

Table of Contents

Dedication	iii
Preface	xvii

Chapter 1: Introduction to AutoCAD Electrical 2021

Introduction	1-2
Installing and Configuring AutoCAD Electrical 2021	1-2
Getting Started with AutoCAD Electrical 2021	1-6
AutoCAD Electrical Interface Components	1-6
Start Tab	1-7
Drawing Area	1-8
Command Window	1-8
Autocorrect the Command Name	1-9
AutoComplete the Command Name	1-9
Internet Search	1-9
Input Search Options	1-9
Application Status Bar	1-10
Navigation Bar	1-12
Invoking Commands in AutoCAD Electrical	1-14
Keyboard	1-14
Ribbon	1-14
Application Menu	1-15
Menu Bar	1-16
Toolbar	1-16
Marking Menu	1-18
Shortcut Menu	1-19
Tool Palettes	1-20
File Tabs	1-21
Project Manager	1-23
Components of AutoCAD Electrical Dialog Boxes	1-23
Saving the Work	1-24
Save Drawing As Dialog Box	1-25
Auto Save	1-27
Creating Backup Files	1-27
Using the Drawing Recovery Manager to Recover Files	1-27
Closing a Drawing	1-28
Quitting AutoCAD Electrical	1-29
Dynamic Input Mode	1-29
Enable Pointer Input	1-29
Creating and Managing Workspaces	1-31
Creating a New Workspace	1-31
Modifying Workspace Settings	1-31
WD_M Block	1-32

AutoCAD Electrical Help	1-33
Help Menu	1-33
InfoCenter Bar	1-35
Save to Web & Mobile	1-37
Additional Help Resources	1-38
Self-Evaluation Test	1-39
Review Questions	1-40

Chapter 2: Working with Projects and Drawings

Introduction	2-2
Project Manager	2-2
Projects Tab	2-3
Opening a Project	2-4
Creating a New Project	2-6
Working with Drawings	2-9
Working with Project Drawings	2-13
Configuring the Drawing List Display	2-19
Copying a Project	2-21
Deleting a Project	2-23
Other Options in the Project Manager	2-25
Details/Preview Rollout	2-36
Location View Tab	2-37
Filter by Installation and Location	2-37
Refresh Tree for Local Changes	2-37
Search Field	2-37
Component Tree	2-38
Display Details and Connections	2-40
Tutorial 1	2-42
Tutorial 2	2-47
Tutorial 3	2-49
Tutorial 4	2-50
Tutorial 5	2-54
Self-Evaluation Test	2-56
Review Questions	2-57
Exercise 1	2-57
Exercise 2	2-57
Exercise 3	2-58

Chapter 3: Working with Wires

Introduction	3-2
Wires	3-2
Inserting Wires into a Drawing	3-2
Inserting Wires at Angles	3-4
Inserting Multiple Bus Wiring	3-6
Modifying Wires	3-9
Trimming a Wire	3-9
Stretching Wires	3-10
Working with Wire Types	3-11

Creating Wire Types	Enhanced	3-12
Changing and Converting Wire Types		3-20
Setting Wire Types		3-22
Working with Wire Numbers		3-23
Types of Wire Numbers		3-23
Inserting Wire Numbers		3-24
Copying Wire Numbers		3-29
Positioning Wire Numbers In-line with a Wire		3-29
Deleting Wire Numbers		3-30
Editing Wire Numbers		3-31
Fixing Wire Numbers		3-33
Hiding Wire Numbers		3-33
Unhiding Wire Numbers		3-34
Swapping Wire Numbers		3-34
Finding/Replacing Wire Numbers		3-34
Moving a Wire Number		3-35
Scooting a Wire Number		3-36
Flipping a Wire Number		3-36
Toggling the Wire Number Position		3-36
Repositioning the Wire Number Text with the Attached Leader		3-37
Inserting In-line Wire Markers		3-38
Inserting Wire Color/Gauge Labels in a Drawing		3-40
Inserting the Special Wire Numbering in a Drawing		3-40
Adding Source and Destination Signal Arrows		3-42
Adding Source Signal Arrows		3-42
Adding Destination Signal Arrows		3-45
Inserting Cable Markers		3-46
Showing Source and Destination Markers on Cable Wires		3-48
Troubleshooting Wires		3-52
Bending Wires at Right Angle		3-52
Checking Line Entities		3-53
Checking, Repairing, and Tracing Wires and Gap Pointers		3-55
Checking and Repairing Gap Pointers		3-55
Checking/Tracing a Wire		3-55
Showing and Editing Wire Sequences		3-56
Showing Wire Sequence		3-56
Editing Wire Sequence		3-57
Manipulating Wire Gaps		3-58
Inserting Wire Gaps		3-58
Removing Wire Gaps		3-59
Flipping Wire Gaps/Loops		3-59
Tutorial 1		3-60
Tutorial 2		3-64
Tutorial 3		3-67
Tutorial 4		3-69
Self-Evaluation Test		3-73
Review Questions		3-73
Exercise 1		3-74

Chapter 4: Creating Ladders

Introduction	4-2
Ladders	4-2
Inserting a New Ladder	4-3
Modifying an Existing Ladder	4-7
Renumbering an Existing Ladder	4-7
Changing the Size of a Ladder	4-9
Repositioning a Ladder	4-10
Changing the Rung Spacing	4-11
Adding Rungs	4-11
Converting Line Reference Numbers	4-12
Renumbering the Ladder Line Reference	4-12
Changing the Reference Numbering Style of a Ladder	4-13
Inserting X Grid Labels	4-14
Inserting X-Y Grid Labels	4-16
Tutorial 1	4-18
Tutorial 2	4-22
Tutorial 3	4-24
Tutorial 4	4-26
Self-Evaluation Test	4-32
Review Questions	4-32
Exercise 1	4-33
Exercise 2	4-33

Chapter 5: Schematic Components

Introduction	5-2
Inserting Schematic Components using Icon Menu	5-2
Menu Area	5-2
NFPA: Schematic Symbols Area	5-3
Inserting Components using Catalog Browser	5-7
Category	5-8
Search	5-8
Database Grid	5-9
Global Search	5-11
Favorites List	5-11
Edit Catalog Database	5-11
Search Database	5-12
Configure Your Database	5-12
Annotating and Editing the Symbols	5-13
Component Tag Area	5-14
Catalog Data Area	5-15
Ratings Area	5-18
Description Area	5-18
Cross-Reference Area	5-19
Show/Edit Miscellaneous	5-22
Pins Area	5-22
Switch Positions Area	5-23

Enhanced

Assigning Catalog Information and Editing the Catalog Database	5-23
Creating a Project Specific Catalog Database	5-25
Creating Parent-Child Relationships	5-27
Component Tag Area	5-28
Inserting Components from the Equipment List	5-31
Default Settings	5-32
Read Settings	5-33
View/Edit Settings Area	5-33
Inserting Components from the User Defined List	5-36
Adding a New Record in the Schematic Component or Circuit Dialog Box	5-38
Editing an Existing Record in the Schematic Component or Circuit Dialog Box	5-41
Inserting Components from Panel Lists	5-41
Swapping and Updating Blocks	5-48
Option A: Swap Block (swap to different block name) Area	5-49
Option B: Update Block (revised or different version of same block name) Area	5-50
Attribute Mapping Area	5-53
Tutorial 1	5-54
Tutorial 2	5-60
Tutorial 3	5-61
Tutorial 4	5-63
Self-Evaluation Test	5-67
Review Questions	5-68
Exercise 1	5-68
Exercise 2	5-69

Chapter 6: Schematic Editing

Introduction	6-2
Changing the Component Location with Scoot Tool	6-2
Changing Component Locations using the Move Component Tool	6-4
Copying a Component	6-5
Aligning Components	6-6
Deleting Components	6-7
Updating Components from Catalog Database	6-8
Update Components on Area	6-9
View Previous Report Area	6-10
Settings Area	6-10
Updating a Schematic Component from a One-Line Component	6-11
Surfing a Reference	6-12
Toggling between the Normally Open and Normally Closed Contacts	6-15
Copying the Catalog Assignment	6-16
Manufacturer	6-17
Catalog	6-17
Assembly	6-17
Catalog Lookup	6-17
Find: Drawing Only	6-17
Multiple Catalog	6-17

Catalog Check		6-17
Editing User Table Data Records	NEW	6-18
Copying Installation/Location Code Values		6-19
Auditing Drawings		6-21
Electrical Auditing		6-21
Auditing a Drawing		6-25
Retagging Drawings		6-29
Component Retag		6-29
Component Cross-Reference Update		6-29
Wire Number and Signal Tag/Retag		6-30
Ladder References		6-30
Sheet (%S value)		6-31
Drawing (%D value)		6-31
Other Configuration Settings		6-31
Title Block Update		6-32
Using Tools for Editing Attributes		6-33
Moving Attributes		6-33
Editing Attributes		6-33
Hiding Attributes		6-34
Unhiding Attributes		6-35
Adding Attributes		6-36
Squeezing an Attribute/Text		6-37
Stretching an Attribute/Text		6-37
Changing the Attribute Size		6-37
Rotating an Attribute		6-39
Changing the Justification of an Attribute		6-39
Changing an Attribute Layer		6-40
Tutorial 1		6-41
Tutorial 2		6-52
Tutorial 3		6-55
Tutorial 4		6-60
Self-Evaluation Test		6-61
Review Questions		6-62
Exercise 1		6-63
Exercise 2		6-63
Exercise 3		6-63

Chapter 7: Connectors, Point-to-Point Wiring Diagrams, and Circuits

Introduction	7-2
Inserting Connectors	7-2
Editing Connector	7-9
Inserting a Connector from the List	7-12
Modifying Connectors	7-12
Adding Pins to a Connector	7-12
Deleting a Connector Pin	7-13
Moving a Connector Pin	7-14
Swapping Connector Pins	7-14

Reversing a Connector	7-15
Rotating a Connector	7-16
Stretching a Connector	7-17
Splitting a Connector	7-18
Using Point-to-Point Wiring Diagrams	7-20
Inserting Splices	7-21
Inserting Wires into Connectors	7-22
Inserting Multiple Wire Bus into Connectors	7-23
Bending Wires at Right Angles	7-24
Working with Circuits	7-24
Saving Circuits to an Icon Menu	7-25
Inserting Saved Circuits	7-28
Moving Circuits	7-30
Copying Circuits	7-31
Saving Circuits by using WBlock	7-33
Inserting the WBlocked Circuit	7-34
Building a Circuit	7-35
Inserting a Circuit	7-35
Configuring a Circuit	7-39
Multiple Phase Circuits	7-42
Adding Multiple Phase Ladders and Wires	7-42
Adding Three-phase Symbols	7-43
Tutorial 1	7-44
Tutorial 2	7-49
Tutorial 3	7-53
Tutorial 4	7-57
Self-Evaluation Test	7-60
Review Questions	7-61
Exercise 1	7-62
Exercise 2	7-62

Chapter 8: Panel Layouts

Introduction	8-2
The WD_PNLM Block File	8-2
Creating Panel Layouts from Schematic List	8-3
Annotating and Editing Footprints	8-10
Item Number Area	8-10
Catalog Data Area	8-12
Rating Area	8-14
Component Tag Area	8-14
Description Area	8-15
Installation / Location codes (for reports) Area	8-16
Switch Positions	8-16
Show/Edit Miscellaneous	8-16
Inserting Footprints from the Icon Menu	8-17
Choice A Area	8-19
Choice B Area	8-19
Choice C Area	8-20

Inserting Footprints Manually	8-22
Inserting Footprints from a User Defined List	8-23
Inserting Footprints from an Equipment List	8-24
Inserting Footprints from Vendor Menus	8-26
Copying a Footprint	8-28
Setting the Panel Drawing Configuration	8-28
Item numbering Area	8-29
Balloon Area	8-29
Footprint layers Area	8-31
Default Spacing for Multiple Inserts Area	8-33
Footprint Insert Area	8-33
Panel Wire Connection report XYZ offset reference Area	8-33
Making the Xdata Visible	8-33
Renaming Panel Layers	8-36
Adding a Balloon to a Component	8-36
Adding Multiple Balloons	8-39
Resequencing Item Numbers	8-41
Inserting Nameplates	8-42
Inserting DIN Rail	8-45
Editing the Panel Footprint Lookup Database File	8-48
Edit Existing Table	8-48
Create New Table	8-49
Create Empty File	8-49
Tutorial 1	8-49
Tutorial 2	8-53
Tutorial 3	8-55
Tutorial 4	8-57
Tutorial 5	8-60
Self-Evaluation Test	8-62
Review Questions	8-63
Exercise 1	8-64
Exercise 2	8-64
Exercise 3	8-64

Chapter 9: Schematic and Panel Reports

Introduction	9-2
Generating Schematic Reports	9-2
Bill of Material Reports	9-2
Missing Bill of Material Reports	9-6
Component Reports	9-6
From/To Reports	9-7
Component Wire List Reports	9-12
Connector Plug Reports	9-13
PLC I/O Address and Descriptions Reports	9-13
PLC I/O Component Connection Reports	9-14
PLC Modules Used So Far Reports	9-14
Terminal Numbers Reports	9-14
Terminal Plan Reports	9-14

Connector Summary Reports	9-14
Connector Detail Reports	9-14
Cable Summary Reports	9-14
Cable From/To Reports	9-14
Wire Label Reports	9-14
Wire Signal and Stand-alone Reference Reports	9-15
Missing Catalog Data	9-17
Generating Component Cross Reference Report	9-18
Understanding the Report Generator Dialog Box	9-19
Changing Report Formats	9-26
Available fields Area	9-26
Fields to report Area	9-26
Change field name/justification Area	9-27
Lines for Description Area	9-27
Adding Fields Using the User Attributes Tool	9-28
Placing Reports in the Drawing	9-29
Saving the Report to Files	9-33
Editing a Report	9-35
Generating Panel Reports	9-38
Bill of Material Report	9-39
Generating the Cumulative Report	9-40
Setting the Format File for Reports	9-44
Tutorial 1	9-46
Tutorial 2	9-52
Tutorial 3	9-55
Self-Evaluation Test	9-62
Review Questions	9-63
Exercise 1	9-64
Exercise 2	9-64

Chapter 10: PLC Modules

Introduction	10-2
Inserting Parametric PLC Modules	10-2
Manufacturer Catalog Tree	10-2
Graphics Style Area	10-3
Scale Area	10-4
Inserting Spacers and Breaks	10-6
Inserting Nonparametric PLC Modules	10-9
Editing a PLC Module	10-10
Addressing Area	10-10
I/O Point Description Area	10-12
Installation/Location codes Area	10-13
Pins Area	10-14
Stretching PLC Modules	10-14
Splitting PLC Modules	10-14
Inserting Individual PLC I/O Points	10-15
Creating and Modifying Parametric PLC Modules	10-17
PLC Module Selection List	10-17

Terminal Grid Area	10-19
Terminal Attributes Area	10-21
New Module	10-21
Module Specifications	10-24
Style Box Dimensions	10-24
Settings	10-24
Creating PLC I/O Wiring Diagrams	10-27
Mapping the Spreadsheet Information	10-35
Tagging Based on PLC I/O Address	10-36
Tutorial 1	10-38
Tutorial 2	10-42
Tutorial 3	10-46
Self-Evaluation Test	10-47
Review Questions	10-48
Exercise 1	10-49
Exercise 2	10-49

Chapter 11: Terminals

Introduction	11-2
Inserting Terminal Symbols	11-2
Annotating and Editing Terminal Symbols	11-3
Inserting Terminal from the Schematic List	Enhanced 11-8
Inserting Terminals Manually	11-10
Inserting Terminals from the Panel List	11-11
Adding and Modifying Associations	11-13
Active Association Area	11-13
Select Association Area	11-15
Terminal Block Properties	11-16
Assign Jumper	11-17
Delete Jumper	11-17
Selecting, Creating, Editing, and Inserting Terminal Strips	11-17
Editing the Terminal Strip	11-19
Defining the Settings of a Terminal Strip Table	11-35
Generating the Terminal Strip Table	11-38
Editing the Terminal Properties Database Table	11-39
Resequencing Terminal Numbers	11-42
Copying Terminal Block Properties	11-44
Editing Jumpers	11-44
Tutorial 1	11-47
Tutorial 2	11-49
Self-Evaluation Test	11-54
Review Questions	11-55
Exercise 1	11-55
Exercise 2	11-56

Chapter 12: Settings, Configurations, Templates, and Plotting

Introduction	12-2
Setting Project Properties	12-2
Project Settings Tab	12-3
Components Tab	12-5
Wire Numbers Tab	12-10
Cross-References Tab	12-12
Styles Tab	12-13
Drawing Format Tab	12-15
Setting Drawing Properties	12-19
Drawing Settings Tab	12-20
Understanding Reference Files	12-22
Project Files (.WDP File)	12-22
Project Description Line Files (.WDL File)	12-23
Component Reference Files	12-24
Mapping the Title Block	12-26
Method 1 Area	12-27
Method 2 Area	12-28
Setting up the Title Block	12-29
Updating Title Blocks	12-32
Creating Templates	12-36
Plotting the Project	12-38
Project Task List	12-41
Tutorial 1	12-42
Tutorial 2	12-44
Tutorial 3	12-46
Tutorial 4	12-48
Tutorial 5	12-50
Self-Evaluation Test	12-59
Review Questions	12-60
Exercise 1	12-61
Exercise 2	12-61
Exercise 3	12-61

Chapter 13: Creating Symbols

Introduction	13-2
Creating Symbols	13-2
Objects Area	13-2
Insertion point Area	13-3
Attribute template Area	13-3
Preview Area	13-4
Common Tools	13-5
Required Rollout	13-8
Optional Rollout	13-10
POS Rollout	13-10
Rating Rollout	13-10

Wire Connection Rollout	13-11
Pins Rollout	13-12
Link Lines Rollout	13-12
Naming Convention of Symbols	13-15
Schematic Symbols	13-15
Panel Layout Footprint Symbols	13-16
Connector Symbols	13-16
Plug /Jack Connector Pin Symbols	13-16
Splice Symbols	13-16
Parametric Twisted Pair Symbols	13-17
Stand-alone PLC I/O Point Symbols	13-17
PLC I/O Parametric Build Symbols	13-17
Stand-alone Terminal Symbols	13-17
Wire Number Symbols	13-18
Wire Dot Symbols	13-18
Source/Destination Wire Signal Arrow Symbols	13-18
Cable Marker Symbols	13-18
Inline Wire Marker Symbols	13-18
One Line Symbol	13-19
Customizing the Icon Menu	13-19
Miscellaneous Tools	13-24
Marking and Verifying Drawings	13-24
Exporting Data to the Spreadsheet	13-27
Updating Data from the Spreadsheet	13-31
Using Project-Wide Utilities	13-32
Tutorial 1	13-34
Tutorial 2	13-40
Tutorial 3	13-43
Tutorial 4	13-47
Self-Evaluation Test	13-51
Review Questions	13-52
Exercise 1	13-52
Exercise 2	13-53
Project 1	P1-1
Index	I-1

PROJECT AVAILABLE FOR FREE DOWNLOAD

In this textbook, one project has been given for free download. You can download this project from our website www.cadcim.com. To download this project, follow the given path: *Textbooks > CAD/CAM > AutoCAD Electrical > AutoCAD Electrical 2021 for Electrical Control Designers > Chapters for Free Download* and then select the project name from the **Chapters for Free Download** drop-down. Click the **Download** button to download the project in the PDF format.