PJ1 04R1 ABE? ABE? ABE? ABE? CR FLT? G? MOT? PBLT? PLC? PLC?	ISC-01, LC-0001 ISC-01, LC-0001 Relay output card	MOTOR RELAY L1 L2 MOTOR OVERLOAD BREAKER. OVERLOAD STOP START S0 HIGH TEMPERATURE. HIGH PRESSURE OVERFLOW CONTROL RELAY LEVEL Switch POWER MOTOR-2 CHILD MOTOR-2 10 INPUTS (24VDC). 6	OUTPUTS (AC/DC)	Freshen

Figure-11. Schematic Tag List dialog box

Before we start inserting components randomly, it is important to understand the basic frame of panels. An electric panel generally has an encloser to close pack all the components of panel, a DIN rail to support the MCBs(Mounted Circuit Breakers), Nameplates to identify components, and electrical components. We will create a panel combining all of them later in this chapter (under Practical).

SCHEMATIC LIST

The **Schematic List** tool is used to import the list of schematic components from the current project drawings so that the panel representation of those components can be created. The procedure to use this tool is given next.

• Click on the Schematic List tool from the Insert Component Footprints drop-down. The Schematic Components List dialog box will be displayed; refer to Figure-12.

Schematic Components List> Pa	nel Layout Insert
Extract component list for:	Location Codes to extract:
Project	Al
Active drawing	🔘 Blank
save list to external file	Named Location
	Location
	Drawing
Browse use external file	List: Project
OK	Cancel <u>H</u> elp

Figure-12. Schematic Components List dialog box

- Select the Active drawing if you want to extract the component list of only current drawing (as in our case) or select the **Project** and include the relevant drawings.
- Click on the **OK** button from the dialog box. The **Schematic Components (active drawing)** dialog box will be displayed(in case of selecting **Active drawing** radio button); refer to <u>Figure-13</u>.

		ents (active drawing) noonents to insert on Pa	nel:		1
	Tag	Installation,Location	Manufacturer,Catalog,Assembly	Description 1,2,3	
	04CR1		AB. 700-P200A1	MOTOR RELAY	
	04PB1		AB, 8008-EAC, 8008-ARP	STOP	
	04PB2		AB. 8008-EAC. 8008-ARP	START	
	040L2		AB, 1492-A1B1	OVERLOAD	
-	04MOT1	ISC-01, LC-0001	AB, CM111-FC1F518GSKCA	MOTOR	
	040L1	ISC-01, LC-0001	AB, 193-A1A1	OVERLOAD BREAKER	
	Sort List	Display	Catalog Check	1 Footprint scale	
	Reload	Show All Hide Existing		Rotate (blank+"ask")	
	Mark Existing	Multiple Catalo	g [+]		
			Automatic footprint lookup		
	External Program	n Manual	Insert Use Footprint tables	Convert I	Existing
-	and the standard		Case rootping tables		
			Close	Pick File	Help

Figure-13. Schematic Components dialog box

- Select any component from the list for which you want to insert symbol in the panel. Click on the **Insert** button at the bottom of the dialog box. If the symbol for the component then it will get attached to the cursor and you will asked to specify the insertion point for the symbol.
- Click in the drawing area to place the component. You will be asked to specify the rotation angle value for the component.
- Specify the desired value in the Command box or press ENTER to set the default angle. The **Panel** Layout-Component Insert/Edit dialog box will be displayed as discussed earlier. Note that the tags are defined automatically this time. This is because the tags are automatically extracted as per the schematic list.
- If you want to perform modifications then do that and click on the **OK** button from the dialog box. The symbol will be created and the **Schematic Components** dialog box will appear again.
- Follow the same procedure and insert all the components required in the panel.
- After inserting all the components, click on the Close button from the dialog box to exit.

MANUAL

The **Manual** tool is used to insert the panel components as per our requirement directly using the blocks. In this case, we need to be very careful regarding the tags otherwise it can create great problems for assembly site. The procedure to use this tool is given next.

• Click on the Manual tool from the Insert Component Footprints drop-down. The Insert Component Footprints -- Manual dialog box will be displayed; refer to Figure-14.

nsert Comp	onent Footprint Manual 🛛 🔀
Manual foot	print selection or creation
xxx	Jse generic marker only (wd_ptag.dwg)
	Draw shapes
₩→₩ F	Pick "just like" footprint
Browse	Footprint file dialog selection
Pick	Select non-AutoCAD Electrical block
	OK Cancel <u>H</u> elp

Figure-14. Insert Component Footprint Manual

- This dialog box is similar to the Choice B area of the Footprint dialog box discussed earlier. Click on the Browse button to insert the block of component.
- If you have the component already in the drawing, then click on the **Pick** button and select the component. (Note that you can select only non-AutoCAD Electrical blocks as symbol for using this feature).
- On selecting the block, you are asked to specify the insertion point for the symbol.
- Click in the drawing area and specify the rotation of the symbol. The symbol will be placed and **Panel Layout Component Insert/Edit** dialog box will be displayed as discussed earlier.
- Specify the desired tags and click on the OK button from the dialog box.

MANUFACTURER MENU

The **Manufacturer Menu** tool is used to insert the components from the manufacturer's menu. AutoCAD Electrical contains a library of manufacturer's components (**Allen-Bradley** and **ABECAD**). The procedure to use this tool is given next.

• Click on the Manufacturer Menu tool from the Insert Component Footprints drop-down. The Vendor Menu Selection dialog box will be displayed (for the first time); refer to <u>Figure-15</u>.

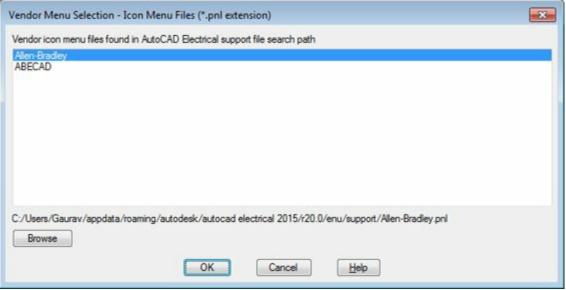


Figure-15. Vendor Menu Selection dialog box

• Select the desired vendor from the list and click on the **OK** button from the dialog box. The **Vendor Panel Footprint** dialog box will be displayed; refer to <u>Figure-16</u>.

en Bradley Footprints	_			1	Menu 😰	Views 🔻 Dia	play: 10
lenu >	Allen Bradley F	ootprints					Recently Used
 Allen Bradley Footprints 40- Push Buttons 40- Push Buttons 40- Buttons 40- Biot Lights 40- Piot Lights 40- Selector Switches 40- Transformers 40- Contactons 40- Contactons 40- SLC-500 PLC 40- Nameplates 	Contactors	Overloads	Plot Lights 1771 PLC Power/Chassis	Selector Switches	Fuse Blocks Nameplates	Transformers	
No edit dialog	Scale schematic Scale panel:	5.000	Type it:	(Vendor Menu Se	Browse	Aways display p	reviously used menu Cancel Help

Figure-16. Vendor Panel Footprint dialog box

• The dialog box works in similar way to Insert Component dialog box discussed earlier.

Similarly, you can use the User Defined List and Equipment List tools to insert the Panel components.

BALLOON

The **Balloon** tool is used to assign balloons to the components for their identification in the table. The procedure to use this tool is given next.

- Click on the **Balloon** tool from the **Insert Component Footprints** panel in the **Ribbon**. You are asked to select the component for which you want to assign the balloon or specify settings for the balloon.
- Enter **S** at the command prompt to specify parameters related to balloon. The **Panel balloon setup** dialog box will be displayed; refer to Figure-17.

Balloon		Text
Balloon Type	Balloon Size O.375	0.125 Text Size
Oircle	Fit 0.125 (margin)	Arrow 0.125 Arrow Size
) Ellipse	Axis Horizontal 0.375 Vertical 0.125	Arrow Type Closed Filled Closed Blank Closed
	Fit 0.25 (margin)	Dot Architectural Tick Oblique
Polygon	O Diameter 0.375	
2	Fit 0.125 (margin)	
None None	Text Gap 0.09	
	OK Cancel	Help

Figure-17. Panel balloon setup dialog box

- Select the desired balloon type and specify the parameters in the dialog box.
- Click on the **OK** button from the dialog box to apply the specified parameters.
- Click on the component. You are asked to specify the leader start point or balloon insertion point.
- Click at the desired point near the component. A dashed line of leader will be displayed having end point attached to the cursor.
- Click to specify the end point of the leader or press **ENTER** to place the balloon at the earlier selected point; refer to Figure-18.



Figure-18. Component with assigned balloon

• If you have specified the end point of the leader then press **ENTER** to place the balloon.

WIRE ANNOTATION

The **Wire Annotation** tool is used to attach wire annotations to the selected panel components in the drawing. The procedure to use this tool is given next.

- Click on the Wire Annotation tool from the Insert Component Footprints panel. The Schematic Wire Number --> Panel Wiring Diagram dialog box will be displayed; refer to Figure-19.
- Select the desired radio button from the **Panel connection annotation for** area. If you select the **Active drawing(all)** then the annotations will be assigned to components in the current drawing based on all the active drawings.

anel connection annotation for:	Location Code	s to process:
🗇 Project	Al	
 Active drawing (all) 	🔘 Blank	
Active drawing (pick)	Named Lo	ocation
	Location	
Freshen wire connection table		Drawing
	List:	Project
Report only (no drawing update)		
OK	Cancel Help	

Figure-19. Schematic Wire Number dialog box

- Select the desired radio button from the Location Codes to process area. The location codes will be assigned to the components as per the selection of the radio button.
- After specifying the desired settings, click on the **OK** button from the dialog box. The **Schematic** -- > **Layout Wire Connection Annotation** dialog box will be displayed; refer to Figure-20.

Full format, "From" Terminal included in annotation text %T=%W (%2) Partial, "From" Terminal on symbol, not in annotation text %W (%2) Wire number (Tag) Wire number (Tag):	 Enter wire numbering format below. Select layout devices to update with scher 	matic wire connection information.	
%T = %W (%2) Partial, "From" Terminal on symbol, not in annotation text %W (%2) Wire number (Tag:Terminal) %W (%2) Additional options for the "To" component Tag ✓ Add terminal pin as a suffix (if exists) to Tag, ex: "PS1:T2" Add terminal description (if exists) to Tag, ex: "PS1:T2: +24V" Include Installation prefix (if exists) to IEC Tag format View/Test Ex: wire number 214 from term J1 runs out to PS1 pin T2 on red #14 wire Full: "J1=214 (PS1:T2)" Partial: "214 (PS1:T2)" Y Suppress any duplicated annotation on each terminal ; Delimiter between multiple instances on same line of text If wire numbering converts to MText No new splits New only	Full format, "From" Terminal		
Partial, "From" Terminal on symbol, not in annotation text Wire number (Tag) %W (%2) Wire number (Tag):Terminal) Additional options for the "To" component Tag Wire number (TEC Tag) ✓ Add terminal pin as a suffix (if exists) to Tag, ex: "PS1:T2" Add terminal description (if exists) to Tag, ex: "PS1:T2: +24V" △ Add terminal description (if exists) to Tag, ex: "PS1:T2: +24V" Include Installation prefix (if exists) to IEC Tag format View/Test Ex: wire number 214 from term J1 runs out to PS1 pin T2 on red #14 wire Full: "J1=214 (PS1:T2)" Partial: "214 (PS1:T2)" ✓ Suppress any duplicated annotation on each terminal ; Delimiter between multiple instances on same line of text If wire numbering converts to MText ④ No new splits New only	%T=%W (%2)		
Partial, "From" Terminal on symbol, not in annotation text %W (%2) Additional options for the "To" component Tag ✓ Add terminal pin as a suffix (if exists) to Tag, ex: "PS1:T2" △ Add terminal description (if exists) to Tag, ex: "PS1:T2" △ Add terminal description (if exists) to Tag, ex: "PS1:T2" △ Add terminal description (if exists) to Tag, ex: "PS1:T2" △ Add terminal description (if exists) to Tag, ex: "PS1:T2" △ Product Installation prefix (if exists) to IEC Tag format View/Test Ex: wire number 214 from term J1 runs out to PS1 pin T2 on red #14 wire View/Test Full: "J1=214 (PS1:T2)" ② Suppress any duplicated annotation on each terminal ; ; Delimiter between multiple instances on same line of text If wire numbering converts to MText Note: use split MText if >50 references.		Wire number (Wire layer)	
symbol, not in annotation text Wire number (Tag:Terminal) Wire layer %W (%2) Wire number (Tag:Terminal) Wire layer Additional options for the "To" component Tag • Add terminal pin as a suffix (if exists) to Tag, ex: "PS1:T2" • Add terminal description (if exists) to Tag, ex: "PS1:T2: +24V" • Include Installation prefix (if exists) to Tag, ex: "PS1:T2: +24V" • Ex: wire number 214 from term J1 runs out to PS1 pin T2 on red #14 wire Full: "J1=214 (PS1:T2)" View/Test Ex: '14 (PS1:T2)" Partial: "214 (PS1:T2)" • Suppress any duplicated annotation on each terminal • pelimiter between multiple instances on same line of text If wire numbering converts to MText Note: use split MText if >50 references. •	Partial, "From" Terminal on		5
%W (%2) Wire number (IEC Tag) + Additional options for the "To" component Tag * Add terminal pin as a suffix (if exists) to Tag, ex: "PS1:T2" Add terminal description (if exists) to Tag, ex: "PS1:T2: +24V" Add terminal description (if exists) to Tag, ex: "PS1:T2: +24V" Include Installation prefix (if exists) to IEC Tag format View/Test Ex: wire number 214 from term J1 runs out to PS1 pin T2 on red #14 wire Full: "J1=214 (PS1:T2)" Partial: "214 (PS1:T2)" Partial: "214 (PS1:T2)" Ø Suppress any duplicated annotation on each terminal J Delimiter between multiple instances on same line of text If wire numbering converts to MText No new splits New only Redo all	symbol, not in annotation text	The second s	
Additional options for the "To" component Tag Additional options for the "To" component Tag Add terminal pin as a suffix (if exists) to Tag, ex: "PS1:T2" Add terminal description (if exists) to Tag, ex: "PS1:T2: +24V" Add terminal description (if exists) to Tag, ex: "PS1:T2: +24V" Add terminal description (if exists) to Tag, ex: "PS1:T2: +24V" Add terminal description (if exists) to Tag, ex: "PS1:T2: +24V" Add terminal description (if exists) to Tag, ex: "PS1:T2: +24V" Add terminal description (if exists) to Tag, ex: "PS1:T2: +24V" Add terminal description (if exists) to Tag, ex: "PS1:T2: +24V" Add terminal description (if exists) to Tag, ex: "PS1:T2: +24V" Add terminal description (if exists) to Tag, ex: "PS1:T2: +24V" Add terminal description prefix (if exists) to Tag, ex: "PS1:T2: +24V" Add terminal description prefix (if exists) to Tag, ex: "PS1:T2: +24V" Add terminal description prefix (if exists) to Tag, ex: "PS1:T2: +24V" Add terminal description prefix (if exists) to Tag, ex: "PS1:T2: +24V" Add terminal description prefix (if exists) to Tag, ex: "PS1:T2: +24V" Add terminal description prefix (if exists) to Tag, ex: "PS1:T2: +24V" Add terminal description prefix (if exists) to Tag, ex: "PS1:T2: +24V" Add terminal description prefix (if exists) to Tag, ex: "PS1:T2: +24V" Add terminal description prefix (if exists) to Tag, ex: "PS1:T2: +24V" Add terminal description prefix (if exists) to Tag, ex: "PS1:T2: +24V" Add terminal description prefix (if exists) to Tag, ex: "PS1:T2: +24V" Add terminal description prefix (if exists) to Tag, ex: "PS1:T2: +24V" Add terminal description prefix (if exists) to Tag, ex: "PS1:T2: +24V" Add terminal description prefix (if exists) to Tag, ex: "PS1:T2: +24V" Add terminal description prefix (if exists) to Tag, ex: "PS1:T2: +24V" Add terminal description prefix (if exists) to Tag, ex: "PS1:T2: +24V" Add terminal description prefix (if exists) to Tag, ex: "PS1:T2: +24V" Add terminal descriptin prefix (if exists) to Tag, ex: "PS1:T2: +24V" Add termi	%W (%2)	Wire number (IEC Tag)	-
; Delimiter between multiple instances on same line of text If wire numbering converts to MText (a) No new splits (b) New only (c) Redo all Note: use split MText if >50 references.			
If wire numbering converts to MText Note: use split MText if >50 references.	Ex: wire number 214 from View/Test Full: "J1=214 (PS1:T2)"		
No new splits New only Redo all Note: use split MText if >50 references.	View/Test Ex: wire number 214 from Full: "J1=214 (PS1:T2)" Partial: "214 (PS1:T2)"	n term J1 runs out to PS1 pin T2 on red #14 wire	
litew spiles (New only Credo di	View/Test Ex: wire number 214 from Full: "J1=214 (PS1:T2)" Partial: "214 (PS1:T2)" Suppress any duplicated annotation on	n term J1 runs out to PS1 pin T2 on red #14 wire n each terminal	
Maximum lines per split	View/Test Ex: wire number 214 from Full: "J1=214 (PS1:T2)" Partial: "214 (PS1:T2)" Suppress any duplicated annotation on ; Delimiter between multiple instances of	n term J1 runs out to PS1 pin T2 on red #14 wire n each terminal	

Figure-20. Schematic dialog box

• Specify the annotation format in this dialog box and click on the OK button from the dialog box. The annotations will be assigned to the components in the current drawing automatically; refer to <u>Figure-21</u>.

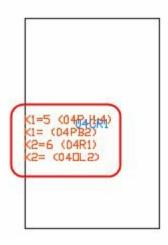


Figure-21. Annotations automatically assigned

PANEL ASSEMBLY

The Panel Assembly tool is used to insert an already created assembly of panel in the current

drawing. This tool is very useful if you are going to use the same type of panel assemblies in various drawings. The procedure to use this tool is given next.

• Click on the **Panel Assembly** tool from the **Insert Component Footprints** panel in the **Ribbon**. The **Insert Panel Assembly of Blocks** dialog box will be displayed; refer to <u>Figure-22</u>.

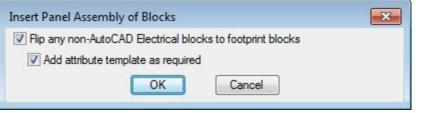


Figure-22. Insert Panel Assembly of Blocks dialog box

• Make sure all the check boxes are selected and then click on the **OK** button from the dialog box. The **WBlocked Assembly to insert** dialog box will be displayed; refer to <u>Figure-23</u>.

Look (n: 🌗 User	- G 👂 📂 🛄 - 🛛 🤇 🖼	2
Name	Date modified Preview	
circ21	14-04-2010 15:39	
circ22	14-04-2010 15:39	
circ23	14-04-2010 15:39	
circ24	14-04-2010 15:39	
fvn_fds	14-04-2010 15:39	
fvn_kfds	14-04-2010 15:39	
har fde III	14_04_2010 15-20	Find File
le <u>n</u> ame:	▼Qpen	Locate
les of type: Drawing (*.dwg)	Cancel	

Figure-23. WBlocked Assembly to insert dialog box

- Select the drawing file of earlier created panel block and click on the **Open** button from the dialog box. You are asked to specify the insertion point for the panel block.
- Click in the drawing area to specify the insertion point for the panel block. You are asked to specify the rotation angle value for the block.
- Specify the desired angle value and press ENTER. The block will be placed.

Till this point, we have discussed about inserting the component footprints in the panel layout. Now, we will learn to terminal footprints. The tools to manage the terminal footprints are available in the **Terminal Footprints** panel in the **Ribbon**. The tools in this panel are discussed next.

EDITOR

The **Editor** tool is used to edit the details of terminals present in the current drawing. Note that the terminal information is collected from all the drawings in the current project. So, it is important to activate the project whose drawing is being used for editing terminal footprints. The procedure to use the **Editor** tool is given next.

• Click on the **Editor** tool from the **Terminal Footprints** panel. The **Terminal Strip Selection** dialog box will be displayed; refer to Figure-24.

Installation	Location	Terminal Strip	Quantity	
	MCAB5	ТВ	9	
		TB-1	5	
	MCAB5	TB-1	5	
	MCAB5	TB-2	4	1
	JBOX1	TS-A	6	٦
	JBOX1	TS-B	3	1
	MCAR5	TR1	26	
	New	Edit		
	Done	Help		

Figure-24. Terminal Strip Selection dialog box

• Select the entry that you want to edit in this table and click on the **Edit** button. If the number of terminals in the current drawing exceed the number of wires then the **Defined Terminal Wiring Constraints Exceeded** dialog box will be displayed; refer to Figure-25.

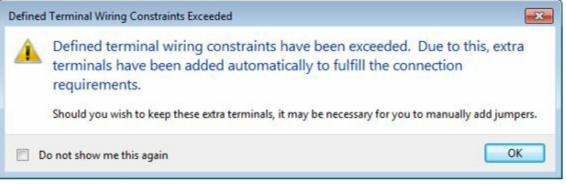


Figure-25. Defined Terminal Wiring Constraints Exceeded dialog box

• Click on the **OK** button from the dialog box. The **Terminal Strip Editor** dialog box will be displayed; refer to <u>Figure-26</u>.

	Installation	Location	Device	Pin	Wire	Type	T	Jumper	Number	Jumper	T	Type	Wire	Pin	Device	Location	Installation
1		MACHINE	L\$406		309	BLK_14A	STU S		309			BLK_14A BLK_14A		309 309	TS-A. TB-2	JBOX1 MCA85	
1		JB0X1 JB0X1	TS-A TS-A	309 309	309 309	BLK_14A BLK_14A			309					-			
1	C.	MACHINE	LS407		309	BLK_14A			309			1					
1		MACHINE	L\$408	-	309	BLK_14A			309			BLK_14A BLK_14A		309	P8414 TS-A	OPSTA3 JBOX1	
1	8/	OPSTA3	SS406	-	408	RED_18A			408			RED_18A	408		LS408	MACHINE	
1		OPSTA3	SS406	-	407	RED_18A			407			RED_18A	407		LS407	MACHINE	
1	8	OPSTA3	\$5406	1	406	RED_16A			405			RED_18A	406		L5406	MACHINE	
	Properties		minal			t.		estinations T T)		_	lumpe 192		Auto-Level		ms	ave Destinati	-

Figure-26. Terminal Strip Editor dialog box

- The selected terminal will be highlighted in yellow color. There are six areas in this dialog box named; **Properties**, **Terminal**, **Spare**, **Destinations**, **Jumpers**, and **Multi-Level**. The tools in these areas are used to edit the respective parameters of the terminals. Hold the cursor on each of the button in these areas to check its function.
- After specifying the desired parameters click on the **OK** button from the dialog box. If you have changed the graphical parameters then the **Graphical Terminal Strip Insert/Update Required** dialog box will be displayed; refer to Figure-27.

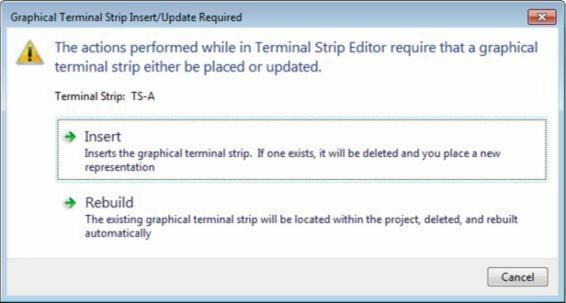


Figure-27. Graphical Terminal Strip Insert or Update Required dialog box

• Click on the **Insert** button if you want to insert new graphical representation of the terminal strip. The strip will get attached to the cursor; refer to <u>Figure-28</u>.

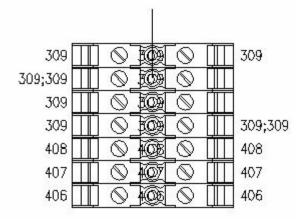


Figure-28. New terminal strip attached to cursor

- In place of selecting the **Insert** button, you can select the **Update** button to update the already existing terminal strip.
- After updating or inserting the strip, the **Terminal Strip Selection** dialog box will be displayed again.
- If you want to add a new terminal strip, then click on the **New** button from the dialog box. The **Terminal Strip Definition** dialog box will be displayed; refer to <u>Figure-29</u>.

Installation:	
	Browse
Location:	
JBOX1	Browse
Terminal Strip:	
TS-A	
Number of Terminal Blocks:	
OK Cancel	Help

Figure-29. Terminal Strip Definition dialog box

- Click in the **Number of Terminal Blocks** edit box and specify the number of blocks of terminals. The **OK** button will become active.
- Click on the **OK** button from the dialog box. The **Terminal Strip Editor** dialog box will be displayed as discussed earlier. Specify each detail of the terminal as required and then click on the **OK** button from the dialog box. The dialog box will be displayed asking you to insert the graphical representation of the terminal.
- Click on the **Insert** button from the dialog box and place the terminal at the desired position in the drawing.
- Click on the Done button from the Terminal Strip Selection dialog box to exit.

TABLE GENERATOR

The **Table Generator** tool is used to insert a table consisting of details related to the terminals in the drawing. The procedure to use this tool is given next.

• Click on the **Table Generator** tool from the **Terminal Footprints** panel in the **Ribbon**. The **Terminal Strip Table Generator** dialog box will be displayed; refer to <u>Figure-30</u>.

Installation	Location	Terminal Strip	Quantity	Table Settings
	MCABS	TB	9	Table Style: Table Title
		TB-1	5	ACE-INCH (TableStyle) + Browse
	MCA85	TB-1	5	Puc-inun (raueuche)
	MCA85	TB-2	4	Define Columns Row Styles Select from List:
	JBOX1	TS-A	6	
	JBOX1	TS-B	3	Layer 0
	MCAB5	TB1	26	Contraction of the second seco
				Number of Sections Per Drawing: All Number of Drawings: 0 Settings
				 Inset Rebuild Refresh

Figure-30. Terminal Strip Table Generator dialog box

• Select the desired terminal from the **Terminal Strip Selection** table in the dialog box. For multiple selection, press and hold the CTRL key and then select; refer to <u>Figure-31</u>.

Installation	Location	Terminal Strip	Quantity
	MCAB5	ТВ	9
		TB-1	5
	MCAB5	TB-1	5
	MCAB5	TB-2	4
	JBOX1	TS-A	6
_	JBOX1	TS-B	3
	MCAB5	TB1	26

Figure-31. Terminal Selection

- Click on the **Table Style** drop-down in the **Table Settings** area of the dialog box and select the desired table style.
- Click in the Table Title edit box and specify the suitable title for the terminal table.
- Click on the **Settings** button in the dialog box. The **Terminal Strip Table Settings** dialog box will be displayed; refer to <u>Figure-32</u>.
- Click on the Browse button for the First Drawing Name edit box in the Drawing Information for Table Output area of the dialog box. The First Drawing Name dialog box will be displayed; refer to Figure-33.
- Select the desired drawing(The name of drawing in which table will be inserted is decided on the basis of the selected drawing's name). Click on the **Save** button from the dialog box.
- After specifying the rest of the parameters as required, click on the **OK** button from the dialog box.

All Rows Same Section X: 0.0000 Y: 0.0000 Rows Same Section X: 0.0000 Complete Section Complete	 Insert One Section Insert All Sections Insert Multiple Sections 		2	
Section Offset Distance: 1.0000		Scale on Insert:	1.0000	•
Direction:	->	Angle on Insert:	0	•
Right *				
Base Point:				
Gap Distance 👻				
rawing Information for Table Output First Drawing Name: C:\Users\Gaurav\Documents\Acade Template:	2016\AeData\Proj\Demo\D	EMO09.DWG	Browse	
			Browse	

Figure-32. Terminal Strip Table Settings dialog box

🔥 First Drawi	ng Name			×
Save in: 🌗	Demo	- 0 🕫 🛙	🤊 🛄 🔻	
Name	*	Date mod	lified	<u>_</u>
EXPORTI		16-04-201 06-05-201 06-12-201	4 11:47	E
DEMO03 DEMO04 DEMO04 DEMO05		06-12-201 06-12-201 06-12-201	3 19:18	
	III	06-12-201	2 10-19 F	*
File <u>n</u> ame:	DEMO09	-	<u>S</u> ave	
Save as type:	Drawing (*.dwg)	•	Cancel	

Figure-33. First Drawing Name dialog box

• Click on the **OK** button from the **Terminal Strip Table Generator** dialog box. The **Table(s) Inserted** dialog box will be displayed; refer to <u>Figure-34</u>.

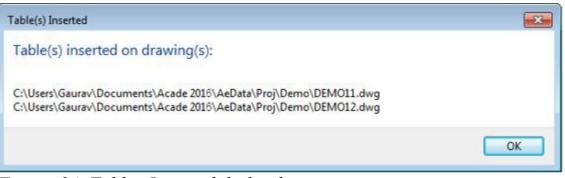


Figure-34. Tables Inserted dialog box

• Click on the **OK** button from the dialog box. Drawing will be added in the current project having tables created recently; refer to Figure-35.

Projects -													
	Installation!	Loce tion	Devices	Phil	wines:	Typel	T3	Number	31	Henufacturier	Cotolog	Type2	Vine2
demo08.dwg - 8 - 0.208		HCARS .	M414		300	RED_DBAV/S				AUTERATIONEDR	34-70	RE3_38AVG	390
demo09.dwg - 9 - 0.209 - 1		HCA35	14422		3390	RED_DBAVG		1 52 1		663	2.132		
DEMO11.dwg - +MCABS-TE	-	HEABS	C3369		369	RED_DBAWS		'		AUTERATIONDOR ECT	28-710	HE3_384VG	324
DEMO12.dwg - +/80X1-TS-4	-	HCA35	C3026	-	325	REE, SRAWS		3		AUTONATIONDOR ECT	39-710	RCB_SHAVE	325
4 · · · · · · · · · · · · · · · · · · ·		HEARS	C9364		304	RED_SOAWS	-	3		AUTOMATIONEDR	34-710	BLX_SHAVE	324
100 C		2010/01								1 		BLK_384VG	324
Details 🗄 🖾 -		-	_									BLK_38AVG	324
Status: Accessible Sheet:		HEA35	CRIES	_	302	RED_18AVG		1		AUTONATIONOUX	24-10	RE3_3MV0	357
Description: +MCA85-TB-1 File Name: DEMO11.dwg						<u> </u>							

Figure-35. Table created

INSERT TERMINALS

There are two tools to insert terminals in the panel layout; **Insert Terminals (Schematic List)** and **Insert Terminals (Manual)** which work similar to **Schematic List** and **Manual** tool respectively. These tools are available in the **Insert Component Footprints** drop-down in the **Insert Component Footprints** panel. Please follow the procedures given for these tools to insert terminals.

EDITING FOOTPRINTS

The tools to edit footprints are available in the **Edit Footprints** panel; refer to <u>Figure-36</u>. These tools are discussed next.



Figure-36. Edit Footprints panel

Edit

The **Edit** tool is used to modify the footprints of components in the panel layout. The procedure to use this tool is given next.

• Click on the Edit tool from the Edit Footprints panel. You are asked to select the component for

editing footprint.

• Select the desired component. The **Panel Layout - Component Insert/Edit** dialog box will be displayed; refer to Figure-37.

tem Number	Component Tag			
Item Number 31 Fixed	Tag CB328			
Drawing Find List	Schematic L	ist Ex	temal List File	
Project Find List	Description			
Next>> 31	Line 1 DEVIC	ENET WIRING		
Catalog Data	Line 2			
Manufacturer EATON	Line 3			
Catalog EGH3015FFG	List: Dra	wing Project	Defaults	
Assembly				
Assembly	Installation / Loca	ation codes (for report Location	s) Mount	Group
				Group
Count Unit		Location		Group
Count Unit Catalog Lookup		Location MCAB5	Mount	
Count Unit Catalog Lookup Drawing Project	Installation Drawing	Location MCAB5 Drawing	Mount Drawing	Drawing

Figure-37. Panel Layout Component dialog box

• Specify the desired tags and parameters in the dialog box and click on the **OK** button from the dialog box to apply the specified settings.

Copy Footprint

The **Copy Footprint** tool is used to copy the footprint of a component so that you can assign it to other components in the panel layout. The procedure is given next.

- Click on the **Copy Footprint** tool from the **Edit Footprints** panel. You are asked to select the components just alike the component to which you want to assign footprints.
- Select the desired component. Its footprint will get attached to the cursor; refer to Figure-38.

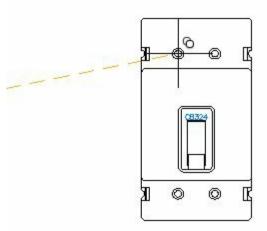


Figure-38. Copied footprint

- Click at the desired location to place the footprint. The **Panel Layout Component Insert/Edit** dialog box will be displayed. The options in this dialog box have already been discussed.
- Follow the procedures discussed earlier.

Delete Footprint

The **Delete Footprint** tool is used to delete the footprints of panel components. The procedure is given next.

- Click on the **Delete Footprint** tool from the **Edit Footprints** panel. You are asked to select the components whose footprints are to be deleted.
- One by one click on the components that you want to be deleted and press ENTER. The footprints will be deleted and the Search for / Surf to Children dialog box will be displayed; refer to Figure-39.



Figure-39. Search for or Surf to Children dialog box

- Click on the **OK** button if you want to delete the children components also or click on the No button to exit the tool.
- If you clicked on the **OK** button then the **Surf** dialog box will be displayed; refer to Figure-40.

Туре		Tag	Sheet,Reference	Installation	Location
p	1	CB322	3, 322		MCAB5
p	1	CB328	3, 328		MCAB5
Show mo		E	dit Catalo	g Check	Pan
	ve		lete Pick	New List	Zoom In

Figure-40. Surf dialog box

• Select the item from the list and click on the **Go To** button. The component will be displayed in the corresponding drawing and the **Delete** button will become active; refer to <u>Figure-41</u>.

Type Tag Sheet,Reference Installation Location CB32 p 1CB322 3.322 MCAB5
p 1 CB328 3, 328 MCAB5
15
how more Freshen Edit Catalog Check Pan
om Save Delete Pick New List Zoom In

Figure-41. Surf dialog box with component in drawing

• Click on the **Delete** button and delete the children components if you want to.

Resequence Item Numbers

The **Resequence Item Numbers** tool is used to re-sequence all the items in the current drawing/project. The procedure is given next.

• Click on the **Resequence Item Numbers** tool from the **Edit Footprints** panel. The **Resequence Item Numbers** dialog box will be displayed; refer to <u>Figure-42</u>.

- Specify the desired starting number for the items in the Start edit box.
- Select the desired radio button and click on the **OK** button from the dialog box. (In our case, **Active drawing(all)** radio button is selected).
- On doing so, the item numbers will be updated automatically.

Resequence Item Numbers
Enter starting item number in box below, include leading zeros if desired.
Start 1
Process blank items only
Drawings to Process
Project
Active drawing (all)
Active drawing (pick)
Manufacturers to Process
V Process all
Allow duplicate item numbers
x = Process this manufacturer
x AB x ANIXTER
x AUTOMATIONDIRECT x BUSSMANN
x BUSSMANN x EATON
x HUBBELL x MS
x PHOENIX CONTACT
x SIEMENS
Add Remove
Move Up Move Down
OK Cancel Help

Figure-42. Resequence Item Numbers dialog box

Copy Codes drop-down

There are four tools in this drop-down; **Copy Installation Code**, **Copy Location Code**, **Copy Mount Code**, and **Copy Group Code**. These tools work in the same way. The procedure for **Copy Location Code** tool is given next. You can assume the same for other tools in the drop-down.

Click on the Copy Location Code tool from the Copy Codes drop-down. The Copy Installation\Location\Mount\Group to Components dialog box will be displayed; refer to Figure-43.

		Master	
elect values to co	V Location	Mount	Group
Drawing	Drawing	Drawing	Drawing
Project	Project	Project	Project
Pick	Pick	Pick	Pick

Figure-43. Copy Installation Location Mount Group to Components dialog box

- Click on the **Pick Master** button. You are asked to select the component whose location code is to be copied.
- Select the desired component. The dialog box will be displayed again. Click on the **OK** button from the dialog box. You are asked to select the target components.
- Select the target components to assign the copied location code and press ENTER. The location code will be assigned.

Copy Assembly

The **Copy Assembly** tool is used to copy one or more components of a panel assembly. The procedure to use this tool is given next.

- Click on the **Copy Assembly** tool from the drawing. You are asked to select components or assembly.
- Select the desired components and press ENTER. You are asked to specify the base point for copying.
- Click to specify the base point. The component will get attached to the cursor.
- Click in the drawing area to place the copied components/assembly.

PRACTICAL 1

Create the panel layout for schematic diagram created in Practical 1 of Chapter 8; refer to Figure-44.

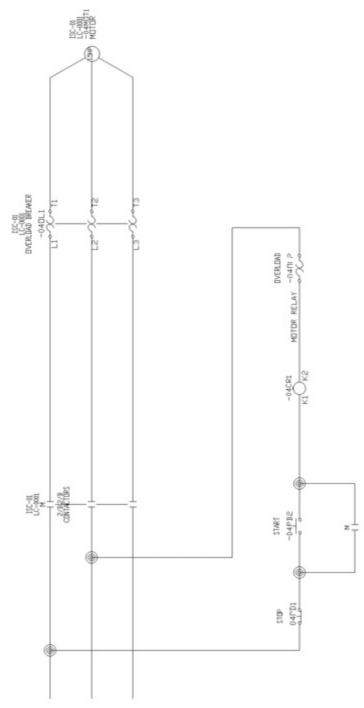


Figure-44. Practical 1 schematic

Starting a drawing

- Select a project having schematic drawing for which you want to design the panel. Note that you need to add the drawing of Practical 1 of previous chapter in any project.
- Right click on the project name in the Project Manager; refer to Figure-45.

PROJECT MANAGER		[-][Top][2D Wirefra
👼 🛃 🚮 🇐 🖅 [A ELECTRICAL_BA	Close	
Projects Projects Practic Proble Proble Proble Proclic Practic Practic Practic Practic	Expand All Collapse All Add Subfolder Flatten Structure Descriptions Title Block Update Drawing List Repo	
Details	Flip DWG Name to	
Status: Locked by File Name: Electric	Flip DWG Name to Sort	
Location: C:\Users \AcadE 2015\AeD; Project Database: \AppData\Roamir Electrical 2015\R2(\ELECTRICAL_BAS	New Drawing Add Drawings Add Active Drawin Remove Drawings Task List	<u>, 7</u>
	Publish	•
	Settings Exception List Properties	5

Figure-45. Shortcut menu of Project

- Click on the **New Drawing** button. The **Create New Drawing** dialog box will be displayed; refer to <u>Figure-46</u>.
- Click in the Name edit box and specify the name as Panel Layout.
- Click on the **Drawing** button and select the code for **Installation** as well as **Location** codes.

Drawing File		
Name:		
Template:	C:\Users\Gaurav\AppData\Local\Autodesk\AutoCAD Electrical 2016	Browse
For Referer	nce Only	0.0
Location:	C:\Users\Gaurav\Documents\AcadE 2016\AeData\proj\Electrical_Ba	Browse
C:\Users\	Gaurav\Documents\AcadE 2016\AeData\proj\Electrical_Basics	
Description 1:		
Description 2:	· · · · · · · · · · · · · · · · · · ·	
Description 3:		
Installation Code		
Installation Code	: Drawing	Project
Installation Code	Drawing	
Location Code:		Project Project
Location Code:	Drawing Drawing	
Location Code:	Drawing	

Figure-46. Create New Drawing dialog box

• Click on the **OK** button from the dialog box. The **Apply Project Defaults to Drawing Settings** dialog box will be displayed; refer to Figure-47.

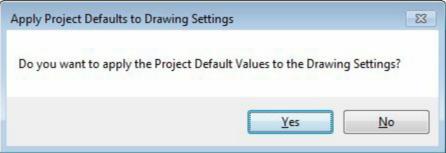


Figure-47. Apply Project Defaults to Drawing Settings dialog box

• Click on **Yes** to apply the settings. The drawing will be created; refer to <u>Figure-48</u>.

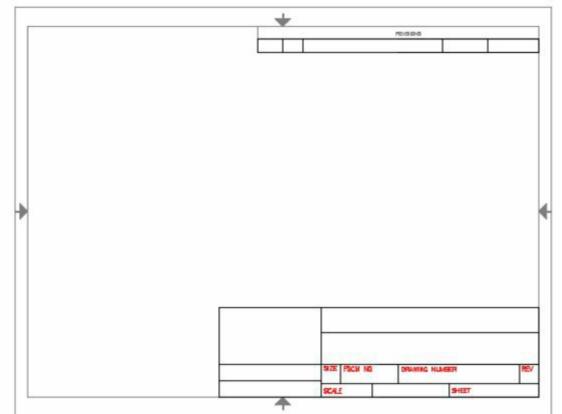


Figure-48. Drawing created

Adding Enclosure of panel

 Click on the Icon Menu button from the Insert Component Footprints drop-down in the Insert Component Footprints panel. For the first time, the Alert dialog box will be displayed; refer to Figure-49.

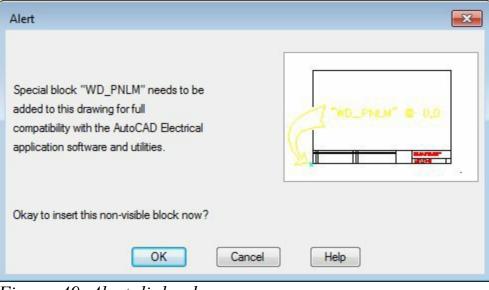


Figure-49. Alert dialog box

• Click on the **OK** button from the dialog box. The **Insert Footprint** dialog box will be displayed; refer to <u>Figure-50</u>.

	1			18	Menu 😰 🕅	Aews 🔻 Dis	splay: 10
Ienu × Panel Layout Symbols +40- Push Buttons +40- Push Buttons +40- Belctor Switches +40- Relays +40- Relays +40- Row/ Lavel Switches +40-	Panel Layout S Push Buttons Other Switches	Selector Switches Timers	Linit Switches	Relays Pilot Lights	Pressure/ Temperatu Fuses/Crout Breakers	Row/ Level Switches	PLC I/O

Figure-50. Insert Footprint dialog box

- Click on the **Enclosures** category in the dialog box. The **Footprint** dialog box will be displayed; refer to <u>Figure-51</u>.
- Click on the **Catalog lookup** button to find out the manufacturer data or specify the desired manufacturer data in edit boxes of the **Choice A** area.
- Click on the **Browse** button and select the drawing block for the enclosure.
- Click on the **Open** button from the dialog box, you are asked to specify the insertion point for the footprint.
- Click in the drawing area to specify the insertion point. You are asked to specify the rotation angle for the current footprint. Enter 0 at the command prompt. The enclosure will be placed; refer to Figure-52 and the Panel Layout dialog box will be displayed; refer to Figure-53.

Choice A		Choice B
Make catalog as for automatic fool		Manual footprint selection or creation
Manufacturer	TELEMECANIQUE	Use generic marker only (wd_ptag.dwg)
Catalog	XACM08	Draw shapes
Assembly	atalog lookup	Pick "just like" footprint
		Browse Footprint file dialog selection
	Irawing Only	Pick Select non-AutoCAD Electrical block
G	atalog Check	ABECAD Link to user's own "ABECAD" install
Choice C		
1) Add E	Entry to Manufacturer	Add a new entry to the manufacturer-specific table (table name: TELEMECANIQUE) and match it with an existing footprint block or drawing file
		Add a new entry to miscellaneous table
2) Add	Entry to Miscellaneous	and match it with an existing footprint block or drawing file

Figure-51. Footprint dialog box for enclosure

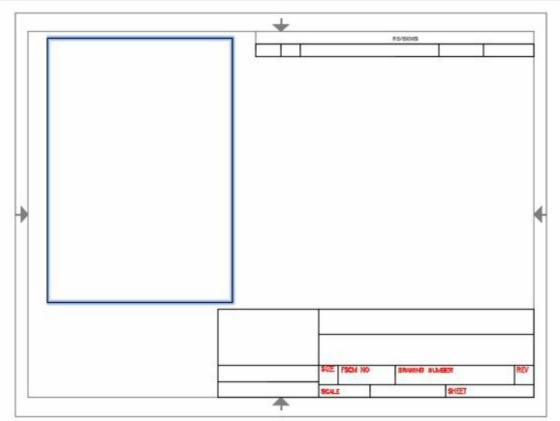


Figure-52. Enclosure placed

	Tag Schematic List	Ede		
	Schematic List	Exte		
Project Find List			emal List File	
	Description			
Next>> 1	Line 1 MAIN ENCLOS	URE		
Catalog Data	Line 2			
Manufacturer TELEMECANK	Line 3			
Catalog XACM08	List: Drawing	Project	Defaults	
Catalog XACM08 Assembly				
-	Installation / Location cod			Group
Assembly	Installation / Location coo	les (for reports))	Group
Assembly Count Unit	Installation / Location coo	des (for reports) ation)	Group Drawing
Assembly Count Unit Catalog Lookup	Installation / Location coor Installation Loc ISC-01 LC-	des (for reports) ation 0001	Mount	

Figure-53. Panel Layout dialog box for enclosure

• Make sure that you have the values specified as in the above figure and then click on the **OK** button from the dialog box.

Inserting other components of the panel

• Click on the Schematic List tool from the Insert Component Footprints drop-down in the Insert Component Footprints panel. The Schematic Components List dialog box will be displayed; refer to Figure-54.

Schematic Components List> Pa	anel Layout Insert
Extract component list for:	Location Codes to extract:
Project	All
Active drawing	🔘 Blank
save list to external file	Named Location
	Location
	Drawing
Browse use external file	Project
ОК	Cancel Help

Figure-54. Schematic Components List dialog box

• Make sure that the **Project** radio button is selected and then click on the **OK** button from the dialog box. The **Select Drawings to Process** dialog box will be displayed; refer to <u>Figure-55</u>.

				🖲 Drawing 👘 🔅	Description
Ref	Subfolder	Section	Sub-Section	Project Drawing List	1
(F:\My Data\Books_Fina\C05_Wires_Circuits C:\Users\Gaurav\Documents\a\proj\Electrica C:\Users\Gaurav\Docume\proj\Electrical_Ba F:\My Data\Books_Fi\C08_Practical and Pra F:\My Data\Books_Fi\C08_Practical and Pra F:\My Data\Books_Fi\C08_Practical and Pra	al_Basics\Proble asics\PLC_Circuit actice\Practical_1 actice\Practical_2- actice\Practical_2
Do A	Process	Reset		by Section/sub-section	by Subfolder
Ref	Subfolder	Section	Sub-Section	Project Drawing List	

Figure-55. Select Drawings to Process dialog box

• Select the **Practical 1** drawing from the list and click on the **Process** button. The drawing will be included in the schematic list; refer to Figure-56.

ef	Subfolder	Section	Sub-Section	Project Drawing List	
				F:\My Data\Books_Fi\C08_Practical and Practice\Practi	tical_

Figure-56. Drawing included for processing

• Click on the **OK** button. The **Schematic Components (active project)** dialog box will be displayed; refer to Figure-57.

Tag	Installation,Location	Manufacture	r,Catalog,Assembly	Descrip	tion 1,2,3	
04CR1		AB, 700-P20	0A1	MOTO	R RELAY	
04PB1		AB. 8008-E/	AC. 800B-ARP	STOP		
04PB2		AB, 8008-E/	AC, 800B-ARP	START	r	
040L2		AB, 1492-A1	and the second sec	OVERL		
04MOT1	ISC-01, LC-0001		FC1F518GSKCA	MOTO		
040L1	ISC-01, LC-0001	AB, 193-A1A1		OVERL	OAD BREA	KER
Sort List	Display		Catalog Check		1.000	Footprint scale
Reload	Show All Hide Existing					Rotate (blank+"ask")
Mark Existing	Multiple Catalo	g [+]				
		Automatic fo	otprint lookup			
			Use Footprint tables			Convert Existing

Figure-57. Schematic Components active projects dialog box

• Select the component with description STOP and click on the Insert button. The icon will get attached to the cursor; refer to Figure-58.



Figure-58. Stop button attached to cursor

- Click in the enclosure to place the button at the desired place. You are asked to specify the rotation angle.
- Enter 0 at the command prompt. The component will be placed and the **Panel Layout Insert/Edit Component** dialog box will be displayed.
- Specify the required parameters and click on the **OK** button. The button will be placed and the **Schematic Components (active project)** dialog box will be displayed again.
- Similarly insert the other components of the user panel and assign balloons as discussed in the chapter. After adding all the components and the balloons the panel layout will be displayed as shown in Figure-59.

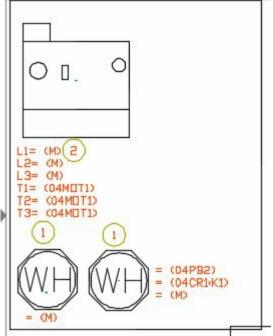


Figure-59. Panel drawing for Practical 1

PRACTICE 1

Create a panel layout for users for the schematic created in Practical 2 of chapter 8; refer to Figure-<u>60</u>. The panel layout is given in .

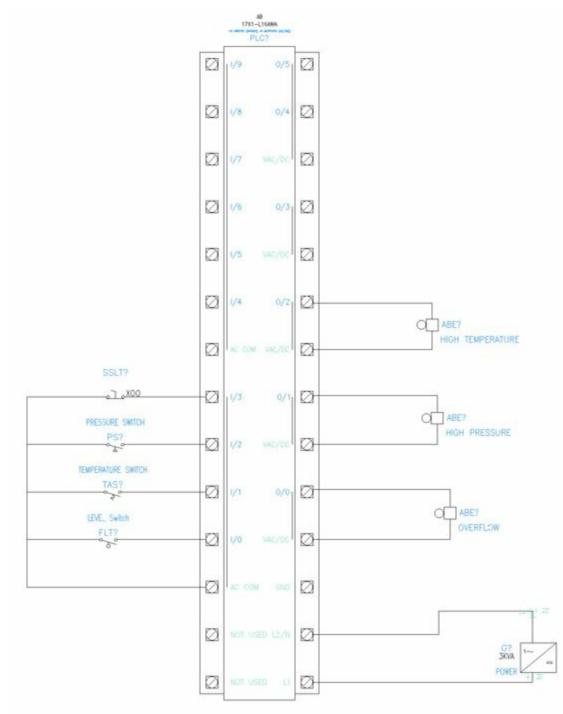


Figure-60. Practical 3

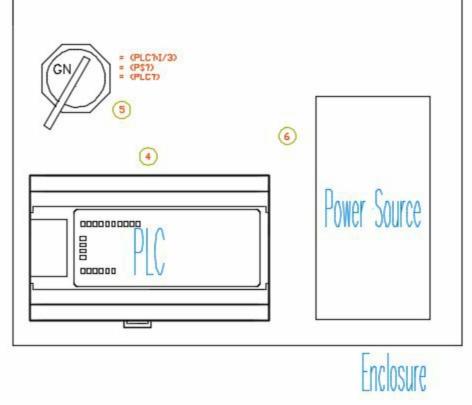


Figure-61. Panel layout for practical 3

REPORTS

CHAPTER 10

Topics Covered

The major topics covered in this chapter are:

- Introduction
- Reports
- Missing Data Catalog
- Electrical Audit
- Drawing Audit
- Dynamic Table editing

Introduction

After the huge discussion of technical aspects in previous chapters, this is the time to relax and see the results of your work. Actually reports are the tabulated representation of components being used in the schematic diagrams and panel layouts. The tools to create reports are available in the **Reports** tab of the **Ribbon**; refer to Figure-1. Before we start using the tools one by one, it is important to note that the reports created here are totally dependent on the schematic diagrams and panel layouts created earlier. The tables generally have Names of components, Manufacturer details of components and quantity of components. We can include other details also like location code, installation code and so on in the table. The tools to create tables are discussed next.

E	Home Anno	tate View	Project	Scher	matic	Panel	Reports	Import/Exp
Reports	? Missing Catalog Data	Electrical A	t	Reports	Automa Report	tic 🖥	Report For User Attrib	
1	Schema	atic	11	Panel		Mis	cellaneous	

Figure-1. Reports panel

REPORTS (SCHEMATIC)

The **Reports** tool in the **Schematic** panel is used to create reports of schematic components of the project. The procedure to use this tool is given next.

• Click on the **Reports** tool from the **Schematic** panel in the **Reports** tab. The **Schematic Reports** dialog box will be displayed; refer to Figure-2.

Report Name	Bill of Material	
20 of Meterial Masing Bill of Material Component From/To Component Wive List Connector Flug PLC I/O Address and Descriptions PLC I/O Ad		Installation Codes to extract: All Blank Named Installation Installation List: Project Location Codes to extract: All Blank
	Display option Normal Tallied Format Normal Tallied Format (Group by Installation/Location) Display in Tallied Purchase List Format Display in "By TAG" Format	Named Location Location Location Drawing List Project
	Freshen Project Database Format OK Cancel	[]

Figure-2. Schematic Reports dialog box

• We have a big list of report types in the **Report Name** selection box at the left; refer to Figure-3. Select the desired report type from the selection box, the options in the dialog box will be modified accordingly.

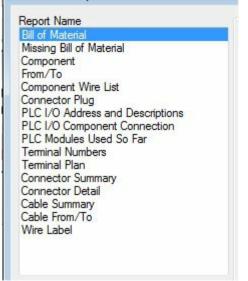


Figure-3. Report Name box

• The list of report types available in the dialog box is given next:

Bill of Materials reports

The Bill of Material reports report only components with assigned BOM information. These reports provide the following BOM-related features:

- Extract BOM reports on demand, active drawing, or project-wide
- Extract BOM reports on a per-location basis
- Change BOM report format
- Output BOM reports to ASCII report file
- Export BOM data to a spreadsheet or database program
- Insert BOM as a table right on an AutoCAD drawing
- List parent or stand-alone components without catalog information

Procedure to create:

- Select the **Bill of Materials** option from the **Report Name** selection box. The options related to Bill of Materials will be displayed in the dialog box.
- Select the **Project** radio button if you want to include the drawings from the current project or select the **Active Drawing** radio button to create Bill of Materials based on the current active drawing.
- Click on the Category drop-down. The list of various options will be displayed; refer to Figure-4.

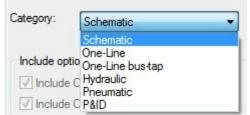


Figure-4. Category drop-down

- Select the desired option, the component related to the selected option will be included in the Bill of Materials report.
- Select the check boxes in the Include options area of the dialog box to include the corresponding

components of the circuit in the report. You can select **All the above** check box to include all the items displayed above this check box.

- Select the List terminal numbers check box to include the terminal numbers in the report.
- The four radio buttons in the **Display option** area of the dialog box are used to specify sorting of the components in the table. The effect of these radio buttons is discussed next.

Normal Tallied Format

Identical component or component/assemblies are tallied and reported as single line items (example: Red push-button operator 800EP-F4 with 800E-A3L latch and two 800E-3X10 N.O. contact blocks).

Normal Tallied Format (Group by Installation/Location)

Identical component or component/assemblies with the same installation/location codes are tallied and reported as single line items.

Display in Tallied Purchase List Format

Each part becomes its own line item (example: no longer any sub-assembly items) and each is tallied across all component types. For example, all 800E-3X10 N.O. contact blocks for all components are reported as a single line item.

Display in By TAG Format

All instances of a given component-ID or terminal tag are processed together and then reported as a single entry.

- Select the desired radio button.
- Click on the Format button and select the desired format for the report.
- Select All radio buttons from **Installation Codes to extract** and **Location Codes to extract** areas to include installation codes and location codes in the report.
- Click on the **OK** button from the dialog box. The **Report Generator** dialog box will be displayed; refer to <u>Figure-5</u>.

10 C 1		stal for all locations (5 records)			
AGS	QTY	SUB CATALOG	MFG	DESCRIPTION	
04H0T1	1	CH111-FC1F518GSKC	A B	TYPE P 1200AC 2 NO 115-1200AC 60Hz / 1100AC 50Hz Severe Duty se AC Motor, ENC: AC Motor 1.5HP 208-230/4600AC	TEFC, C FACE FOOT MOUNTE
040L 1	1	193-8181	AB	3 PHASE, 60Hz, SYNCH. RPM: 18 OUERLOAD RELAY MANUAL RESET, MANUAL RESET 0.1-0.32AMPS MOUNTS DIRECTLY TO CONTACTORS	CLASS 10
	1	193-A1A1	AB	OVERLOAD RELAY MANUAL RESET, Manual Reset 0.1-0.32AMPS	CLASS 10
840L1 < Header	1	193-A1A1		OVERLOAD RELAY MANUAL RESET, Manual Reset 0.1-0.32AMPS	CLÁSS 10 100 AND 104
•	å	193-A1A1	Bre	OVERLOAD RELAY MANUAL RESET, Manual Reset 0.1-0.32AMPS Mounts directly to contactors	CLÁSS 10 180 AND 104 Squeeze © 1 @ 2 © 3
< 🛄 Header	å		Bre	OUERLOAD RELAY MANUAL RESET, MANUAL RESET 0.1-0.32AMPS MOUNTS DIRECTLY TO CONTACTORS	CLÁSS 10 180 AND 104 V Squeeze 1 0 2 0 3 Add blanks between entries
< Header Time/Date		Add First section only	Bre	OUERLOAD RELAY MANUAL RESET, MANUAL RESET 0.1-0.32AMPS MOUNTS DIRECTLY TO CONTACTORS eaks Add page breaks	CLÁSS 10 180 AND 104 Squeeze © 1 @ 2 © 3

Figure-5. Report Generator dialog box

- Select the Add check box for desired data header from the Header area of the dialog box.
- Click on the **Edit Mode** button to edit the table data. The **Edit Report** dialog box will be displayed; refer to Figure-6.

dit Report	QTY	SUB	CATALOG	MEG	DESCRIPTION
	3233.44	200			
04CR1 04M0T1	1		700-P200A1 CM111-FC1F518GSKCA	AB	P TYPE ELECTRICALLY HELD RELAT TYPE P 120VAC 2 NO 115-120VAC 60Hz / 110VAC 50Hz SEVERE DUTY SE AC MOTOR, ENC: AC MOTOR 1.5HP 200 200/160000
040L1	1		193-A1A1	AB	208-230/460VAC 3 PHASE, 60Hz, SYNCH. RPM: 18 OVERLOAD RELAY MANUAL RESET, 1 MANUAL RESET 0.1-0.32AMPS
•					
	New line	s			Edit Move Up
	Add	d from Ca	Add above selecte Add below selecte		Delete Move Down
Line 1					
			turn to Report	ancel-R	etum to Report Help

Figure-6. Edit Report dialog box

• Double-click on the desire row, the Edit Line dialog box will be displayed; refer to Figure-7.

Edit Line 1	×
TAGS	04CR1
QTY	1
SUB	
CATALOG	700-P200A1
MFG	AB
DESCRIPTION	P TYPE ELECTRICALLY HELD RELAY, 4 POLE, AC COIL, CO
	Back Next
	OK Cancel

Figure-7. Edit Line dialog box

• Specify the desired values in the edit boxes of this dialog box and click on the **OK** button to exit the dialog box.

- You can add a new line by using the Add from Catalog button and use the catalog data.
- Click on the **OK-Return to Report** button to return the report creation.
- Now, we are ready to insert the report in the drawing. Click on the **Put on Drawing** button from the **Report Generator** dialog box. The **Table Generation Setup** dialog box will be displayed; refer to <u>Figure-8</u>.
- The options in this dialog box are used to modify the details of the table. Specify the desired parameters and click on the **OK** button from the dialog box. A box of table boundary will get attached to the cursor.

Table	Column Width	First New Section Placement
Insert New	Calculate automatically	X-Dimension
Insert New (non-updatable)	⑦ Define widths	Y-Dimension
O Update Existing	Define	
Table Style		Row Definition
ACE-INCH (TableStyle)	Browse	Last line: 24
Column Labels	fa 77.	Start line 1 End 24
Include column labels		Apply Special Breaks
Show Labels on first section o	nly	Rows for Each Section
Title		Bows
lnclude time/date		Force to Maximum Rows
Include project information		
Include title line		
Report for Drawing Practical_1.0	dwg	Section Definition
Include Special Break values		Sections On Drawing
Show Title on first section only	/	X-Distance
Layer MISC		Y-Distance

Figure-8. Table Generation Setup dialog box

- Click in at the desired place in the drawing to place the table. The table will be placed and the **Report Generator** dialog box will be displayed again.
- Click on the **Save to File** button if you want to save the report in a separate file. The **Save Report to File** dialog box will be displayed; refer to <u>Figure-9</u>.

Save Report to File	X
Select:	
ASCII report output (as shown)	
Excel spreadsheet format (xls)	
Include project "LINEx" values	First section only
C Access database format (.mdb)	
⊘ XML format (xml)	
CSV comma delimited ASCII output	
Include project "LINEx" values	First section only
Include labels as first data line	First section only
OK Can	cel

Figure-9. Save Report to File dialog box

- Select the desired radio button to specify the format for the file. (Excel spreadsheet format(.xls) in our case)
- Click on the **OK** button from the dialog box. The **Select file for report** dialog box will be displayed; refer to Figure-10.

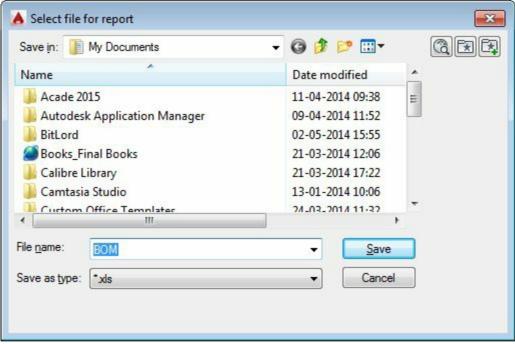


Figure-10. Select file for report dialog box

• Browse to the desired location in the hard-drive and save the file. On selecting the Save button, the **Optional Script File** dialog box will be displayed; refer to <u>Figure-11</u>.



Figure-11. Optional Script File dialog box

- Click on the **Run Script** button to generate the script file or click on the **Close-No Script** button to exit. If you generate the script file then it help the other programs to link the table data to its generation process.
- Click on the **Close** button from the **Report Generator** dialog box to exit. <u>Figure-12</u> shows a table inserted in the drawing.

			COURT CAD FILLER HEAVEN FOR HEAVEN FILL CLARS IN MANAVAL RELET 0.1-0.324975 MANAVES TERRETELE IS CENTRETERS AND AND DOA NEW STOLED STARE ALLAN IMPO-1
		1432-8181	
	*1		NORD HAINTAINEE P.SH BUTTON - RECTANCILAR BETEL BERN A-GOUD-ARP
	•		

Figure-12. Report of BOM

Above procedure is similarly applicable to other type reports discussed next.

Component report

This report performs a project-wide extract of all components found on your wiring diagram set. This data includes component tags, location codes, location reference, description text, ratings, catalog information, and block names.

Wire From/To report

If you marked components and/or terminals with location codes, you can make good use of this report. This report first extracts component, terminal, location code, and wire connection information from every drawing in the project set. Then it displays a location list dialog box where you can make your report's "from" and "to" location selections. All the location codes AutoCAD Electrical found on the drawing set are listed on each side of this dialog box. Location "(??)" is also included in the list if AutoCAD Electrical found any component or stand-alone terminal that did not have an assigned location code.

Component Wire List report

This report extracts the component wire connection data and displays it in a dialog box. Each entry shows a connection to a component, the wire number, component tag name, terminal pin number, component location code (if present), and the layer that the connected wire is on.

Connector Plug report

This report extracts plug/jack connection reports and optionally generates pin charts. Since each wire tied to each connector pin displays in the report, each pin has two entries. One entry is for the 'in' wire and the other is for the 'out' wire. To create a more useful report, select the PIN chart 'on' radio button at the bottom of the Report Generator dialog box. Make sure the Remove duplicated pin numbers toggle is checked and click OK. It reformats the report so each pin is listed only once.

PLC I/O Address and Description report

This report lists each PLC module and its beginning and ending I/O address numbers. It scans your drawing set and returns all individual I/O connection points it finds. It includes up to five lines of description text and the connected wire number for each I/O point.

PLC I/O Component Connection report

This report scans the selected drawings and returns information about any components connected to PLC I/O points. Data for the report starts at each wire connection point and follows the connected wire. The first terminal symbol, fuse symbol, or connector symbol that is hit reports in the column marked with default "TERMTAG" label. The first schematic component reports in the column with the "CMPTAG" label. If there are multiple instances, the one closest to the PLC I/O point is the one that shows up in the report column.

PLC Modules Used So Far report

For this report, AutoCAD Electrical quickly scans the wiring diagram set. It returns in a few moments and displays the I/O modules it finds. Each entry shows the beginning and ending address of the module.

Terminal Numbers report

This project-wide, stand-alone report lists all instances of terminals. Each entry includes information tied directly to the terminal such as terminal number, terminal strip number, and location code.

Terminal Plan report

This project-wide, stand-alone report does a wire network extraction. It takes longer to generate, but the report includes wire number and wire layer name information.

Connector Summary report

This report lists a single line for each connector tag along with pins used, maximum pins allowed (if the parent carries the PINLIST information), and a list of any repeated pin numbers used. You can run this report across the project or for a single component.

Connector Details report

This report extracts the component wire connection data and displays it in a dialog box. Each entry shows a connection to a component, the wire number, component tag name, terminal pin number, component location code (if present), and the layer that the connected wire is on.

Cable Summary report

This project-wide cable conductor report gives a report listing all the cable marker tags (parent tags) found.

Cable From/To report

This project-wide cable conductor report lists the "from / to" for each cable conductor. It also lists the parent cable number of the conductor, conductor color code, and wire number (if present).

Wire Label report

This report lists wire markers/labels and can be used to create physical wire or cable labels.

MISSING CATALOG DATA

The **Missing Catalog Data** tool is used to display a diamond on the components in the schematic diagram and panel layout that do not have catalog data attached. The procedure to use this tool is given next.

• Click on the Missing Catalog Data tool from the Schematic panel. The Show Missing Catalog Assignments dialog box will be displayed; refer to Figure-13.

Show	Active drawing - show	
Report	Drawing or project-wide	

Figure-13. Show Missing Catalog Assignments dialog box

• Click on the **Show** button to highlighted the components not having catalog data attached; refer to <u>Figure-14</u>.

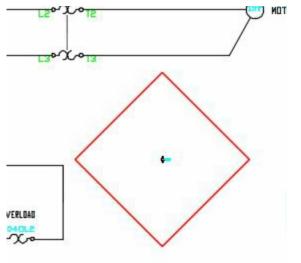


Figure-14. Component not having catalog data attached

- Click on the **Report** button from the **Show Missing Catalog Assignments** dialog box to generate the report. The **Schematic Reports** dialog box will be displayed.
- Click on the **OK** button from the dialog box. The **Select Drawings to Process** dialog box will be displayed.
- Select the **Do All** button to include all the drawings of the Project and click on the **OK** button from the dialog box. The **QSAVE** dialog box will be displayed.
- Click on the **OK** button from the dialog box. The **Report Generator** dialog box will be displayed with the missing entries; refer to Figure-15.

		rt for all installations, for all locations (7 records)	
AGNAME LOC	DESC1	DESC2 DESC3	
84CR2 84LT1 84PJ1 84R1 FLT? PS? TAS?	L1 S0 LEVEL Switch PRESSURE SWITCH TEMPERATURE SWITCH		
<		Breaks	▼ Squeeze © 1 ⊛ 2 (
< Header Time/Date	Add First section only	Add page breaks	Squeeze 1 2 (
 Header Time/Date Title Line 	Add First section only	Add page breaks	Sort User Post
< Header Time/Date		Add page breaks Special breaks Installation/Location	

Figure-15. Report Generator dialog box with missing catalog data components

• Click on the **Put on Drawing** button or **Save to File** button as discussed earlier to extract the report. You can also print the table by using the **Print** button from the dialog box.

ELECTRICAL AUDIT

The Electrical Audit tool is used to audit all the drawings in project and find out the faulty

components in the project. The procedure to use this tool is given next.

- Click on the **Electrical Audit** tool from the **Schematic** panel in the **Ribbon**. The **Electrical Audit** dialog box will be displayed.
- Click on the **Details** button. The expanded dialog box will be displayed; refer to Figure-16.

oject					
tive Drawing		116 Error(s) Four	d		
			Details 🛠	Close	Help
Terminal D	uplication	8 Pin Exce	ption	Contacts	
🕴 Com	ponent - No Catalog Nu	mber	8	Component Duplicati	on
🕴 Com	ponent - No Connection	n	Mit	ked Component Netw	ork
😵 Wire - No C	Connection	😫 Wire Exce	ption	Cable Exce	eption
Wire Number	Error Message	Drawin	Ig	Location	
	Unconnected wires	PRAC	TICAL.DWG	(0.59 2.33)	
	Unconnected wires	PRAC	TICAL_1.DWG	(72.19 194.68)	
	Unconnected wires	PRAC	TICAL_1.DWG	(72.19 199.68)	
	Unconnected wires	PRAC	TICAL_1.DWG	(72.19 204.68)	
1	Unconnected wires	PRAC	TICAL_2.DWG	(103.52 178.55)	
1	Unconnected wires	PRAC	TICAL_2.DWG	(91.12 213.55)	
1	Unconnected wires	s PRAC	TICAL_2.DWG	(91.12 173.55)	
3	Unconnected wires	s PRAC	TICAL.DWG	(0.53 7.00)	
3	Unconnected wires	B PRAC	TICAL.DWG	(10.00 6.00)	
3	Unconnected wires	s PRAC	TICAL.DWG	(10.00 6.50)	
3	Unconnected wires	PRAC	TICAL.DWG	(10.00 7.00)	
3	Unconnected wires	s PRAC	TICAL.DWG	(0.50 6.00)	
3	Unconnected wires	PRAC	TICAL.DWG	(0.50 6.50)	
6	Unconnected wires		TICAL_2.DWG	(141.12 213.55)	
~		0040	TICAL S DUAC	(1 X1 10 170 FF)	
	Go To	Save As	Save All	Print	

Figure-16. Electrical Audit dialog box

 Click on the Active Drawing radio button to display the problems in the current drawing. Click on the tabs in the expanded dialog box which are marked with a cross, the errors will be displayed; refer to <u>Figure-17</u>.

Terminal D	uplication	8	Pin Exception	Contacts
😢 Comp	onent - No Cata	log Number		Somponent Duplication
🔞 Comp	ponent - No Con	nection		Mixed Component Network
🛿 Wire - No C	onnection	Wire Exception		Cable Exception
Wire Number	Error Message		Drawing	Location
	Unconnecte	d wires	PRACTICAL_1.DW	/G (72.19 194.68)
	Unconnecte	d wires	PRACTICAL_1.DW	/G (72.19 199.68)
	Unconnecte	d wires	PRACTICAL_1.DW	/G (72.19 204.68)
	Go To	Save /	As Save All	Print

Figure-17. Errors in the drawing

• Select the error from the table and click on the **Go To** button from the dialog box. The component having error will be highlighted in the drawing; refer to Figure-18.

Terminal D	uplication	O Pri Exception	n	Contacts
the second se	onent - No Catalog Nu			ponent Duplication
	ponent - No Connection			Component Network
Wire - No C	onnection	Wre Exception	n	Cable Exception
Wire Number	Error Message	Drawing	L	cation
×	Unconnected wires	PRACTIC	AL_1.DWG (7	2.19 194.68)
	Unconnected wires			2.19 199.68)
	Unconnected wires	PRACTICA	AL_1.DWG 0	2.19 204 68)

Figure-18. Component of error highlighted

• Modify the component as per the requirement.

DRAWING AUDIT

The **DWG** Audit tool is used to audit the drawing for errors of wiring or wire numbers. The procedure to use this tool is given next.

• Click on the **DWG Audit** tool from the **Schematic** panel of the **Ribbon**. The **Drawing Audit** dialog box will be displayed; refer to Figure-19.

Date/Time: 08-05-2014 14:09:16
Project: (single drawing)

Figure-19. Drawing Audit dialog box

- Select the Active drawing or Project radio button as per your requirement. If selected the Project radio button then you need to include the drawings of project as discussed earlier. (Active drawing radio button is selected in our case)
- Click on the **OK** button from the dialog box. The **Drawing Audit** dialog box with the options to display in the drawing will be displayed; refer to Figure-20.



Figure-20. Drawing Audit dialog box with entities to display

• Select the desired check boxes and click on the **OK** button from the dialog box. The selected components will be highlighted; refer to Figure-21.

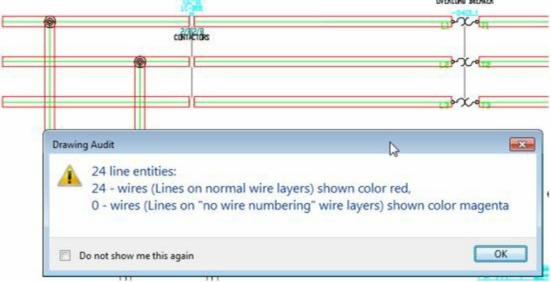


Figure-21. Wires highlighted

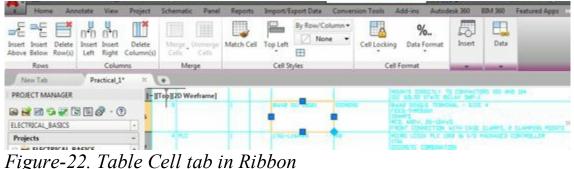
• Click on the **OK** button from the dialog box to exit.

Similarly, you can use the other tools in the Reports tab to edit or create the reports.

DYNAMIC EDITING OF REPORTS IN DRAWING

You can edit any entry of the reports inserted in the drawing by using the dynamic editing facility of the AutoCAD Electrical. The procedure is given next.

• Click in any cell of the table. The Table Cell tab will be displayed; refer to Figure-22.



• Type the new value for the selected cell if you want to change the value.

• Using the tools in the Table Cell tab you can change the format of the table.

The tools in the Table Cell tab are discussed next.

MODIFYING TABLES

Select any cell in the table; the **Table Cell** tab will be added to the **Ribbon**, as shown in <u>Figure-23</u>. The options in the **Table Cell** tab are used to modify the table, insert block, add formulas, and perform other operations.



Figure-23. The Table Cell tab added to the Ribbon

Modifying Rows

To insert a row above a cell, select a cell and choose the **Insert Above** tool from the **Rows** panel in the **Table Cell** tab. To insert a row below a cell, select a cell and choose the Insert Below tool from the Rows panel in the **Table Cell** tab. To delete the selected row, choose the **Delete Row(s)** tool from the **Rows** panel in the **Table Cell** tab. You can also add more than one row by selecting more than one row in the table.

Modifying Columns

This option is used to modify columns. To add a column to the left of a cell, select the cell and choose the **Insert Left** tool from the **Columns** panel in the **Table Cell** tab. To add a column to the right of a cell, select a cell and choose the **Insert Right** tool from the **Columns** panel in the **Table Cell** tab. To delete the selected column, choose the **Delete Column(s)** tool from the **Columns** panel in the **Table Cell** tab. To **Cell** tab. You can also add more than one column by selecting more than one row in the table.

Merge Cells

This button is used to merge cells. Choose this button; the **Merge Cells** drop-down is displayed. There are three options available in the drop-down. Select multiple cells using the **SHIFT** key and then choose **Merge All** from the drop-down to merge all the selected cells. To merge all the cells in the row of the selected cell, choose the **Merge By Row** button from the drop-down. Similarly, to merge all cells in the column of the selected cell, select the **Merge By Column** tool from the drop-down. You can also divide the merged cells by choosing the Unmerge Cells button from the Merge panel.

Match Cells

This button is used to inherit the properties of one cell into the other. For example, if you have specified **Top Left Cell Alignment** in the source cell, then using the **Match Cells** button, you can inherit this property to the destination cell. This option is useful if you have assigned a number of properties to one cell, and you want to inherit these properties in some specified number of cells. Choose **Match Cell** from the **Cell Styles** panel in the **Table Cell** tab; the cursor is changed to the match properties cursor and you are prompted to choose the destination cell. Choose the cells to which you want the properties to be inherited and then press ENTER.

Table Cell Styles

This drop-down list displays the preexisting cell styles or options to modify the existing ones. Select the desired cell style to be assigned to the selected cell. The **Cell Styles** drop-down also has the options to create a new cell style or manage the existing ones.

Edit Borders

Choose the **Edit Borders** button from the **Table Cell** tab; the **Cell Border Properties** dialog box will be displayed, as shown in <u>Figure-24</u>. *Figure-24*. *The Cell Border Properties dialog box*

🔥 Cell Border	Properties	
First specify Bo or click on the p appropriate bo	preview to apply selected	ess the Border Type buttons I border properties to the
Border prope	erties	
Lineweight:		ByBlock 🔻
Linetype:		ByLayer 🔻
Color:		ByBlock
🔲 Double li	ne	
Spacing:		0.0450
	Tex	t
	Cancel	Help

Text Alignment

The down arrow with the **Middle-Center** button of the **Cell Styles** panel in the **Ribbon** is used to align the text written in cells with respect to the cell boundary. Choose this button; the **Text Alignment** drop-down will be displayed. Select the desired text alignment from this drop-down; the text of the selected cell will get aligned accordingly.

Locking

This button is used to lock the cells so that they cannot be edited by accident. Select a cell and choose **Cell Locking** from the **Cell Format** panel in the **Table Cell** tab; the **Cell Locking** drop-down list will be displayed. Four options are available in the drop-down list. The **Unlocked** option is chosen by default. Choose the **Content Locked** option to prevent the modification in the content of the text, but you can modify the formatting of the text. Choose the **Format Locked** option to prevent the modification in the formatting of the text, but in this case, you can modify the content of the text. Select the **Content Locked** option to prevent the modification of both formatting and content of the text.

Data Format

The display of the text in the cell depends on the format type selected. Choose Cell Format to change

the format of the text in the cell. On doing so, the **Data Format** drop-down list is displayed. Choose the required format from it. You can also select the **Custom Table Cell Format** option and choose the required format from the Data type list box in the **Table Cell Format** dialog box and then choose the **OK** button.

Block

This tool is used to insert a block in the selected cell. Choose the **Block** tool from the **Insert** panel; the **Insert a Block in a Table Cell** dialog box will be displayed, refer to Figure-25. Enter the name of the block in the **Name** edit box or choose the **Browse** button to locate the destination file of the block. If you have browsed the file path, it will be displayed in the **Path** area. The options available in the **Insert a Block in a Table Cell** dialog box are discussed next.

Name:		▼ Browse
Path:		
Properties		
Scale:	1.0000	
	📝 Auto Fit	
Rotation angle:	0	
Overall cell alignment	: Top Left	+
ſ	ОК Са	Incel Help

Figure-25. The Insert a Block in a Table Cell dialog box

Properties Area

The options in this area are discussed next.

Scale. This edit box is used to specify the scale of the block. By default, this edit box is not available because the **AutoFit** check box is selected below this drop-down list. Selecting the **AutoFit** check box ensures that the block is scaled such that it fits in the selected cell.

Rotation angle. The **Rotation angle** edit box is used to specify the angle by which the block will be rotated before being placed in the cell.

Overall cell alignment. This drop-down list is used to define the block alignment in the selected cell.

Field

You can also insert a field in the cell. The field contains the data that is associative to the property that defines the field. For example, you can insert a field that has the name of the author of the current drawing. If you have already defined the author of the current drawing in the Drawing Properties

dialog box, it will automatically be displayed in the field. If you modify the author name and update the field, the changes will automatically be made in the text. When you choose the **Field** button from the **Insert** panel, the **Field** dialog box will be displayed. You can select the field to be added from the **Field names list** box and select the format of the field from the **Format list box**. Choose **OK** after selecting the field and format. If the data in the selected field is already defined, it will be displayed in the Text window. If not, the field will display dashes (----).

Formula

Choose **Formula** from the **Insert** panel; a drop-down list is displayed. This drop-down list contains the formulas that can be applied to a given cell. The formula calculates the values for that cell using the values of other cell. In a table, the columns are named with letters (like A, B, C, ...) and rows are named with numbers (like 1, 2, 3, ...). The TABLEINDICATOR system variable controls the display of column letters and row numbers. By default, the TABLEINDICATOR system variable is set to 1, which means the row numbers and column letters will be displayed when Text Editor is invoked. Set the system variable to zero to turn off the visibility of row numbers and column letters. The nomenclature of cells is done using the column letters and row numbers. For example, the cell corresponding to column A and row 2 is A2. For a better understanding, some of the cells have been labeled accordingly in Figure-26.

Formulas are defined by the range of cells. The range of cells is specified by specifying the name of first and the last cell of the range, separated by a colon (:). The range takes all the cells falling between specified cells. For example, if you write A2 : C3, this means all the cells falling in 2nd and 3rd rows, Column A and B will be taken into account. To insert a formula, double click on the cell; Text Editor is invoked. You can now write the syntax of the formula in the cell. The syntax for different formulas are discussed later while explaining different formulas. Formulas can also be inserted by using the Formula drop-down list. Different formulas available in the Formula drop-down list are discussed next.

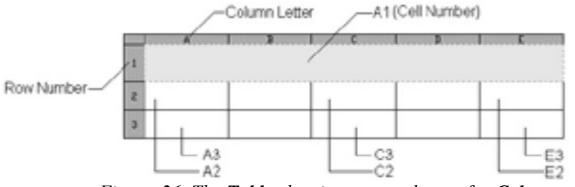


Figure-26. The Table showing nomenclature for Columns, Rows, and Cells

Sum

The **Sum** option gives output for a given cell as the sum of the numerical values entered in a specified range of cells. Choose the **Sum** option from the **Table Cell > Insert > Formula** drop-down; you will be prompted to select the first corner of the table cell range and then the second corner. The sum of values of all the cells that fall between the selected range will be displayed as the output. As soon as you specify the second corner, the Text Editor is displayed and also the formula is displayed in the

cell. In addition to the formula, you can also write multiline text in the cell. Choose **Close Text Editor** from the **Close** panel to exit the editor. When you exit the text editor, the formula is replaced by a hash (#). Now, if you enter numerical values in the cells included in the range, the hash (#) is replaced according to the addition of those numerical values. The prompt sequence, when you select the Sum option, is given next.

Select first corner of table cell range: Specify a point in the first cell of the cell range.

Select second corner of table cell range: Specify a point in the last cell of the cell range.

Note that the syntax for the Sum option is: =Sum{Number of the first cell of cell range (for example: A2): Number of the last cell of the cell range (for example: C5)}

Average

This option is used to insert a formula that calculates the average of values of the cells falling in the cell range. Prompt sequence is the same as for the Sum option.

Note that the syntax for the **Average** option is: =Average{Number of the first cell of the cell range (for example: A2): Number of the last cell of the cell range (for example: C5)}

Count

This option is used to insert a formula that calculates the number of cells falling under the cell range. The prompt sequence is the same as for the Sum option.

Note that the syntax for the Count option is: =Count{Number of the first cell of cell range (for example: A2): Number of the last cell of cell range (for example: C5)}

Cell

This option equates the current cell with a selected cell. Whenever there is a change in the value of the selected cell, the change is automatically updated in the other cell. To do so, choose the **Cell** option from **Table Cell > Insert > Formula** drop-down; you will be prompted to select a table cell. Select the cell with which you want to equate the current cell. The prompt sequence for the Cell option is given next.

Select table cell: Select a cell to equate with the current cell.

Note that the syntax for the **Cell** option is: =Number of the cell.

Equation

Using this option, you can manually write equations. The syntax for writing the equations should be the same as explained earlier.

Manage Cell Content

The Manage Cell Content button is used to control the sequence of the display of blocks in the cell, if there are more than one block in a cell. Choose Manage Cell Contents from the Insert panel; the Manage Cell Content dialog box will be displayed, see Figure-27. The options in the Manage Cell Content dialog box are discussed next.

ble Cell Text ock - MANAGE	Move Up
	Move Down
	Delete
ptions	
ayout mode:	
Flow	
Stacked horizontal	
Stacked vertical	
Content spacing:	

Figure-27. The Manage Cell Content dialog box

Cell content Area

This area lists all blocks entered in the cell according to the order of their insertion sequence.

Move Up

This button is used to move the selected block to one level up in the display order.

Move Down

This button is used to move the selected block to one level down in the display order.

Delete

This button is used to delete the selected block from the table cell.

Options Area

The options in this area are used to control the direction in which the inserted block is placed in the cell. If you select the **Flow** radio button, the direction of placement of the blocks in the cell will depend on the width of the cell. Select the **Stacked horizontal** radio button to place the inserted blocks horizontally. Similarly, select the **Stacked vertical** radio button to place the inserted blocks vertically. You can also specify the gap to be maintained between the two consecutive blocks by entering the desired gap value in the **Content** spacing edit box.

Link Cell

To insert data from an excel into the selected table, choose **Data > Link Cell** from the **Table Cell** tab; the **Select a Data Link** dialog box will be displayed. The options in this dialog box are used to link the data in a cell to the external sources.

Download from source

If the contents of the attached excel spreadsheet are changed after linking it to a cell, you can update these changes in the table by choosing this button. AutoCAD will inform you about the changes in the content of the attached excel sheet by displaying an information bubble at the lower-right corner of the screen.

PROJECT

CHAPTER 11

Topics Covered

The major topics covered in this chapter are:

- Schematic Drawing
- Panel Layout
- Report Generation

Project

Create schematic of the circuit as shown in <u>Figure-1</u>. Design the panel for the user and then generate the report for the components.

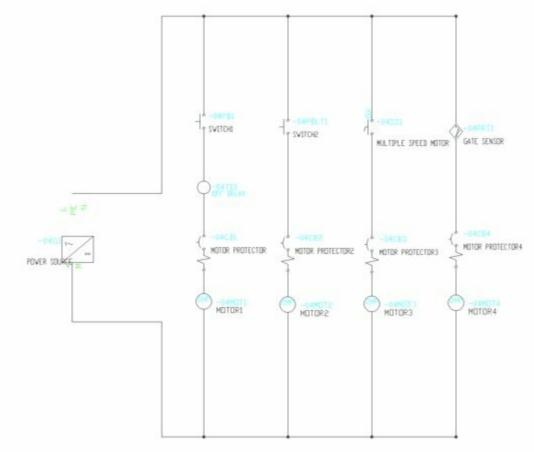


Figure-1. Project-Model

Starting a New Project File

- Click on the AutoCAD Electrical icon from the desktop or Start AutoCAD Electrical by using the Start menu.
- Click on the New Project button from the Project Manager; refer to Figure-2.

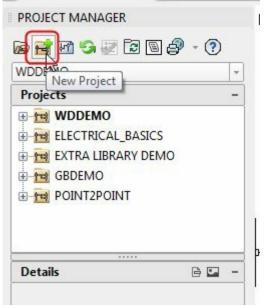


Figure-2. New Project button

• On doing so, the Create New Project dialog box will be displayed; refer to Figure-3.

Create New Project	×
Name:	_
1	
Location:	
C:\Users\Gaurav\Documents\AcadE 2016\AeData\proj\	Browse
Create Folder with Project Name C:\Users\Gaurav\Documents\AcadE 2016\AeData\proj\ Copy Settings from Project File:	
C:\Users\Gaurav\Documents\AcadE 2016\AeData\proj\Demo\wddemo.wdp	Browse
Descriptions OK - Properties OK Cancel Help	

Figure-3. Create New Project dialog box

- Specify the name of the file as **Project** in the **Name** field of the dialog box.
- Click on the **OK-Properties** button from the dialog box. The **Project Properties** dialog box will be displayed.
- Click on the Drawing Properties tab from the dialog box. The options in the dialog box will be displayed as shown in <u>Figure-4</u>.

roject Settings Components Wire Numbers Cross-R Project: C:\Users\Gaurav\Documents\AcadE 2016\/ Components Components\AcadE 2016\/	
Vertical Horizontal	Width:
Spacing:	Multi-wire Spacing:
 Default: Insert new ladders without references Format Referencing X-Y Grid X Zones Reference Numbers 	Scale Feature Scale Multiplier: 1.0 Inch Inch Inch scaled to mm Mm full size Combined scale factor: 1.000000 Wire connection "trap": 0.025000
Tag / Wire Number Order Sort Order: No override	Layers Define

Figure-4. Project Properties dialog box

• Select the **Horizontal** radio button from the **Ladder Defaults** area of the dialog box and click on the **OK** button. A new project file will be added in the **Project Manager** with the name **Project**.

Adding Drawing in the Project

• Click on the **New Drawing** button from the Project Manager. The **Create New Drawing** dialog box will be displayed; refer to <u>Figure-5</u>.

reate New Draw Drawing File		×
Name:		
Template:	C:\Users\Gaurav\AppData\Local\Autodesk\AutoCAD Electrical 2016'	Browse
For Referen	ice Only	
Location:	C:\Users\Gaurav\Documents\AcadE 2016\AeData\proj\Project	Browse
C:\Users\	Gaurav\Documents\AcadE 2016\AeData\proj\Project	
Description 1:	-	
Description 2:	-	
Description 3:	· · · · · · · · · · · · · · · · · · ·	
Project Code:		
Installation Code		
	Drawing	Project
Location Code:		
	Drawing	Project
Sheet Values		
Sheet:	Section:	•
Drawing:	Sub-Section:	
Diawing.		

Figure-5. Create New Drawing dialog box

- Click in the Name field of the dialog box and specify Project 1 as the name.
- Click on the **Browse** button for the **Template** edit box and select the **ACAD ELECTRICAL IEC** template from the dialog box displayed; refer to <u>Figure-6</u>.

Look in:	Complate		- 🔶 🖳 🕻		Views 🔻 Tools
~	Name	*	1.	review	
0	DTWTen	nplates	1		П
itodesk 360	SheetSet	5	1 E		
Œ.	🖬 acad -Na	amed Plot Styles	c		
1	🖬 acad -N	amed Plot Styles3D	c		
History	🛅 acad		(
E	And and a second s	LECTRICAL	(
		LECTRICAL_IEC	(
Documents	acad3D		C		
1		-Named Plot Styles	C		
1 A	provide .	-Named Plot Styles3D	C		
Favortes	acadiso		C		
-	acadiso3	Contraction of the second seco	C C		
	and the second se	SI_A(Landscape)_Color	(
Desktop	denotes the second s	SI_A(Landscape)_Named SI_A(Portrait)_Color	l c		
		SI_A(Portrait)_Color SI_A(Portrait)_Named	· -		
	and a provide the second	II			
	File name:	ACAD_ELECTRICAL_IEC			▼ <u>Open</u>
	Files of type:	Drawing Template (*.dwt)			Cancel

Figure-6. Select Template dialog box

- Click on the **Open** button from the dialog box.
- Click on the **OK** button from the **Create New Drawing** dialog box. The **Apply Project Defaults to Drawing Settings** dialog box will be displayed; refer to <u>Figure-7</u>.



Figure-7. Apply Project Defaults to Drawing Settings dialog box

- Click on the **No** button from the dialog box. New drawing will be added in the Project with the name Project 1.
- Click on the Grid Snap and Grid Display button to turn off the grid snap and hide the grid from drawing.

Creating Ladder

• Click on the **Insert Ladder** button from the **Ladders** drop-down in the **Insert Wires/Wire Numbers** panel. The **Insert Ladder** dialog box will be displayed; refer to <u>Figure-8</u>.

Insert Ladder	—
Width	Spacing
200	40
Length	1st Reference
Rungs	Image:
Phase	Draw Rungs
1 Phase	No Bus No Rungs
3 Phase 10 Spacing	Yes Skip
OK	

Figure-8. Insert Ladder dialog box

- Click on the **OK** button from the dialog box. You are asked to specify the start position of the first rung.
- Click in the drawing area to specify the starting position. The end point of the ladder gets attached to the cursor and you are prompted to specify the last rung.
- Click in the drawing area to specify the last rung so that the ladders are displayed as shown in <u>Figure-9</u>.

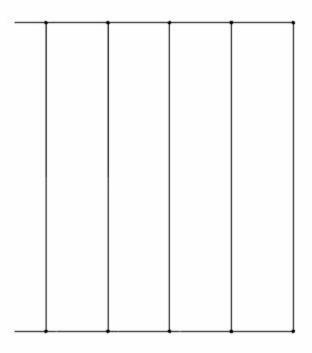


Figure-9. Ladders created

Adding wire

- Click on the **Wire** tool from the **Insert Wires/Wire Numbers** panel in the **Ribbon**. You are asked to specify the start point of the wire.
- Click on the top end of the ladder as shown in Figure-10.

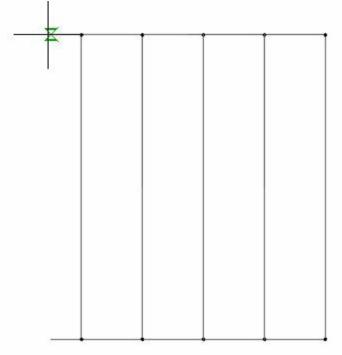


Figure-10. End to be selected

• Drawing the wire as shown in Figure-11.

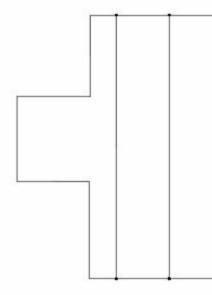


Figure-11. Wire drawn

Adding Components in the circuit

• Click on the **Icon Menu** button from the **Insert Components** panel in the **Ribbon**. The **Insert Component** dialog box will be displayed; refer to <u>Figure-12</u>.

C: Schematic Symbols				1	Menu 🗊	Views 🕶 Dis	splay: 10
Menu ×	JIC: Schematic	Symbols					Recently Used
JIC: Schematic Symbols	Plot Lights	Selector Switches PLC I/O	Fuses/Orcut Breakers/ Teminala/ Connectors	Relays/ Contacts	Timers Tressure/ Temperatu DOT	Motor Control Row/Level Switches One-Line Components	
Horizontal 📃 No edit dialog	Scale schematic:	1.000	Type #:		Browse	Always display p	reviously used menu
No tag	Scale panel:	1.000				ОК	Cancel Help

Figure-12. Insert Component dialog box

• Click on the **Miscellaneous** category from the dialog box. The components will be displayed as shown in Figure-13.

C: Schematic Symbols				1	Menu 🗊	Views 🔻 Di	splay: 10
Menu x	JIC: Miscellan	eous					Recently Used
JIC: Schematic Symbols +	Bell IIIII Battery Receptacles	Buzzer JIIII Battery (Pipped) Shields (Non Intelligent) Image: Shields (Non Intelligent)	Hom XX) Suppressor (tag) 1 2 Splice symbols Power Source 3 Phase	Bectronics Suppressor	Ground	Eath/Ground —— Cable Markers — Stand-Alone Cross-Referen	
Horizontal 🔝 No edit dialog	Scale schematic	: 1.000	Type It:		Browse	🔄 Always display p	reviously used menu
No tag	Scale panel:	1,000				OK	Cancel Help

Figure-13. Miscellaneous components

• Click in the **Scale schematic** edit box at the bottom of the dialog box and specify the value as **20**; refer to Figure-14.

III Noedit dialog	Scale schematic:	20.000	Type it:	
No tag	Scale panel:	1.000		

Figure-14. Scale schematic edit box

- Click on the **Power Source 1 Phase** component from the dialog box. The component will get attached to the cursor.
- Click in the middle of the wire to place the component; refer to <u>Figure-15</u>. The Insert/Edit Component dialog box will be displayed; refer to <u>Figure-16</u>.

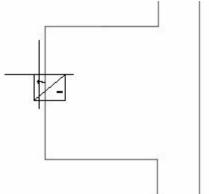


Figure-15. Placing power source

Component Tag		Description		
-??G1	fixed	Line 1		
Use	PLC Address	Line 2		
Tags Used:	Schematic	Line 3		
	Panel	List: Drawing Project Defaults Pick		
Ð	demal List			
	Options	Cross-Reference		
atalog Data	1	Component override Setup		
Manufacture	r 🗌	Reference NO NO/NC Setup		
atalog		Reference NC		
ssembly				
em 🗌	Count			
Next>>] 1	Installation code		
Lookup	Pre <u>v</u> ious	Drawing Project Pins		
Drawing	Project			
Multiple	Catalog	Location code		
Cat	alog Check			
Ratings				
Rating		Show/Edit Miscellaneous		
		OK-Repeat OK Cancel Help		

Figure-16. Insert or Edit Component dialog box

- Click in the Line 1 edit box of the Description area of the dialog box and specify Power Source in it.
- Click on the Lookup button from the Catalog Data area of the dialog box. The Catalog Browser will be displayed; refer to Figure-17.

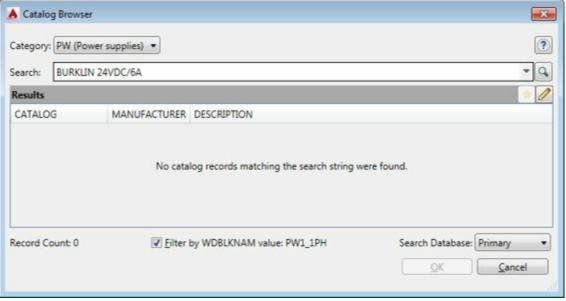


Figure-17. Catalog Browser

- Click in the Search field and specify 230VAC.
- Click on the **Search** button next to **Search** field. The list of power sources will be displayed; refer to <u>Figure-18</u>.

earch:	230VAC					
esults					1	
CAT	ALOG	MANUFACTURER	DESCRIPTION			
1606	-XL120DR	AB	SWITCHED MODE POWER SUPPLY, 16	506 SERIES		
1609	-P3000A	AB	UNITERRUPTIBLE MODE POWER SUP	PLY, 1609 SERIES		
1609	-\$350ES	AB	UNITERRUPTIBLE MODE POWER SUP	PLY, 1609 SERIES		
1609	-U500EH	AB	UNITERRUPTIBLE MODE POWER SUP	PLY, 1609 SERIES		
1609	-U500EHC	AB	UNITERRUPTIBLE MODE POWER SUP	PLY, 1609 SERIES		
1609	-U500ES	AB	UNITERRUPTIBLE MODE POWER SUP	PLY, 1609 SERIES		
٠			1			

Figure-18. Power sources

- Select the **1609-P3000A** field under the **CATALOG** column and click on the **OK** button from the dialog box.
- Click on the Next button from the Catalog Data area of the dialog box to specify the item number.
- Specify the Installation Code and Location Code as X1 and L3 respectively.
- Click on the **OK** button from the dialog box. The power source will be placed; refer to Figure-19.

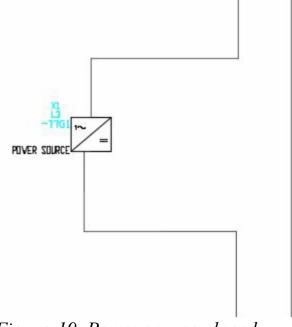


Figure-19. Power source placed

Adding other components

• Click on the Icon Menu button once again and Select the Motor Control category. The components for motor controls will be displayed; refer to <u>Figure-20</u>.

IC: Schematic Symbols					1	Menu	News 🔻 Di	splay: 10
Menu	×	JIC: Motor Cor	itrol					Recently Used
JIC: Schematic Symb +@- Push Buttons B +@- Selector Switche		⊈ ₽	ם גגג	1020	*** ***	°	•O•	
+ + Fuses/ Circuit Br + + Circuit Break	ers/Disco	3 Phase Starter Contacts NO	3 Phase Starter Contacts NC	3 Phase Stater Contacts with	3 Phase Overloads	Motor Starter Coll	Motor Starter Coll with Pins	Power Source 1 Phase
+a- Timers +a- OFF Delay T	·	****	æ	¤	6	·**	0	
+0- Plot Lights		Overload	3 Phase Motor	2nd+ Starter Contact NO	2nd+ Starter Contact NO wi	2nd+ Overload	1 Phase Motor	
+0- Terminals/ Conn +0- Limit Switches +0- Pressure/ Temp	erature Sw	N [∞]	e la	مېره ۱۱	46	the state	Ň	
+9- Row/ Level Swt +9- Miscellaneous S +9- Solenoids		2nd+ Stater Contact NC	2nd+ Starter Contact NC wi		KVAR Capacitor	3 Phase KVAR	2nd+ Overload Contact NC	
+@ Instrumentation B +@- Miscellaneous B +@- One-Line Components	이()	=	80	00				
		2nd+ KVAR Capacitor	Ground	Fuses/ Circuit Breakers	Breakers/ Disconnects			
e [,							
Horizontal 📃 No edit dial	og	Scale schematic	: 20.000	Type It:		Browse	Aways display p	reviously used menu
No tag		Scale panel:	1,000				OK	Cancel Help

Figure-20. Components of Motor Control

- Click on the 1 Phase Motor component. It will get attached to the cursor.
- Click on the first rung of the ladder and place the component as shown in Figure-21.

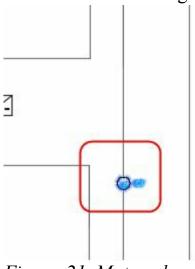


Figure-21. Motor placed

- Click in the Line 1 edit box in the Description area of the dialog box displayed and specify the name as Motor1.
- Click on the Lookup button from the Catalog Data area of the dialog box and select the 1329-ZF00206NVH field in the CATALOG column; refer to Figure-22.

rch: AB "AC MOTO	DR"	· .
ults		*
CATALOG	MANUFACTURER	DESCRIPTION
1329L-ZF00206NVH	AB	BUILD TO ORDER AC VARIABLE SPEED MOTOR, FOOT MOUNTED, COUPLED
1329L-ZF00209NVH	AB	BUILD TO ORDER AC VARIABLE SPEED MOTOR, FOOT MOUNTED, COUPLED (
1329L-ZF00212NVH	AB	BUILD TO ORDER AC VARIABLE SPEED MOTOR, FOOT MOUNTED, COUPLED (
1329L-ZF00306NVH	AB	BUILD TO ORDER AC VARIABLE SPEED MOTOR, FOOT MOUNTED, COUPLED (
1329L-ZF7F506TVH	AB	BUILD TO ORDER AC VARIABLE SPEED MOTOR, FOOT MOUNTED, COUPLED (
1329L-ZF7F509AOH	AB	BUILD TO ORDER AC VARIABLE SPEED MOTOR, FOOT MOUNTED, COUPLED (

Figure-22. Motor in catalog browser

- Click on the OK button from the Catalog Browser dialog box.
- Click on the Next button from the Catalog Data area of the dialog box to specify the item number.
- Specify the same Installation and Location codes as done for previous component.
- Click on the **OK-Repeat** button from the dialog box and create motors for other rungs.
- Similarly add the other components in the schematic drawing; refer to Figure-23.

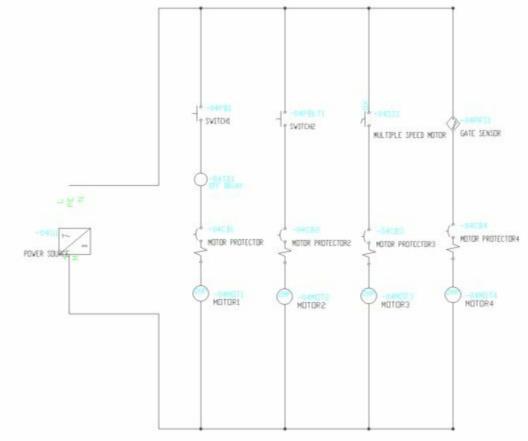


Figure-23. Project-Model

Adding Panel drawing in the Project

• Click on the New Drawing button from the Project Manager. The Create New Drawing dialog

box will be displayed as discussed earlier.

- Specify the name as Panel Drawing in the Name field of the dialog box.
- Specify the same Installation and Location codes, and click on the **OK** button from the dialog box.
- Click on No button from the dialog box displayed for applying defaults of project.

Adding panel components

- Click on the **Panel** tab from the **Ribbon**. The tools related to panel will be displayed.
- Click on the **Icon Menu** button from the **Insert Component Footprints** panel. The **Alert** dialog box will be displayed.
- Click on the **OK** button from the dialog box. The **Insert Footprint** dialog box will be displayed; refer to Figure-24.

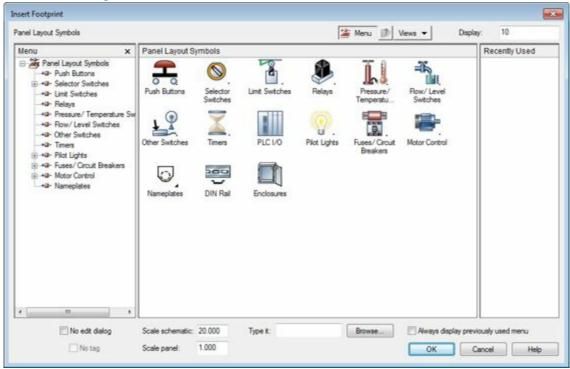


Figure-24. Insert Footprint dialog box

• Click on the **Enclosures** category from the dialog box. The **Footprint** dialog box will be displayed as shown in <u>Figure-25</u>.

Choice A	Choice B
Make catalog assignment for automatic footprint selection Manufacturer Catalog Assembly Catalog lookup	Manual footprint selection or creation xxx Use generic marker only (wd_ptag.dwg) Image: The selection of creation Image: The selection I
Drawing Only Catalog Check	Browse Footprint file dialog selection Pick Select non-AutoCAD Electrical block ABECAD Link to user's own "ABECAD" install
Choice C	
1) Add Entry to Manufacturer	Add a new entry to the manufacturer-specific table and match it with an existing footprint block or drawing file
2) Add Entry to Miscellaneous	Add a new entry to miscellaneous table and match it with an existing footprint block or drawing file

Figure-25. Footprint dialog box

- Click on the Catalog lookup button from the dialog box.
- Make the **Search** field empty and click on the **Search** button from the **Catalog Browser**. The list of enclosures will be displayed; refer to <u>Figure-26</u>.

tegory: EN (Enclos	ures/hardware) 🔻						0
arch: Enter searc	h text such as catalog n	umber, manufact	turer, color and st	yle.		¥	
sults						-	I
CATALOG	MANUFACTURER	DESCRIPTION					
GV2MC01	TELEMECANIQUE	EMPTY ENCLOS	URE FOR GV2ME	- PLASTIC	la de la companya de		
GV2MC02	TELEMECANIQUE	the state of the s		and the second se			
GV2MC03	TELEMECANIQUE	EMPTY ENCLOS	URE FOR GV2ME	- PLASTIC			
GV2MCK04	TELEMECANIQUE	EMPTY ENCLOS	URE FOR GV2ME	- EMERGEN	ICY STOP - PLASTI	С	
GV2MP01	TELEMECANIQUE	EMPTY ENCLOS	URE FOR GV2ME	- PLASTIC			
GV2MP02	TELEMECANIQUE	EMPTY ENCLOS	URE FOR GV2ME	- PLASTIC		1	
cord Count: 608	🔽 <u>F</u> ilte	r by WDBLKNAN	I value: EN		Search Database:	Primary	

Figure-26. List of enclosures

- Select the first enclosure from the list and click on the OK button from the Catalog Browser.
- Click on the **Browse** button from the **Footprint** dialog box. The **Pick** dialog box will be displayed; refer to Figure-27.

Look in: 🔒	EN-ENCLOSURES HARDWARE	- 🕝 🦸 📂 🖽 -			
Name	*	Date modified		Preview	
TE_EN_2	257_307	19-02-2014 22:11			10
TE_EN_2	287_367	19-02-2014 22:11	E		
TE_EN_3	00_400	19-02-2014 22:11			
TE_EN_3	00_500	19-02-2014 22:11			
TE_EN_3	30_430	19-02-2014 22:11			
TE_EN_4	00_400	19-02-2014 22:11			
TE EN	III	10.02.201/ 22.11	•		Find File
le <u>n</u> ame:	TE_EN_400_400	- Ope	n		Locate
les of type:	Drawing (*.dwg)	▼ Can	el		

Figure-27. Pick dialog box

- Select the desired file and click on the **Open** button from the dialog box. The selected enclosure will get attached to the cursor.
- Click in the drawing area to place the enclosure. You are asked to specify the rotation angle for the enclosure.
- Specify the rotation as **0** and press **ENTER**. The **Panel Layout-Component Insert/Edit** dialog box will be displayed; refer to <u>Figure-28</u>.
- Click in the Line 1 of Description area and specify the value as Panel enclosure.
- Click on the Next button from the Item Number area to specify the item number.
- Click on the **OK** button from the dialog box.

Item Number	Component Tag					
tem Number 📃 🕅 fixed	Tag					
Drawing Find List	Schematic List	Ed	emal List File			
Project Find List	Description					
Next>> 2	Line 1					
Catalog Data	Line 2					
Manufacturer TELEMECANIC	Line 3					
Catalog GV2MC01	List: Drawi	ng Project	Defaults			
Assembly	Installation / Location	on codes (for reports	4			
Count Unit	Installation	Location	Mount	Group		
		11000000000000000000000000000000000000				
Catalog Lookup						
Catalog Lookup Drawing Project	Drawing	Drawing	Drawing	Drawing		
	Drawing Project	Drawing Project	Drawing Project	Drawing Project		
Drawing Project						

Figure-28. Panel Layout dialog box

Inserting buttons in the Panel layout

• Click on the Schematic List button from the Insert Component Footprints drop-down in the Insert Component Footprints panel in the Ribbon. The Schematic Components List dialog box will be displayed as shown in Figure-29.

xtract component list for:	Location Codes to extract:
Project	All
Active drawing	🔘 Blank
save list to external file	Named Location
	Location
	Drawing
Browse use external file	List: Project

Figure-29. Schematic Components List dialog box

• Click on the **OK** button from the dialog box. The **Select Drawings to Process** dialog box will be displayed; refer to Figure-30.

Ref	Subfolder	Section Sub-Section	Project Drawing List	
			C:\Users\Gaurav\Documents\Ac\AeData\proj C:\Users\Gaurav\Documents\eData\proj\Proje	
Laine				
Do A	Process	Reset	Un-select by Section/sub-section	by Subfolder
ef	Subfolder	Section Sub-Section	Project Drawing List	

Figure-30. Select Drawings to Process dialog box

- Select the **Project 1** drawing from the list and click on the **Process** button from the dialog box.
- Click on the **OK** button from the dialog box. The **Schematic Components (active project)** dialog box will be displayed; refer to Figure-31.

		Installation,Location	Manufacturer, Catalog, Assembly	Description 1,2,3		
	04CB1		AB, 140-CA02	MOTOR PROTECTOR		
•	04CB2		AB, 140-CA02	MOTOR PROTECTOR2		
-	04CB3		AB. 140-CA02	MOTOR PROTECTOR3		
•	04CB4		AB, 140-CA02	MOTOR PROTECTOR4		
	04TD1		AB, 700-FS26BA1			
	04PB1		AB, 800H-BR6A	SWITCH1		
-	04PBLT1		AB, 800H-PRA16RA2	SWITCH2		
-	04551		AB. 800T-H17A	MULTIPLE SPEED MOTOR		
	04PRS1		AB. 872C-DH2CP12-E2	GATE SENSOR MOTOR1 MOTOR2 MOTOR3 MOTOR4 POWER SOURCE		
•	04MOT1		AB, 1329L-ZF00206NVH			
	04MOT2		AB, 1329L-ZF00206NVH			
-	04MOT3		AB, 1329L-ZF00206NVH			
-	04MOT4		AB, 1329L-ZF00206NVH			
-	04G1		AB, 1609-P3000A			
	Sort List	Display	Catalog Check	c 1 Footprint scale		
	Reload	Show All Hide Existing		Rotate (blank="ask")		
	Mark Existing	Multiple Catalo	g [+]			
			Automatic footprint lookup			
	External Program	m Manual	Insert Use Footprint tables	Convert Existing		

Figure-31. Schematic Components dialog box

- Select the component from the list for which you want to insert the footprint and click on the **Insert** button from the dialog box.
- If the footprint is mapped to component then the footprint will get attached to the cursor and you are asked to place the footprint.
- Place the footprint in the panel enclosure. The **Panel Layout** dialog box will be displayed. Specify the desired parameters and click on the **OK** button from the dialog box.
- If the footprint for the component is not mapped then the **Footprint** dialog box will be displayed and you need to manually select the block for the component by using the **Browse** button as done earlier.
- Similarly, place all the desired components in the panel enclosure. After adding all the components, the panel is displayed as shown in Figure-32.

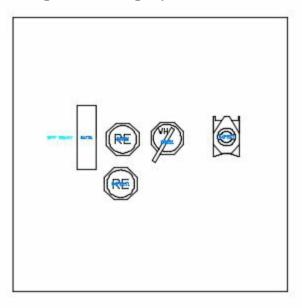


Figure-32. Panel after adding components

• Specify the desired annotation to the buttons to make it easy for interpretation.

Generating Reports

• Click on the **Reports** tab in the **Ribbon**. The tools related to reports will be displayed; refer to <u>Figure-33</u>.

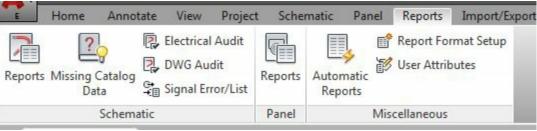


Figure-33. Reports tab

• Click on the **Reports** tool from the **Schematic** panel in the tab. The **Schematic Reports** dialog box will be displayed; refer to Figure-34.

Report Name	Bill of Material	
21 of Meteola Resing Bill of Material Component Tom/To Component Wire List Connector Flug VLC I/O Addresa and Descriptions VLC I/O Addr		Installation Codes to extract:
	Display option Normal Tallied Format Normal Tallied Format (Group by Installation/Location) Display in Tallied Purchase List Format Display in "By TAG" Format	Named Location Location Drawing List Project
	Freshen Project Database Format OK Cancel	Beb

Figure-34. Schematic Reports dialog box

- Select the Bill of Material option from the Report Name selection box.
- Click on the **OK** button from the dialog box. The **Select Drawings to Process** dialog box will be displayed.
- Click on the **Do All** button and click on the **OK** button from the dialog box. The **QSAVE** dialog box will be displayed if the drawing is not saved.
- Click on the **OK** button from the dialog box. The **Report Generator** dialog box will be displayed; refer to <u>Figure-35</u>.

10.0	Material	for all loc	ations (8 records)			
AGS	QTY	SUB	CATALOG	MFG	DESCRIPTION	
84C81 04C82 84C83 84C84	4		140-CA02	AB	AUXILIARY CONTACT BLOCK, INTER AUXILIARY INTERNAL FRONT MOUNTED 2 N.C	NAL FRONT MOUNTED, 2 NC
04MOT1 04MOT2 04MOT3 04MOT4	4		1329L-ZF 88286NVH	AB	BUILD TO ORDER AC VARIABLE SPE AC MOTOR 2HP 2300 650RPM, CONSTANT TORQUE, 1000:	
04PB1	1		800H-BR6A	AB	PUSH BUTTON - MOMENTARY, NEMA 30.5mm EXTENDED RED	
					1 NO 1 NC	
•					1 NO 1 NC	
+ 🔛 Header					1 NO 1 NC Breaks	▼Squeeze 01 0 2 0 3
		⊡ Ad	ld 🗌 First section only			
Header					Breaks	Add blanks between entries
Header Time/Date	15	-	d Rist section only		Breaks	

Figure-35. Report Generator dialog box

• Click on the **Put on Drawing** button. The **Table Generation Setup** dialog box will be displayed; refer to Figure-36.

Table Generation Setup		×.		
Table Insert New Insert New (non-updatable) Update Existing 	Insert New Insert New (non-updatable) Calculate automatically Define widths			
Table Style ACE-INCH (TableStyle)	Browse	Row Definition Last line: 35 Start line 1 End 35		
Column Labels Include column labels Show Labels on first section only	Apply Special Breaks Rows for Each Section			
Title Include time/date Include project information Include title line	Rows Force to Maximum Rows			
Report for Project C:\Users\Gaura	Report for Project C:\Users\Gaurav\Documents\AcadE 2015\AeData\proj			
Layer MISC	OK Cancel	Y-Distance		

Figure-36. Table Generation Setup dialog box

- Click on the **OK** button from the dialog box. The table will get attached to the cursor.
- Click at the desired location in the drawing area to place the table. Refer to Figure-37.

		TARLE TO DESIR AS VARIABLE SPECE ADDR. FIEL ADARTS, SERVICE OF BUILDED VIEW CARDING MENA CHIEF, SPECE A, DES.
		Deletion of the second se

Figure-37. Report

- Click on the **Close** button from the dialog box to exit.
- Similarly, you can insert other reports as required.

AUTOCAD ELECTRICAL WITH INVENTOR

CHAPTER 12

Topics Covered

The major topics covered in this chapter are:

- Electromechanical Link
- Electrical Part creation in Inventor
- Wire Harness in Autodesk Inventor

INTRODUCTION TO AUTODESK INVENTOR

Autodesk Inventor is a CAD product which provides tools to create 3D models. Once we have created electrical drawings for the circuit, the next step is to create panel drawings. We have learnt these things in earlier chapters. Note that the panel drawing is not enough to manufacture the panels. We need a 3D model of the panel with all the components placed at their proper position. For creating 3D models of panel, we need Autodesk Inventor. After creating the model, the next step is to connect model with the electrical drawing for easy synchronization. The 2016 version of AutoCAD Electrical and Autodesk Inventor gives us capability to make connections between Electrical drawing and Inventor models by Electromechanical linking. Creating models in Autodesk Inventor is not in the scope of this book. For that you can use the book on basics of Inventor. Here, we will start with creating an Electromechanical link and then we will discuss other options related to linking.

CREATING ELECTROMECHANICAL LINK

Electromechanical link is an option to connect the electrical drawing with its 3D model. The 3D model generally includes the wire harness same as creating in the electrical drawing. The procedure to create an electromechanical link file in AutoCAD Electrical is given next.

• Open any project that you have created earlier. Now, open the panel drawing for which the 3D model has been created in Autodesk Inventor; refer to <u>Figure-1</u>.

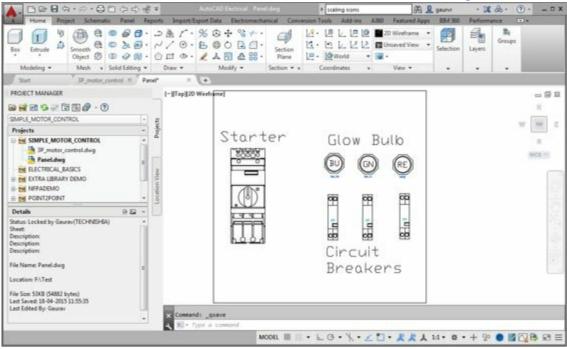


Figure-1. Panel drawing in AutoCAD Electrical

• Click on the **Electromechanical** tab from the **Ribbon**. The tool(s) related to electromechanical linking will be displayed; refer to <u>Figure-2</u>.

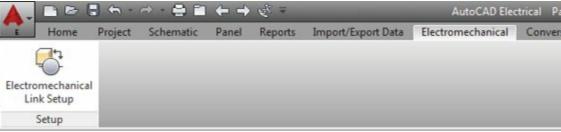


Figure-2. Electromechanical tab in Ribbon

• Click on the **Electromechanical Link Setup** tool from the **Ribbon**. The **Electromechanical Link Setup** dialog box will be displayed; refer to <u>Figure-3</u>.

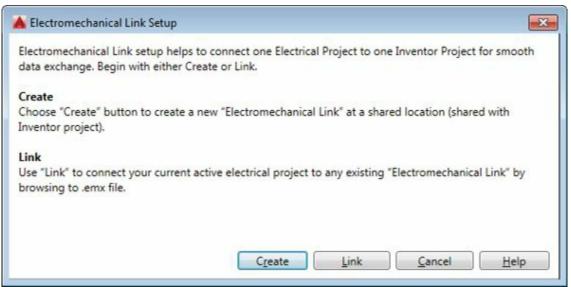


Figure-3. Electromechanical Link Setup dialog box

• There are two ways for linking electrical drawing and inventor model. Either create a new link or use the link earlier created with Autodesk Inventor. Both the ways are discussed next.

Creating New Electromechanical link

• Click on the **Create** button from the **Electromechanical Link Setup** dialog box. The **Create Electromechanical Link** dialog box will be displayed; refer to <u>Figure-4</u>.

🛕 Create Electromechanical Link		×
	ectrical Project to one Inventor Project to facilitate same file from Inventor to complete this	te
Active Electrical Project to be Connected: Sir	nple_motor_control.wdp	
Electromechanical Link File Name:		_
Specify Shared Folder:		
		_
	Create Cancel Help	

Figure-4. Create Electromechanical Link dialog box

- Specify the desired name for the link file in the Electromechanical Link File Name edit box.
- Click on the ellipse button () to browse for shared folder. The **Browse For Folder** dialog box will be displayed; refer to <u>Figure-5</u>.

rowse For Folder Select Shared Folder	
📃 Desktop	
Libraries	
🖻 🥦 Gaurav	E
▷ 🕎 Computer	
🖻 📬 Network	
P I Control Panel	
📴 Recycle Bin	
🌗 Autodesk Russia	
D Bhawna	-
Make New Folder OK	Cancel
Make New Folder OK	Cancel

Figure-5. Browse For Folder dialog box

- Browse to the desired folder from the dialog box and click on the **OK** button from the dialog box to make it shared folder.
- Click on the **Create** button from the dialog box. The link file will be created and the **Electromechanical Link Creation** dialog box will be displayed; refer to <u>Figure-6</u>.

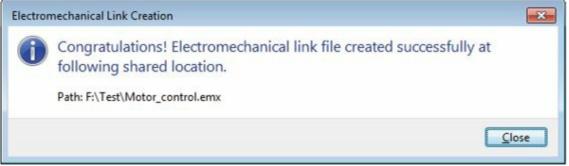


Figure-6. Electromechanical Link Creation dialog box

• Click on the **Close** button from the dialog box. The **Electromechanical Link Setup** dialog box will be displayed; refer to <u>Figure-7</u>.

Electromechanical Link File Prop	perties
Link File Path: F:\Test\Motor_co	ontrol.emx
Electromechanical Link File Nar	me:
Motor_control	
Specify Shared Folder:	
F:\Test	
Electromechanical Link Properti	ies
Connected Electrical Project: Si	imple motor control.wdp
Connected Inventor Project:	
Connected Assemblies/Subasse	emblies:
Annually Manual	
Assembly Name	
	ence
ink Conflict Resolution Prefere	ence flict between the two products, always give preference to
Link Conflict Resolution Prefere	

Figure-7. Electromechanical Link Setup dialog box with properties

- Select the desired option from the Link Conflict Resolution Preference area of the dialog box to set the priority of AutoCAD Electrical or Autodesk Inventor in case of conflict during synchronization. In simple word: If there is any conflict between files of AutoCAD Electrical and Autodesk Inventor then priority will be given to the software for which the radio button is selected in the Link Conflict Resolution Preference area.
- Click on the Close button from the dialog box to exit the dialog box.

Note that you can revise the properties of the link anytime by using the **Electromechanical Link Setup** button from the **Electromechanical** tab in the **Ribbon**.

Using Existing Electromechanical Link

• After selecting the **Electromechanical Link Setup** button from the **Ribbon**, click on the **Link** button from the **Electromechanical Link Setup** dialog box. The **Select Electromechanical Link File** dialog box will be displayed; refer to Figure-8.

👗 Select Electromechanical File		×
Computer + Data (F:) + Test +	✓ 4y Search Test	P
Organize 🔻 New folder	i≡ • □ 0	0
Pir Favorites Google Drive Links My Document: My Music My Pictures My Videos NxBrowser post_template Saved Games Searches Tracing Network	Select a file to preview.	
File <u>n</u> ame:	Electromechanical File (*.emx) Qpen Cancel	

Figure-8. Select Electromechanical Link File dialog box

• Browse to the desired folder and select the already existing file for linking the electrical and inventor project.

Note that the Electromechanical link file acts as a bridge between inventor and AutoCAD Electrical so the same file should be linked to projects in both AutoCAD Electrical as well as Autodesk Inventor.

LINKING INVENTOR MODEL WITH AUTOCAD ELECTRICAL DRAWING

I hope that you have already created the Wire harness model of the drawing in Autodesk Inventor. The steps after creating the model are given next.

• Open the assembly file of Electrical model in Autodesk Inventor; refer to Figure-9.

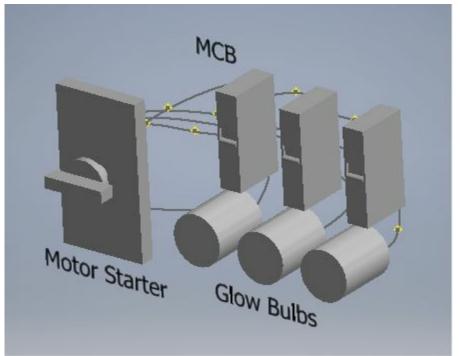


Figure-9. 3D Model of Electrical assembly

• Click on the **Electromechanical** tab from the **Ribbon** in Inventor. The tools related to Electromechanical linking will be displayed; refer to <u>Figure-10</u>.



Figure-10. Electromechanical tab in Inventor

- Click on the **Electromechanical Link Setup** button from the **Setup** panel in the **Electromechanical** tab. The **Electromechanical Link Setup** dialog box will be displayed as discussed earlier.
- Click on the Link to an electromechanical file button Select from the dialog box. The Select Electromechanical File dialog box will be displayed as shown in Figure-11.

Select Electromechanical File	• 49	Search Test
Organize 👻 New folder		H • 🗆 🛛
Favorites Google Drive Links My Document: My Music My Pictures My Videos My Videos NxBrowser post_template_ Saved Games Searches Stracing Tracing Network	•	Select a file to preview.
File name:	•	Electromechanical File (*.emx)
		Open Cancel

Figure-11. Select Electromechanical Link File dialog box

• Select the desired link file and click on the Open button from the dialog box. If there are unsaved changes in the assembly file then you will be asked to save the unsaved changes; refer to Figure-12.

ave Do you want to save changes t	to "Assembly2.iam" and its depe	endents?		
2	C	ОК		Cancel
	Files Requirir	ng Save	Save	Status
	F:\Test\Assem and Harness\Assembly2.Harn and Harness\Assembly2.Harr	ess2.iam	Yes	

Figure-12. Save dialog box

• Click on the Yes to All button and then on the OK button from the dialog box to save the changes. The Electromechanical Link Setup dialog box will be displayed; refer to Figure-13.

Electromechanical File		
F:\Test\Motor_control.em	x	
Linked AutoCAD Electrical P	Project	
Simple_motor_control.wdp	2	
Linked Inventor Assemblies	i	
Assembly Name	Assembly Path	6
Assembly2.iam	F:\Test\Assembly2.iam	
Inventor Project		
Inventor Project C: \Users\Public\Document	ts\Autodesk\Inventor 2016\Default.ipj	
-		
C: \Users\Public\Document	ference nk conflict between the two products, always give	
C: \Users\Public\Document	ference nk conflict between the two products, always give	
C: \Users\Public\Document Link Conflict Resolution Pre While syncing if there is a lin preference to links created	ference nk conflict between the two products, always give in:	Close

Figure-13. Electromechanical Link Setup dialog box with inventor project selected

• Click on the **Close** button from the dialog box. The **Location View** pane will be displayed at the right of the application window; refer to Figure-14.

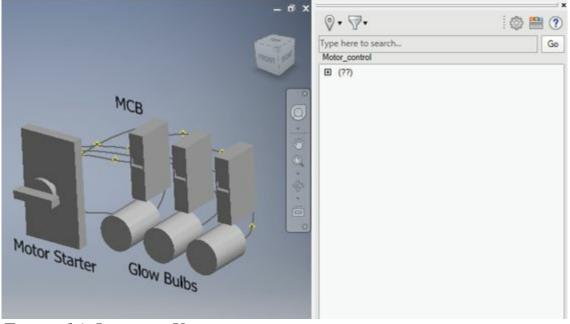


Figure-14. Location View pane

• Expand the location codes in the Location View pane to display the components; refer to Figure-15.

◎ • ¬ •	🗇 💾 ?
Type here to search	Go
Motor_control	
 □ (??) □ (??) □ (MCB:3) □ 04H1 □ 04H1 □ 04LT1 □ 04LT1 □ 04LT2 □ 04LT2 □ 04MOT1 □ 04PJ1 □ 04PJ1 □ 04PJ1 : [J] □ 04PJ1 : [P] 	

Figure-15. Expanded locations in Location View pane

Note that in <u>Figure-15</u>, the components are displayed with different icons. These icons show the nature and origin of component. There are four type of icons that are displayed in Location View pane before the component name, which are:

Inventor Only 🗐

Electrical Only O

Linked 🖋

Linked with Differences 🚜

• To link the electrical component to the Autodesk Inventor component, right-click on the desired electrical only component. A shortcut menu will be displayed as shown in <u>Figure-16</u>.

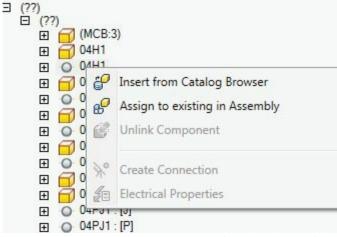


Figure-16. Shortcut menu for linking file

• Click on the Assign to existing in Assembly option if you have the component already created in

the model space. You will be asked to select the component from the model space.

• Click on the component that you want to link with the selected electrical component. On selecting the Inventor component, both the components will be replaced with a common component with symbol of linking; refer to Figure-17.

Type here to search	Go
Test_Link	
 □ (??) □ (??) {EN} □ (MCB:3) □ 04LT1 □ 04LT2 □ 04PJ1 □ 04PJ1<td></td>	

Figure-17. Linked light with differences

• If we expand the link, we can find out the differences between the two objects like in Figure-18. In this figure, the pins are not properly connected and hence cause the differences between the linking.

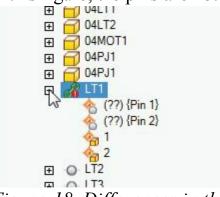


Figure-18. Differences in the link

• We can resolve such problems by connecting the component pins to the same components in both AutoCAD Electrical and Autodesk Inventor.

Note that the functions of Location View pane has already been discussed in Chapter 3 of this book.

ELECTRICAL HARNESS IN AUTODESK INVENTOR FOR AUTOCAD ELECTRICAL

This topic is not related to AutoCAD Electrical directly. In this topic, we will be discussing the functions of Autodesk Inventor for Electrical harnessing. So, those who are not willing to work on Autodesk Inventor for 3D electrical model of panel can skip this topic.

Creating Electrical components in Autodesk Inventor

After creating the Electrical drawing some of the client may demand you the 3D model of panel. For creating 3D model of the panel, we will require the components of the panel. Most of the time, we will not be able to get all the components in the library. In those cases, we will need a procedure to create custom components which have electrical properties. The procedure to create such components in Autodesk Inventor is given next.

• After starting Autodesk Inventor, click on the **Part** option from the **New** cascading menu in the **Application** menu; refer to <u>Figure-19</u>. The modeling environment will be displayed.

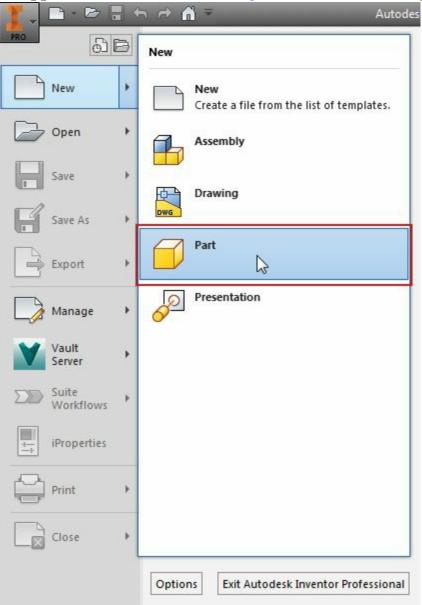


Figure-19. Part option from Application menu

• Create a solid model by using the 3D modeling tools of Autodesk Inventor; refer to Figure-20.

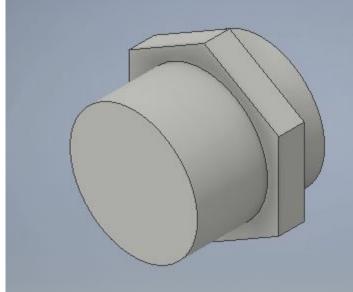


Figure-20. Model of a glow bulb

• Right-click on any panel name in the **Ribbon** and select the **Harness** option from the shortcut menu displayed; refer to Figure-21. The **Harness** panel will be displayed, see Figure-22.

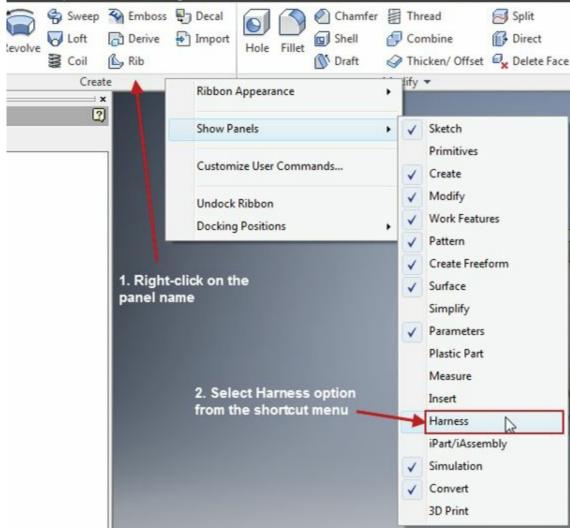


Figure-21. Harness option



Figure-22. Harness panel

- Click on the **Place Pin** tool is from the **Harness** panel in the **Ribbon**. You are asked to specify position of the pins.
- Click at the desired location on the face of model. The **Place Pin** dialog box will be displayed; refer to <u>Figure-23</u>.

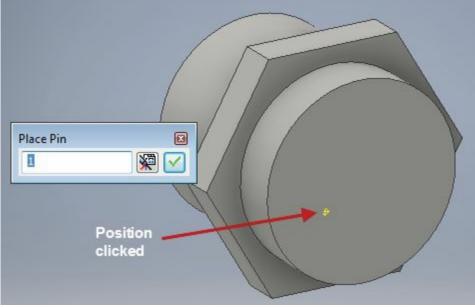


Figure-23. Placing pin

- Specify the pin number in the dialog box and click on the **OK** button. You will be asked to specify position of the next pin. Continue the same procedure till you get the desired number of pins.
- After creating desired number of pins, right-click in the empty area of the modeling space and select the **Done** option from the shortcut menu; refer to <u>Figure-24</u>. You can also press the **ESC** button from keyboard in place of selecting **Done** option from the shortcut menu.

	5				
/ /	$^{\prime}$	-			
[]	1/				1
					1
	1 /				.00
IT					1
					1
Done [ES				.9	/
Previous	View	F5		1	
Home Vie	w	F6	-		
How To					

Figure-24. Completing pin creation

• Save the part and use it in assembly for harness.

Placing Multiple pins on part

Instead of placing pins individually, you can place a group of pins on the component to make it useful for connectors. The procedure of placing multiple pins is given next.

- Click on the **Place Pin Group** tool from the **Harness** panel in the **Ribbon**. The **Place Pin Group** dialog box will be displayed; refer to <u>Figure-25</u>.
- Specify the desired number of pins in the Pins Per Row edit box in the dialog box. Similarly, specify the number of rows, distance between two pins (pitch), starting number of pins and prefix.

lace Pin Group	×
Start Location	
Grouping	
Pins Per Row:	2
Pin Pitch:	0.100 in
Rows:	1
Row Pitch:	0.100 in
Naming	
Prefix Letter	1 Start Number
Sequential Row Sequential Column	Preview 💉 1 2 💉
Circumventing	OK Cancel Apply

Figure-25. Place Pin Group dialog box

- Select the desired option from the **Sequential Row**, **Sequential Column**, and **Circumventing** radio buttons.
- Click at the desired location on the model to create the pin group. Note that you need to have a reference point at the location where you want to place pin group. In <u>Figure-26</u>, we have already created a sketch point on the surface of model, which we are going to select.

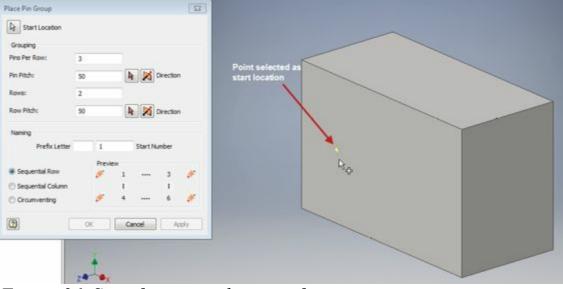


Figure-26. Specifying start location for pin group

• Click on the Select reference button next to Pin Pitch edit box in the dialog box to select reference for column direction; refer to Figure-27. On doing so, you will be asked to select a reference entity.

Pin Pitch:	50	Direction
Rows:	2	

Figure-27. Button selecting Pin Pitch reference

• Select a reference like in <u>Figure-28</u>. You can flip direction of pin pitch by using the **Flip** button next to Select reference button.

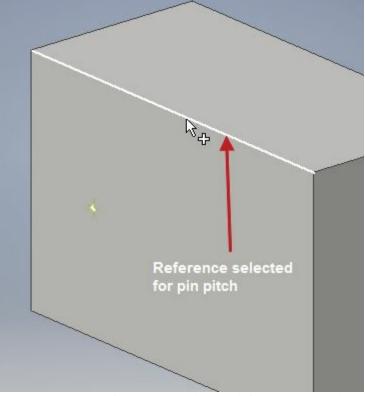


Figure-28. Reference selected for pin pitch

• Similarly, select the row pitch; refer to Figure-29.

Start Location Grouping Pins Per Row: 3 Pin Pitch: 50 Rows: 2 Row Pitch: 50 Row Pitch: 50 Preview Preview Sequential Row I I I I						- 20-00
Pin Pitch: 50 Direction Rows: 2 Row Pitch: 50 Direction Naming Prefix Letter 1 Start Number Preview Sequential Row 1 3 5 Sequential Column I I	Place Pin Group					
Pins Per Row: 3 Pin Pitch: 50 Rows: 2 Row Pitch: 50 Naming Prefix Letter 1 Start Number Preview Sequential Row Sequential Column I 1	Start Location					
Pin Pitch: 50 Direction Rows: 2 Row Pitch: 50 Direction Naming Prefix Letter 1 Start Number Preview Sequential Row 1 3 Sequential Column I I	Grouping					
Rows: 2 Row Pitch: 50 Direction Naming Prefix Letter 1 Start Number Preview Sequential Row Sequential Column I I	Pins Per Row:	3				
Row Pitch: 50 birection Naming Prefix Letter 1 Start Number Preview Sequential Row 1 3 5 Sequential Column I I	Pin Pitch:	50		8	Directio	n
Naming Prefix Letter 1 Start Number © Sequential Row 1 3 * © Sequential Column I I	Rows:	2				
Naming Prefix Letter 1 Start Number Preview Sequential Row Sequential Column I I	Row Pitch:	50		R	Directio	n
Prefix Letter 1 Start Number	Namina					
Sequential Row Preview 1 3 Sequential Column I		er T	1	Start N	umber	
Sequential Row Sequential Column I					0.000	
	Sequential Row				3	15
O Circumventing of 4 ···· 6 of			I		I.	
	Circumventing		4		6	19
	2	OK		Cancel	A	oply

Figure-29. Directions of row pitch and pin pitch references

• Click on the **OK** button to create the pin group; refer to <u>Figure-30</u>.

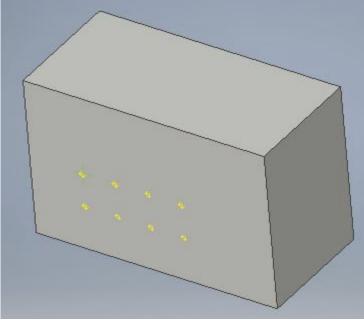


Figure-30. Pin group created

Harness Properties of Part

To match schematic symbol of AutoCAD Electrical with Autodesk Inventor model, we need to specify some properties of the harness part. The procedure to apply properties to harness part are given next.

• Click on the Harness Properties tool 🕅 from the Harness panel in the Ribbon. The Part Properties dialog box will be displayed as shown in <u>Figure-31</u>.

Part Properties		×
General Custom		
Part Name:		
Part Number:		
RefDes:		
Gender		
 Male Female 		
 None 		
2	OK Cancel	Apply

Figure-31. Part Properties dialog box

- Specify the reference description in the **RefDes** edit box in the dialog box. Note that this reference data is matched with the description in AutoCAD Electrical catalog for cross-referencing.
- You can also specify whether the part is Male or Female. If the part is not to act as connector then select the **None** radio button from the **Gender** area of the dialog box.
- Click on the **Custom** tab in the dialog box to define custom properties. Using the options in the **Custom** tab, you can create various properties of part and set their values; refer to Figure-32.

General Custo	m		
Name:		-	Add
Type:	Text	•	Delete
Value:			
Name			
Name	Value	Туре	
Name	Value	Туре	

Figure-32. Custom tab of Part Properties dialog box

• Specify the desired parameters; refer to <u>Figure-33</u> and click on the Add button to add it in the table; refer to <u>Figure-34</u>.

General	Custom				
Name:		Number of C	Connectors	-	Add
Type:		Unitless		•	<u>D</u> elete
Value:		8			
Name		Va	alue	Type	

Figure-33. Specifying parameters for part

Type:	Unitles			<u>D</u> elete
/alue:		Value	Ture	
			Туре	
Number of Co	nnectors	8 ul	Unitless	

Figure-34. After adding parameter in table

• Similarly, add the desired parameters and click on the OK button from the dialog box.

Now, we have the components in the form of 3D models. The next step is to create harness assembly using these components. Since this book is dedicated to AutoCAD Electrical only, so we will discuss only little about the harness assembly.

Creating Wiring in Harness Assembly

The benefit of wiring in harness assembly is that you can create the bill of material for wiring. In this way, you can get the idea of total length of various wires required in you project. The procedure to create wiring is given next.

• Open the assembly file of the model that you want to use for harness; refer to <u>Figure-35</u>. Note that pins are must on components for creating wiring. Without pins, you cannot create wiring.

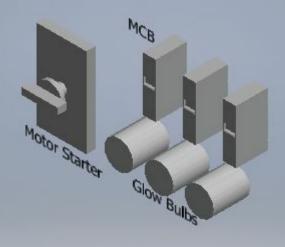


Figure-35. Model used for harness

• Click on the **Cable and Harness** tool from the **Begin** panel in the **Environments** tab of the **Ribbon**; refer to <u>Figure-36</u>. The **Create Harness** dialog box will be displayed; refer to <u>Figure-37</u>.

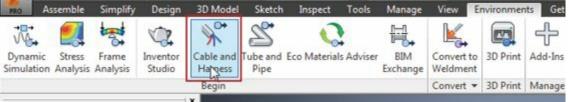


Figure-36. Cable and Harness button

Create Harness		×
Harness Assembly File N	ame	
Assembly 2. Harness 4. ia	am	
Harness Assembly File L	ocation	
F:\Test\Assembly2\AIF	Cable and Harness	
2	ОК	Cancel

Figure-37. Create Harness dialog box

• Specify the desired name and location for harness model. Click on the **OK** button from the dialog box. The **Cable and Harness** contextual tab will be added in the **Ribbon** with options related to cable and harness; refer to Figure-38.

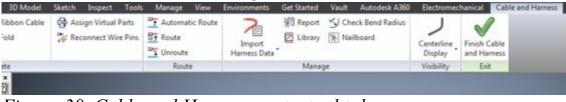


Figure-38. Cable and Harness contextual tab

• Click on the **Create Wire** tool from the **Create** panel in the **Cable and Harness** contextual tab of the **Ribbon**. The **Create Wire** dialog box will be displayed; refer to <u>Figure-39</u>. Also, you are asked to select a pin from the component.

Create Wire	×
Pin 1	▶ 💓 Pin 2
Wire ID:	Wire1
Category:	(none) 🔹
Name:	Default Library Wire 🔹
	Properties
ОК	Cancel Apply

Figure-39. Create Wire dialog box

• Select the first pin to be connected by wire; refer to Figure-40.

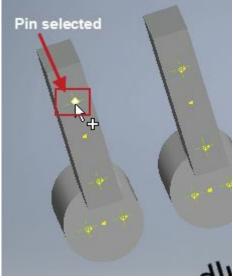


Figure-40. First pin selected

- Specify the wire id in the **Wire ID** edit box of the dialog box.
- Select desired category from the **Category** drop-down and then select the wire type from the **Name** drop-down.
- Now, select the other pin to specify end point of the wire.
- Click on the Apply button from the dialog box and keep on creating other wires.
- After creating all the desired wires, click on the Cancel button from the dialog box to exit.

Modifying Shape of wires

You will get the wires created as straight line but straight wires are not desired at every place; refer to <u>Figure-41</u>. To change the shape of wires, follow the steps given next.

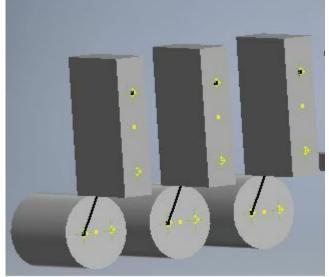


Figure-41. Straight wires created

- Select the wire to be modified. (Note that we will create points on the wire by which we can change shape of wire.)
- Right-click on the wire. A shortcut menu will be displayed; refer to Figure-42.

icce micring	m) noute	Import
	📑 🔽 Repeat Crea	ate Wire Data
	Display as R Delete Bend Radius View Path Edit Wire Splice Marness Pro	s
	<u>A</u> dd Points Delete All <u>P</u> o	
	✓ <u>V</u> isibility	
	Paste	Ctrl+V
	Find In Brow Previous Vie Home View Help Topics.	ew F5 F6
Cre	Create	Segment
Cable & Harn	h	Automatic Route
	8 Finish Cable	e and Harness
		n a mal

Figure-42. Shortcut menu for wires

- Click on the **Add Points** option from the shortcut menu. You are asked to specify position of the point on wire.
- Click at the desired location and press ESC; refer to Figure-43.
- Right-click at the new point created and select the 3D Move/Rotate option from the shortcut menu displayed. A 3D dragger will be displayed on the point; refer to Figure-44.

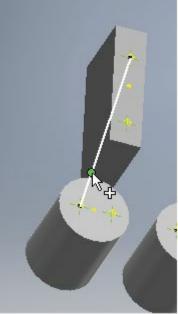


Figure-43. Specifying position of point

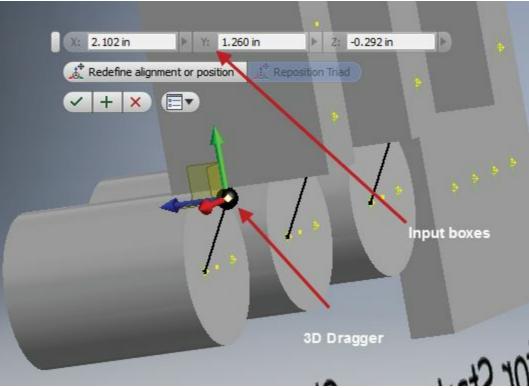


Figure-44. 3D Dragger and Input boxes

• Move the dragger in desired direction and click on the **OK** button from the Input boxes to apply the shape modification.

You can learn more about Autodesk Inventor from the book Autodesk Inventor 2016 Black Book from the same author.