

SOLIDWORKS®

SOLIDWORKS Routing: Electrical

Dassault Systèmes SolidWorks Corporation
175 Wyman Street
Waltham, MA 02451 U.S.A.

© 1995-2019, Dassault Systemes SolidWorks Corporation, a Dassault Systèmes SE company, 175 Wyman Street, Waltham, Mass. 02451 USA. All Rights Reserved.

The information and the software discussed in this document are subject to change without notice and are not commitments by Dassault Systemes SolidWorks Corporation (DS SolidWorks).

No material may be reproduced or transmitted in any form or by any means, electronically or manually, for any purpose without the express written permission of DS SolidWorks.

The software discussed in this document is furnished under a license and may be used or copied only in accordance with the terms of the license. All warranties given by DS SolidWorks as to the software and documentation are set forth in the license agreement, and nothing stated in, or implied by, this document or its contents shall be considered or deemed a modification or amendment of any terms, including warranties, in the license agreement.

Patent Notices

SOLIDWORKS® 3D mechanical CAD and/or Simulation software is protected by U.S. Patents 6,611,725; 6,844,877; 6,898,560; 6,906,712; 7,079,990; 7,477,262; 7,558,705; 7,571,079; 7,590,497; 7,643,027; 7,672,822; 7,688,318; 7,694,238; 7,853,940; 8,305,376; 8,581,902; 8,817,028; 8,910,078; 9,129,083; 9,153,072; 9,262,863; 9,465,894; 9,646,412; 9,870,436; 10,055,083; 10,073,600; 10,235,493 and foreign patents, (e.g., EP 1,116,190 B1 and JP 3,517,643).

eDrawings® software is protected by U.S. Patent 7,184,044; U.S. Patent 7,502,027; and Canadian Patent 2,318,706.

U.S. and foreign patents pending.

Trademarks and Product Names for SOLIDWORKS Products and Services

SOLIDWORKS, 3D ContentCentral, 3D PartStream.NET, eDrawings, and the eDrawings logo are registered trademarks and FeatureManager is a jointly owned registered trademark of DS SolidWorks.

CircuitWorks, FloXpress, PhotoView 360, and TolAnalyst are trademarks of DS SolidWorks.

FeatureWorks is a registered trademark of HCL Technologies Ltd.

SOLIDWORKS 2020, SOLIDWORKS Standard, SOLIDWORKS Professional, SOLIDWORKS Premium, SOLIDWORKS PDM Professional, SOLIDWORKS PDM Standard, SOLIDWORKS Simulation Standard, SOLIDWORKS Simulation Professional, SOLIDWORKS Simulation Premium, SOLIDWORKS Flow Simulation, SOLIDWORKS CAM, SOLIDWORKS Manage, eDrawings Viewer, eDrawings Professional, SOLIDWORKS Sustainability, SOLIDWORKS Plastics, SOLIDWORKS Electrical Schematic Standard, SOLIDWORKS Electrical Schematic Professional, SOLIDWORKS Electrical 3D, SOLIDWORKS Electrical Professional, CircuitWorks, SOLIDWORKS Composer, SOLIDWORKS Inspection, SOLIDWORKS MBD, SOLIDWORKS PCB powered by Altium, SOLIDWORKS PCB Connector powered by Altium, and SOLIDWORKS Visualize are product names of DS SolidWorks.

Other brand or product names are trademarks or registered trademarks of their respective holders.

COMMERCIAL COMPUTER SOFTWARE - PROPRIETARY

The Software is a "commercial item" as that term is defined at 48 C.F.R. 2.101 (OCT 1995), consisting of "commercial computer software" and "commercial software documentation" as such terms are used in 48 C.F.R. 12.212 (SEPT 1995) and is provided to the U.S. Government (a) for acquisition by or on behalf of civilian agencies, consistent with the policy set forth in 48 C.F.R. 12.212; or (b) for acquisition by or on behalf of units of the Department of Defense, consistent with the policies set forth in 48 C.F.R. 227.7202-1 (JUN 1995) and 227.7202-4 (JUN 1995).

In the event that you receive a request from any agency of the U.S. Government to provide Software with rights beyond those set forth above, you will notify DS SolidWorks of the scope of the request and DS SolidWorks will have five (5) business days to, in its sole discretion, accept or reject such request. Contractor/Manufacturer: Dassault Systemes SolidWorks Corporation, 175 Wyman Street, Waltham, Massachusetts 02451 USA.

Copyright Notices for SOLIDWORKS Standard, Premium, Professional, and Education Products

Portions of this software © 1986-2018 Siemens Product Lifecycle Management Software Inc. All rights reserved.

This work contains the following software owned by Siemens Industry Software Limited:

D-Cubed® 2D DCM © 2019. Siemens Industry Software Limited. All Rights Reserved.

D-Cubed® 3D DCM © 2019. Siemens Industry Software Limited. All Rights Reserved.

D-Cubed® PGM © 2019. Siemens Industry Software Limited. All Rights Reserved.

D-Cubed® CDM © 2019. Siemens Industry Software Limited. All Rights Reserved.

D-Cubed® AEM © 2019. Siemens Industry Software Limited. All Rights Reserved.

Portions of this software © 1998-2019 HCL Technologies Ltd.

Portions of this software incorporate PhysX™ by NVIDIA 2006-2010.

Portions of this software © 2001-2019 Luxology, LLC. All rights reserved, patents pending.

Portions of this software © 2007-2019 DriveWorks Ltd. © 2012, Microsoft Corporation. All rights reserved.

Includes Adobe® PDF Library technology.

Copyright 1984-2016 Adobe Systems Inc. and its licensors. All rights reserved. Protected by U.S. Patents 6,563,502; 6,639,593; 6,754,382; Patents Pending.

Adobe, the Adobe logo, Acrobat, the Adobe PDF logo, Distiller and Reader are registered trademarks or trademarks of Adobe Systems Inc. in the U.S. and other countries.

For more DS SolidWorks copyright information, see Help > About SOLIDWORKS.

Copyright Notices for SOLIDWORKS Simulation Products

Portions of this software © 2008 Solversoft Corporation.

PCGLSS © 1992-2017 Computational Applications and System Integration, Inc. All rights reserved.

Copyright Notices for SOLIDWORKS PDM Professional Product

Outside In® Viewer Technology, © 1992-2012 Oracle © 2012, Microsoft Corporation. All rights reserved.

Copyright Notices for eDrawings Products

Portions of this software © 2000-2014 Tech Soft 3D.

Portions of this software © 1995-1998 Jean-Loup Gailly and Mark Adler.

Portions of this software © 1998-2001 3Dconnexion.

Portions of this software © 1998-2017 Open Design Alliance. All rights reserved.

The eDrawings® for Windows® software is based in part on the work of the Independent JPEG Group.

Portions of eDrawings® for iPad® copyright © 1996-1999 Silicon Graphics Systems, Inc.

Portions of eDrawings® for iPad® copyright © 2003 – 2005 Apple Computer Inc.

Copyright Notices for SOLIDWORKS PCB Products

Portions of this software © 2017-2018 Altium Limited.

Copyright Notices for SOLIDWORKS Visualize Products

NVIDIA GameWorks™ Technology provided under license from NVIDIA Corporation. Copyright © 2002-2015 NVIDIA Corporation. All rights reserved.

Contents

Introduction

About This Course	2
Prerequisites	2
Course Design Philosophy	2
Using this Book	2
About the Training Files	3
Conventions Used in this Book	4
Windows	4
Use of Color	5
Graphics and Graphics Cards	5
Color Schemes	5
More SOLIDWORKS Training Resources	6
Local User Groups	6

Lesson 1:

Fundamentals of Routing

What is Routing?	8
Review Lesson	8
Types of Routes	8
Routes	9
Routing FeatureManager	10
External vs. Virtual Files	10
Virtual Components	11
File Names in Routing	11
Routing Setup	15
Routing Add-in	15
Routing Training Files	16
Routing Library Manager	16
General Routing Settings	19

Lesson 2:**Basic Electrical Routing**

Basic Electrical Routing	22
Adding Routing Components	22
Routes	22
Start by Drag and Drop Connector	22
Auto Route	24
“Stub” Lines	25
Electrical Attributes	26
Edit Wires	26
Assigning Pins Manually	28
Reshaping the Spline	31
While Editing the Route	31
Save to External File.	32
Exercise 1: Basic Electrical Routing	34

Lesson 3:**Routing with Clips**

Routing with Clips	36
Routing Through Existing Clips	36
Drag and Drop Connector.	37
Adding Clips while Auto Routing	39
Rotating Route Components.	40
Editing a Route	43
Working with Clips.	43
Rotating a Clip	43
Routing Through a Clip	45
Unhooking from a Clip.	46
Virtual Clips	47
Splitting a Route	48
JPoint Name	48
Adding Bends	49
Adding a Splice.	50
Multiple Routes Though a Clip.	52
Route Stacking	53
Isolate Options	56
Exercise 2: Editing Electrical Routes	58
Exercise 3: Adding Splices.	59

Lesson 4:**Electrical Routing Components**

Routing Library Parts Introduction	62
Electrical Routing Library Parts	63
Libraries	63
Electrical	63
Electrical Conduit	65
Routing Component Wizard	66
Routing Library Manager	66
Routing Components Created by the Wizard	67
Routing Component Geometry	68
Creating a Connector	69
Connection Points	70
Routing Component Attributes	73
Creating a Clip	75
Routing Points	76
Clip Axis and Axis of Rotation	76
Using the Auto Sizing Option	78
Electrical Libraries	80
Cable Library	81
Component Library	81
Covering Library	82
From/To List	82
Exercise 4: Creating Routing Components	87
Exercise 5: Creating and Using Electrical Clips	89

Lesson 5:**Standard Cables and Reusing Routes**

Using Standard Cables	92
Standard Cables Excel File	93
File Structure - Excel	94
Fixed Length Routes	97
Replacing a Standard Cable Wire	99
Modifying Standard Cables	100
Replace Part File	100
Creating a Standard Cable	102
Reshaping with the Triad	103
Inline Components	104
Reuse Route	105
Appearance of Reused Routes	106
Route Length	106
Removing the Link	106
Using Reuse Route Without Fixed Length	109

Delink Route	110
Routing Templates	111
Creating a Custom Routing Template	111
Selecting a Routing Template	111
Exercise 6: Using Standard Cables and Reuse Route	112
Exercise 7: Creating Standard Cables	114
Lesson 6:	
Electrical Data Import	
Importing Data	118
Reusable Data	118
General From-To Steps	118
Routing Library Manager	119
Component Library Wizard	119
Importing a Cable/Wire Library	121
From/To Lists	123
Electrical Data	124
Using the From-To List Wizard	124
Route Properties	127
Route Guidelines	128
Guideline Actions	129
Repair Route	130
Editing From/To Lists	133
Using Guidelines and Clips	134
Connections	135
Exercise 8: Creating Libraries and From/To Lists	140
Lesson 7:	
Electrical Drawings	
Route Flattening and Detailing	146
Tables	146
Connectors	146
Annotation Flattening	146
Flatten Route	147
Flatten Options	147
Drawing Details	148
Wire Lengths	150
Edit Flattened Route- Annotation	152
Manufacture Flattening	154
Edit Flattened Route - Manufacture	155
Edit Flattened Route- Manufacture	157
Exercise 9: Electrical Drawings	162

Lesson 8: Flex Cables

Flex Cables	166
Flex Cable Routes	166
Flex Cable Connectors	167
Flex Cable	167
Flattening and Drawings	167
Flex Cable CPoints	168
Flex Cable Auto Routing	169
Flexible	169
Edit by Dragging	169
Manual Sketching	170
Adding Flex Cables	170
Using Flex Cables With Clips	172
Ribbon Manipulator Points	173
Exercise 10: Creating Flex Cables	175

Lesson 9: Electrical Conduits

Electrical Conduits	178
Existing Geometry	179
Rigid Electrical Conduit	179
Flexible Conduit	179
Electrical	179
Rigid Electrical Conduit	181
Electrical Conduit Route Properties	182
Orthogonal Routing with Auto Route	183
Tips for Selecting an Orthogonal Solution	184
Electrical Data in Conduits	186
Editing Libraries	189
Defining Cables	190
Electrical Conduit Drawing	191
Manual Sketch Routing	192
3D Sketching	192
Dragging and Dropping Fittings	193
Flexible Electrical Conduit	195
Electrical Routes through Ducts and Cable Trays	196
Exercise 11: Electrical Conduits	199
Exercise 12: Adding Cables and Editing Conduits	202

**Appendix A:
Review Section**

Review of Configurations	204
How Routing Uses Configurations	204
A Note About File References	204
Find References	205
Pack and Go	205
File Management	205
How Libraries Use Configurations	205
Design Tables	205
Design Table Input and Output	206
Review of Top Down Design	207
Parts and Assemblies	207
Editing Options	207
Edit Assembly	208
Edit Part	209
Edit subassembly	210
Edit Route	211
Assembly Feature	211
Review of Design Library Task Pane	212
Essentials of Using the Design Library Task Pane	213
Directory Structure of the Design Library	213
Review of 3D Sketching	214
Coordinate Systems	215
Orthogonal 3D Sketching	216
Sketching on Selected Planes	218
Creating planes within the sketch	220
Splines	222