

SolidWorks® 2014 Part II - Advanced Techniques

Parts, Surfaces, Sheet Metal, SimulationXpress,
Top-Down Assemblies, Core and Cavity Molds



Paul Tran CSWE, CSWI

Visit the following websites to learn more about this book:



[amazon.com](https://www.amazon.com)

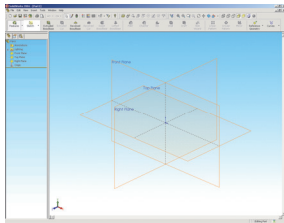
[Google books](https://books.google.com)

[BARNES & NOBLE](https://www.barnesandnoble.com)

Table of Contents

Copyrights Notices
 Disclaimer
 Trademarks

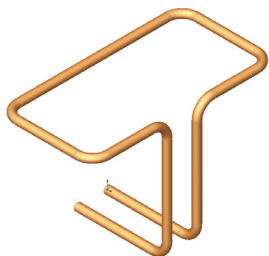
Introduction: SolidWorks 2014 User Interface



The 3 references planes	XXIII
The toolbars	XXIV
The system feedback symbols	XXIV
The status bar	XXVI
2D sketch examples	XXVI
3D feature examples	XXVII
	XXVIII

Advanced Modeling Topics

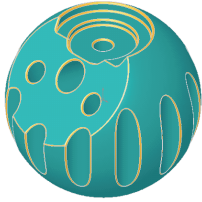
Chapter 1: Introduction to 3D Sketch



	1-1
Tools Needed	1-2
Adding 3D lines	1-3
Using the reference axis indicator	1-4
Using the tab key	1-4
Completing the profile	1-4
Adding dimensions	1-5
Adding the sketch fillets	1-6
Sketching the Sweep profile	1-7
Creating the swept feature	1-8
Questions for review	1-9
Exercise: Sweep with 3D Sketch	1-10
Exercise: 3D Sketch & Planes	1-11
Exercise: 3D Sketch & Composite Curve	1-18

Chapter 2: Plane Creation

	2-1
Tools Needed	2-2
Sketching the base profile	2-3
Creating a tangent plane	2-4



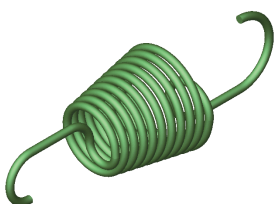
Creating a flat surface	2-5
Extruding with flip side to cut	2-6
Creating an at-angle plane	2-7
Showing the sketches	2-8
Creating a coincident plane	2-9
Creating a parallel plane	2-10
Creating the recess	2-11
Creating an offset-distance plane	2-12
Creating the bore holes	2-12
Creating a perpendicular plane	2-13
Creating the side-grips	2-14
Creating a circular pattern	2-15
Creating a Mid-Plane	2-17
Adding fillets to all edges	2-19
Questions for Review	2-20
Viewing the sections	2-21
Exercise: Create new work planes	2-22

Chapter 3: Advanced Modeling – 5/8” Spanner 3-1

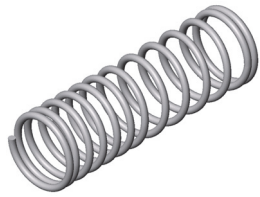


Tools needed	3-2
Opening the part document	3-3
Using min / max arc conditions	3-3
Creating the transition sketch	3-4
Creating a new work plane	3-6
Creating the closed-end sketch	3-7
Extruding the closed-end feature	3-7
Adding a 12-sided polygon hole	3-8
Creating the recess profile	3-9
Mirroring the recessed feature	3-10
Adding fillets	3-11
Adding text	3-13
Extruding the text	3-14
Questions for Review	3-17
Exercise: Circular text wraps	3-19

Chapter 4: Sweep with Composite Curves – Helical Ext. Spring 4-1

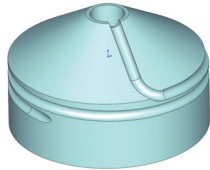


Tools needed	4-2
Creating the sweep path	4-3
Defining the helix	4-3
Creating a plane at angle	4-4
Adding other hook features	4-5
Creating a parallel plane	4-6



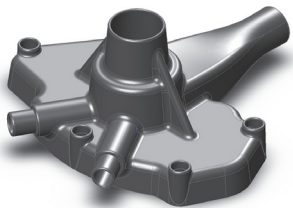
Combining sketches using Composite Curve	4-8
Sketching the Sweep profile	4-9
Creating the base sweep	4-9
Other Spring examples	4-10
Questions for review	4-11
Exercise: Circular Spring – Expanded	4-12

Using Variable Pitch 4-15



Tools Needed	4-16
Creating the base sketch	4-17
Creating a helix using variable pitch	4-17
Sketching the sweep profile	4-18
Adding a pierce relation	4-18
Sweeping the profile along the path	4-19
Creating the flat ends	4-20
Extruding a cut	4-20
Questions for Review	4-21
Exercise: Projected Curve & Composite Curve	4-22

Chapter 5: Advanced Modeling with Sweep & Loft 5-1

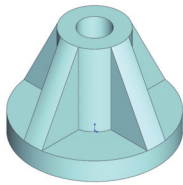


Tools Needed	5-2
Understanding the draft options	5-3
Opening the base	5-4
Sketching the upper inlet port - revolve	5-5
Adding constant fillets	5-6
Creating offset-distance planes	5-7
Creating the outlet port - loft	5-10
Creating the mounting bosses	5-11
Sketching the rear inlet port	5-12
Revolving the rear inlet port	5-12
Adding face Fillets	5-13
Mirroring features	5-15
Shelling the part	5-16
Adding the ribs	5-17
Mirroring the ribs	5-18
Removing the sharp edges	5-19

Chapter 6: Loft vs. Sweep – Water Meter Housing 6-1

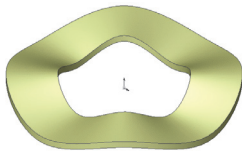


Tools Needed	6-2
Constructing the body	6-3
Creating an offset distance plane	6-5
Constructing loft profiles / features	6-5

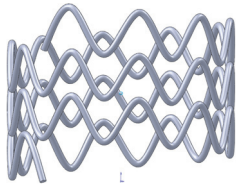


Constructing the Inlet / outlet profiles	6-6
Using split entities	6-6
Constructing the centerline parameter	6-10
Creating the solid loft feature	6-11
Using the shell command	6-13
Adding the left / right brackets	6-14
Adding a seal-ring	6-15
Adding fillets / chamfers	6-17
Questions for Review	6-19
Exercise: Loft	6-20

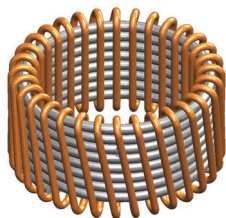
Chapter 7: Loft with Guide Curves – Waved Washer 7-1



Tools Needed	7-2
Adding the construction geometries	7-3
Creating an offset distance plane	7-4
Creating a derived sketch	7-5
Creating a curve through reference points	7-5
Constructing the loft sections	7-7
Creating the derived sketches	7-7
Creating the loft feature	7-10
Showing / hiding sketches	7-11
Questions for review	7-12
Exercise: V-Shape – 3 revolutions	7-13

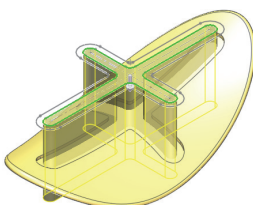


Advanced Sweep - Wire Form 7-21



Tools Needed	7-22
Creating a helix	7-23
Creating the sweep profile	7-24
Creating a solid sweep	7-25
Creating a circular Sketch pattern	7-27
Creating a derived sketch	7-29
Creating a 3D sketch	7-30
Creating the wire form sweep	7-35
Exercise: Using Curve Through Reference Points	7-37

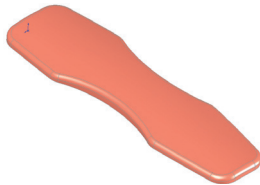
Chapter 8: Using Surfaces – Advanced Modeling 8-1



Tools Needed	8-2
Creating offset distance plane	8-3
Constructing the loft profiles	8-3
Creating a surface-loft	8-6
Setting the start/end constraints	8-6
Splitting the surface	8-7

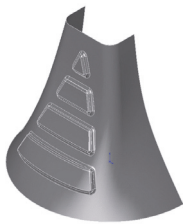
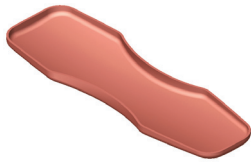


Deleting surfaces	8-8
Thickening the surface	8-9
Calculating the angle between the faces	8-10
Adding a full round fillet	8-12
Sketching / extruding the slot contours	8-14
Questions for Review	8-17

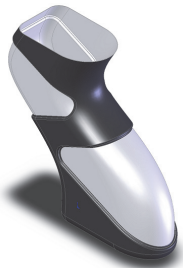


Lofted Surface – Remote Control Casing 8-19

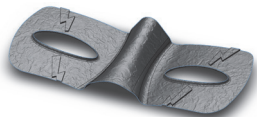
Creating offset distance planes	8-19
Sketching the loft sections	8-20
Twisting the loft profiles	8-23
Creating the loft surface	8-24
Adding revolved surface	8-25
Copying / moving surfaces	8-26
Trimming surfaces	8-27
Hiding surfaces	8-27
Filling surfaces	8-28
Knitting surfaces	8-30
Adding fillets	8-31
Thickening surfaces	8-32
Removing the upper half	8-33
Creating the lower half	8-35
Questions for Review	8-37
Exercise: Loft & Delete Face	8-38



Chapter 9: Advanced Surfaces–Offset Surface & Ruled Surface 9-1



Tools Needed	9-2
Using offset surface and ruled surface	9-3
Creating the base loft	9-4
Using the splitting lines	9-5
Using offset surfaces	9-6
Using ruled surface	9-7
Using knit surfaces	9-8
Creating a cut with surface	9-10
Exercise: Advanced Surfaces	9-13
Exercise: Advanced Surfacing Techniques	9-15



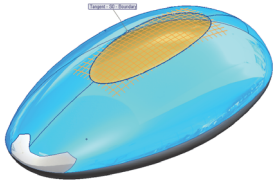
Using the Deform Feature 9-25

Creating a curve-to-curve deform	9-25
Setting the anchor faces	9-26
Setting the stiffness	9-26
Deforming a surface	9-27



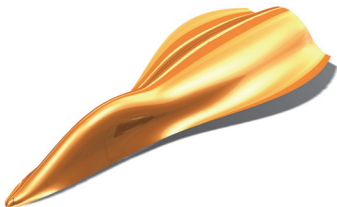
Deform with curve-to-curve	9-27
Setting the anchor edges	9-28
Mirroring a body	9-28

Chapter 10: Using Filled Surfaces **10-1**



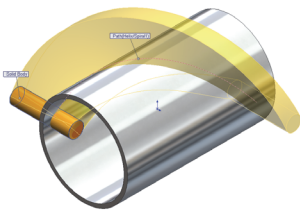
Tools Needed	10-2
Enabling the surfaces toolbar	10-3
Creating a planar surface	10-4
Creating a surface fill with tangent control	10-4
Creating a surface fill with curvature control	10-6
Knitting all surfaces	10-7
Creating a solid body	10-7
Questions for Review	10-10

Boundary and Freeform Surfaces **10-11**



Creating the 1st boundary surface	10-11
Creating the 2nd boundary surface	10-14
Creating the Freeform feature	10-16
Dragging with the triad	10-18
Displaying the curvature comb	10-19

Sweep with Solid Body **10-21**

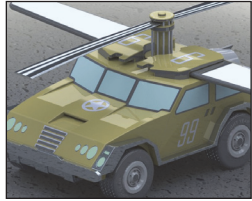


Tools Needed	10-22
Creating the main body	10-23
Creating an offset distance plane	10-24
Creating the sweep path	10-24
Creating a plane normal-to-curve	10-25
Revolving the swept body	10-27
Creating the sweep cut with a solid body	10-27
Questions for Review	10-28

Chapter 11: Surfaces vs. Solid Modeling – Safety Helmet **11-1**



Tools Needed	11-2
Constructing the body of Helmet – surface loft	11-3
Creating a perpendicular plane	11-4
Sketching the sweep profile	11-4
Creating the sweep path	11-5
Adding a planar surface	11-6
Knitting the surfaces bodies	11-6
Thickening the surface Knit	11-7
Adding an extruded cut feature	11-7
Adding a revolve cut feature	11-9



Creating the Cut-out slot with draft	11-11
Creating a sweep cut	11-13
Adding fillets	11-13
Exercise: Advanced Loft – Turbine Blades	11-15
Exercise: Advanced Sweep – Candle Holder	11-16

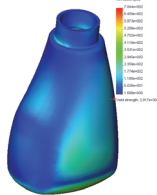
Using PhotoView 360 11-23



Activating the Add-Ins	11-23
Setting the appearance	11-24
Setting the scene	11-25
Setting the floor distance	11-26
Setting the illumination	11-26
Adjusting the render quality	11-27
Setting the image file type	11-27
Saving the final image	11-28

Level 3: Final Exam 11-29

Chapter 12: SimulationXpress – 5/8" Spanner 12-1

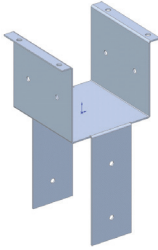


Tools Needed	12-2
Starting SimulationXpress	12-3
Setting up the units	12-3
Adding a fixture	12-4
Applying a force	12-6
Selecting material	12-7
Analyzing the model	12-8
Viewing the Results	12-9
Stress distribution	12-9
Displacement distribution	12-10
Factor of Safety (FOS)	12-10
HTML report	12-11
Viewing the report	12-13
eDrawings	12-15
Questions for Review	12-19
Exercise: SimulationXpress: Force	12-20
Exercise: SimulationXpress: Pressure	12-21

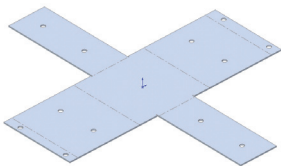
Sheet Metal Topics

Chapter 13: Sheet Metal Parts – Post Cap

13-1

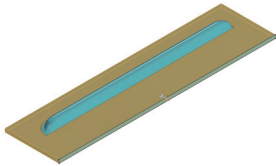


Tools Needed	13-2
Creating the Base Sketch	13-3
Extruding the Base Flange	13-3
Creating an Edge Flange	13-4
Editing the Edge Flange	13-5
Setting the Auto-Relief	13-5
Creating a Sketch Bend	13-7
Adding Holes in Sheet Metal Parts	13-11
Making the Flat Pattern	13-12
Questions for Review	13-13

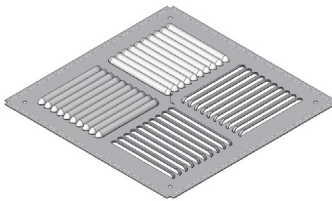


Sheet Metal Parts – Vents

13-15

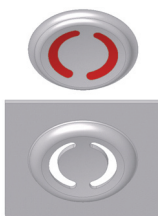


Tools Needed	13-15
Creating the Base Sketch	13-16
Extruding the Base-Flange	13-17
Creating the Miter-Flange	13-18
Flattening the Part	13-20
Creating a Forming Tool	13-21
The Rectangle Options	13-21
Revolve the Form Body	13-25
The Position Sketch	13-27
Saving the Forming Tool	13-29
Applying the Forming Tools onto Sheet Metal Part	13-30
Position the Form Tool	13-31
Adding other Sheet Metal Features	13-32
Creating a Linear Pattern of the Forming Tools	13-33
Creating an Axis	13-34
Creating a Circular Pattern	13-35
Questions for Review	13-36

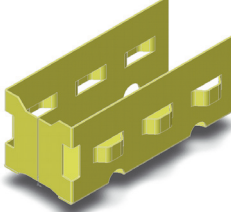
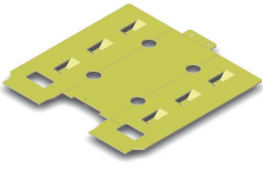
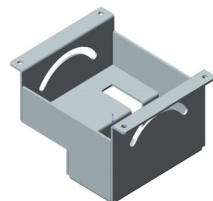
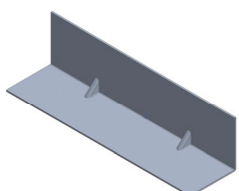



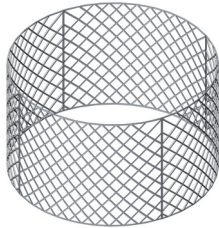
Chapter 14: Sheet Metal Forming Tools – Button with Slots

14-1



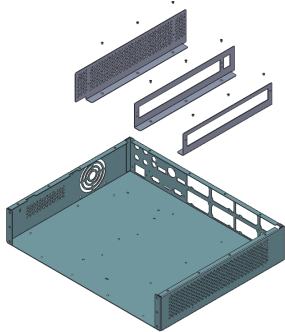
Tools Needed	14-2
Sketching the Base	14-3
Revolving the Body	14-4
Adding Slots	14-5
Creating the Split Lines	14-7
Defining the Stopping & Removing Faces	14-9
Saving in the Design Library	14-10
Questions for Review	14-12

	Designing Sheet Metal Parts – Mounting Tray 14-13
	Tools Needed 14-14
	Creating the Base Flange 14-15
	Creating an Edge Flange 14-16
	Adding Sheet Metal Cuts 14-17
	Unfolding a Sheet Metal Part 14-18
	Folding the Sheet Metal Part 14-20
	Accessing the Design Library 14-23
	Adding the Bridge Lance 14-24
	Creating a Linear Pattern 14-26
	Mirroring the Body 14-27
	Sheet Metal Chamfers 14-30
	Switching to the Flat Pattern 14-31
	Questions for Review 14-32
	
Chapter 15: Sheet Metal Conversions 15-1	
	Tools Needed 15-2
	Opening an IGES Document 15-3
	Using the Rip Command 15-4
	Inserting the Sheet Metal Parameters 15-5
	Adding Fillets 15-6
	Creating a Flat Pattern 15-7
	Questions for Review 15-8
	
Sheet Metal Gussets 15-9	
	Opening a sheet metal document 15-9
	Creating a new gusset 15-10
	Applying the parameters 15-11
	Mirroring the gusset 15-12
	
Flat Pattern Stent 15-13	
	Tools Needed 15-14
	Revolving the Main Body 15-15
	Converting to Sheet Metal 15-16
	Unfolding the Sheet Metal Part 15-16
	Sketching the 2D Pattern 15-17
	Creating the 2D Linear Pattern 15-18
	Folding the Sheet Metal Part 15-19
	Creating a Configuration 15-20
	Adding Fillets 15-20
	Switching to Flatten Mode 15-21
	



Stent Sample - Sheet Metal Approach	15-23
Revolving the Main Body	15-23
Shelling the Solid Body	15-24
Creating an Offset Plane	15-25
Creating a Rib Feature	15-25
Patterning the Rib Feature	15-26
Creating a Second Rib	15-27
Patterning the Second Rib	15-27
Using Combine Common	15-28
Making an assembly from the part	15-28
Creating a Circular Component pattern	15-29

Chapter 16: Working with Sheet Metal STEP Files **16-1**

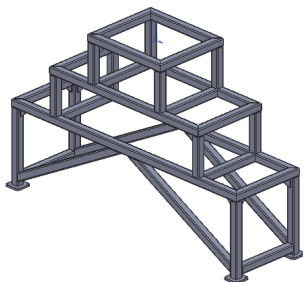


Tools Needed	16-2
Opening an Assembly Step File	16-3
Mating the components	16-4
Adding the Sheet Metal tool tab	16-7
Inserting Sheet Metal parameters	16-8
Viewing the Flat Pattern	16-9
Converting other components	16-9
Using the Hole Series	16-11
Using the Hole Wizard	16-13
Adding the Smart Fasteners	16-15
Creating an Exploded View	16-17

Adding Parts to the Toolbox Library **16-18**



Starting the Toolbox Settings Utility	16-18
Setting the Standards	16-20
Adding a new part	16-20
Activating Toolbox	16-21
Using the taskpane	16-21
Locating the new part	16-22
Viewing the new part	16-22
Adding a Part Number and Description	16-23



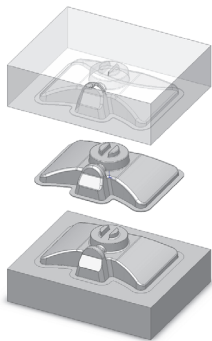
Weldments – Structural Members **16-24**

Opening a Weldments Frame Document	16-24
Enabling the Weldments Toolbar	16-24
Adding Structural Members	16-25
Setting the Corner Treatments	16-25
Adding Structural Members to Contiguous Groups	16-26
Adding Structural Members to the Parallel Groups	16-27

Trimming the Structural Members	16-29
Adding the foot pads	16-36
Adding the Gussets	16-37
Adding the Fillet Beads	16-39
Viewing the Weldments Cut List	16-41
Updating the Cut List	16-42
Creating a drawing	16-43
Inserting the cut list	16-43
Inserting the balloons	16-43

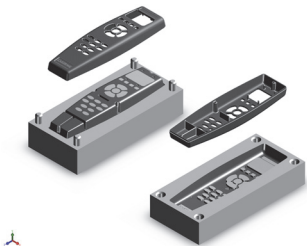
Top-Down Assembly Topics

Chapter 17: Top-Down Assembly:

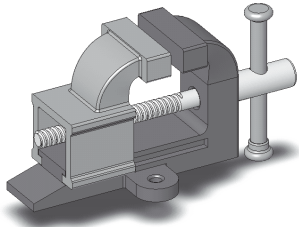


Core & Cavity – Assembly Level	17-1
Tools Needed	17-2
Opening the Existing IGES document	17-3
Scaling the Part	17-3
Creating the Radiate Surface	17-4
Transferring the Part to Assembly	17-5
Creating the Core Part	17-6
Knitting the Surfaces	17-7
Hiding Components	17-7
Extruding with Up to Surface	17-9
Editing Part vs. Edit Assembly Modes	17-10
Creating the Cavity Part	17-11
Creating an Assembly Exploded View	17-17
Animating the Explode & Collapse Configurations	17-20
Questions for Review	17-22

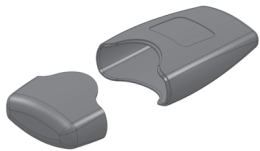
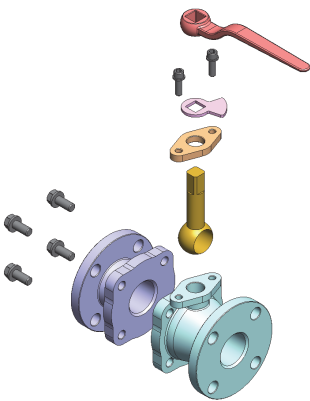
Core & Cavity – Part Level	17-23
Tools Needed	17-24
Opening an existing Parasolid document	17-25
Creating the Parting Lines	17-26
Using the Shut-Off Surfaces Command	17-27
Using Parting Surfaces	17-28
Using Tooling Split	17-30
Saving the Parts	17-32
Separating the 2 blocks	17-33
Questions for Review	17-35



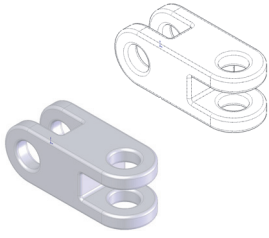
Chapter 18: Top-Down Assembly: Miniature Vise	18-1
Tools Needed	18-2
Creating the Base part	18-3
Adding side flanges	18-5
Creating an offsetting distance plane	18-7
Creating Loft Profiles and Guide Curves	18-8
Creating a Loft with Guide Curves	18-11
Creating a new part in an assembly	18-14
Understanding the Inplace mates	18-15
Offsetting existing geometry	18-15
Creating a Loft with Guide Curve	18-20
Using loft with guide curve in an assembly	18-22
Extruding with Up-to-Surface option	18-24
Creating Internal threads	18-26
Creating a Section View	18-29
Adding the sub-components	18-30
Questions for Review	18-32



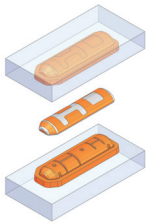
Chapter 19: Top-Down Assembly – Water Control Valve	19-1
Tools Needed	19-2
Starting a New Assembly Template	19-3
Changing the Units to IPS	19-3
Creating the 1st Component	19-4
Revolving the Base	19-5
Adding a Flange	19-5
Adding Mounting Holes	19-6
Adding Chamfers and Fillets	19-8
Saving as Virtual Component	19-10
Creating the 2nd Component	19-10
Extruding the Boss	19-12
Adding the Transition Body	19-12
Adding a Flange	19-13
Adding other Features	19-14
Exiting the Edit Part Mode	19-20
Applying dimension changes	19-20
Viewing the External References	19-22
Inserting other components	19-23
Mating the components	19-24
Creating an assembly exploded view	19-24
Questions for Review	19-25
Exercise: Top Down Assembly: Using Lip & Groove	19-27
Exercise: Top Down Assembly: Using Mounting Boss	19-31



Chapter 20: External References & Repair Errors	20-1
External Reference Symbols	20-2
Removing External References	20-3
Understanding External Reference Symbols	20-4
Repairing Sketch level	20-5
Repairing / replacing relations and dimensions	20-6
Questions for Review	20-8
Exercise: Repair Errors and External References	20-9
Level 4: Final Exam	20-17



CSWP Core Preparation Practice	
Preparation Materials for the CSWP-Core Examination	21-1
Part Modeling & Modifications	21-2
Part Configurations & Design Tables	21-22
Part Modifications	21-28
Bottom Up assembly	21-37



Glossary

Index

SolidWorks 2014 Quick-Guides:

Quick Reference Guide to SolidWorks 2014 Command Icons and Toolbars.

