

Introduction to Manufacturing

I-DEAS Tutorials: Fundamental Skills

Learn how to:

- create an NC job
- create OpGroups
- perform a hole-making operation
- perform a volume-clear operation
- perform a copy-mill operation

Before you begin...

Prerequisite tutorials:

1. Getting Started (I-DEAS™ Multimedia Training)

–or–

Quick Tips to Using I-DEAS

–and–

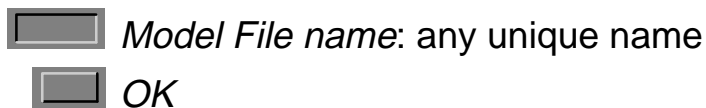
Creating Parts

2. Managing Parts in Model Files
3. Using Libraries
4. Creating Assemblies

If you didn't start I-DEAS with a new (empty) model file, open a new one now and give it a unique name.



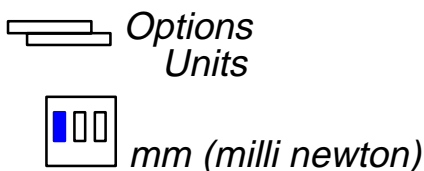
Open Model File form



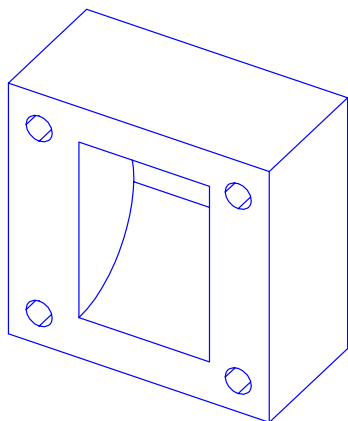
Make sure you're in the following application and task:



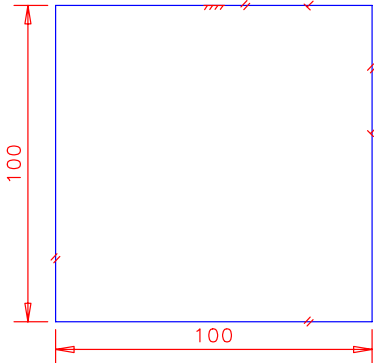
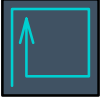
Set your units to mm.



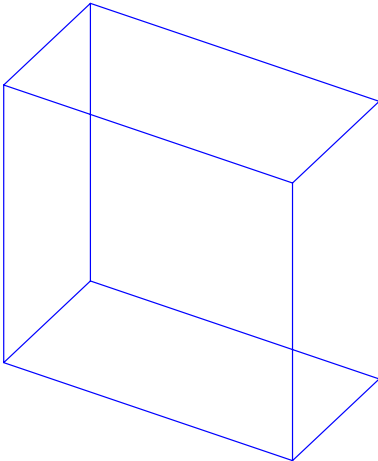
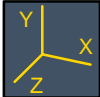
For this tutorial, you need to create the part shown below, following the steps provided on the next few pages.



Step 1. Sketch the following closed shape and modify the dimensions as shown.



Step 2. Extrude the wireframe shape a distance of 50mm.



Save your model file.**Warning!**

If you are prompted by I-DEAS to save your model file, respond:



Save only when the tutorial instructions tell you to—not when I-DEAS prompts for a save.

If you make a mistake at any time between saves and can't recover, you can reopen your model file to the last save and start over from that point.

Hint

To reopen your model file to the previous save, press Control-z.

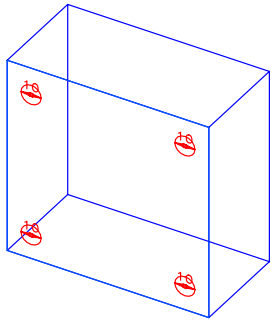
Step 3. Sketch four equal circles equally spaced on the surface shown. Dimensions are not critical for this tutorial.



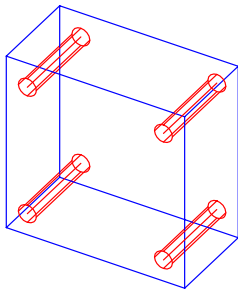
Options



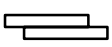
Radius: 5



Step 4. Extrude (cutout) the four holes through the part as shown.

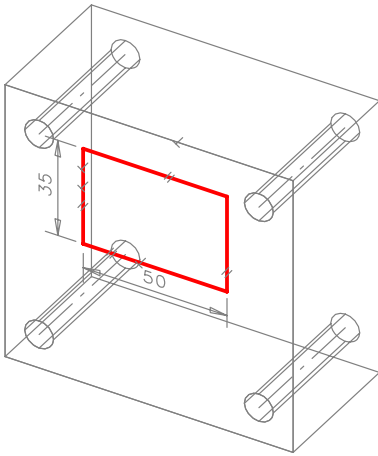
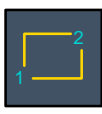


Recovery Point



File
Save

Step 5. Sketch a rectangle on the face as shown. Dimensions are not critical.



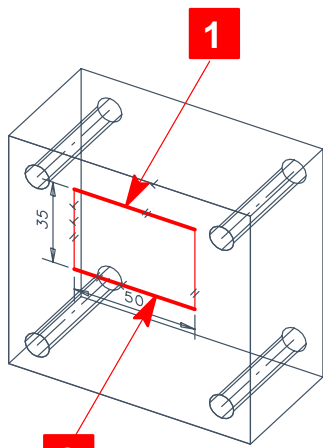
Step 6. Revolve the rectangle, cutting a pocket from the block.



1



2

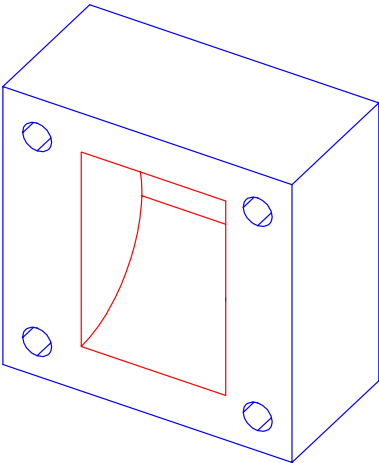


Revolve Section form

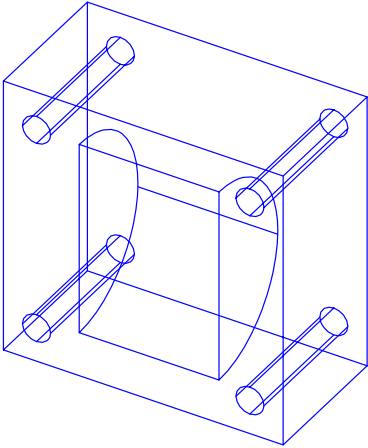


2

Result



Step 7. Name the part "Block."



Recovery Point



When you use the *Generative Machining* task, an NC Job is created, and is associated with the part to be machined.

An NC Job represents your entire job plan. It is the collection of setups and operations required to machine a part. An NC Job also identifies the part to be machined.

In the Manage Bins form, you will see the NC Job listed indented under the part name. When you double-click on the part name (e.g., Block...), the NC Jobs associated with the part will be listed.

You cannot delete the part without deleting the NC Job. Also, you cannot create an NC Job for an unnamed part.

Switch to the *Generative Machining* task.



Master Modeler
Generative Machining

NC Job Specification form



Block (select)



Job Name: Job1



OK

Look in your model file bins to see which entities were created when you created the NC Job.



Manage form



Block... (double-click)



Do not dismiss the Manage form.

Things to notice

Notice the “Job1” (Type of NC JOB) associated with the part “Block.”

Notice also that two assemblies have been created. One is called Setup-1_Assembly. This is a special assembly called a Setup Assembly. (You should have already completed the tutorial “Creating Assemblies” which explained the concepts of assemblies.) This assembly stores the orientation of the part to be machined and other optional instances to represent the machine table and fixtures.

Manage form



Each NC Job can contain multiple setups to define different positions of the workpiece and fixtures for different machining operations.

In this tutorial example, you will use only one setup for the NC Job.

Recovery Point

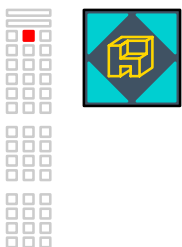


Machining operations are grouped together in OpGroups. In this tutorial, you will use two OpGroups.

1. You will use one hole-making operation to drill the holes.
2. The second OpGroup will use two operations:
 - a volume-clear operation to remove most of the material from the pocket
 - a copy-mill operation to smooth the surface

```
Job1 (NC Job)
  Setup-1
    OpGroup1
      Machine Holes
    OpGroup2
      Volume Clear
      Copy Mill
```

Bring up the Job Planning form. Modify the Setup by adding a new OpGroup.



NC Job Planning form

Click on the icon to create an OpGroup.



OpGroup Specification form

Name: OpGroup-2

Things to notice

Now the Job Planning form contains two OpGroups under Setup-1.



Do not dismiss the NC Job Planning form.

One or more machining operations can be grouped in each OpGroup.

Machining operations fall into the categories of hole-making, milling, and turning. Each of these categories is further broken down into multiple types of operations.

In this scenario, you will use OpGroup1 to store one hole-making operation. You will use a normal drilling type of hole-making operation. Other types are available, such as center drill and plunge mill.

If you dismissed the NC Job Planning form, bring it back up.



NC Job Planning form

Job Plan



OpGroup-1 (select)

Click on the *Modify Entity* icon.



OpGroup Specification form



Operation Selection form



Category: Hole Making



Type: Drill



Create

Operation Specification form



1

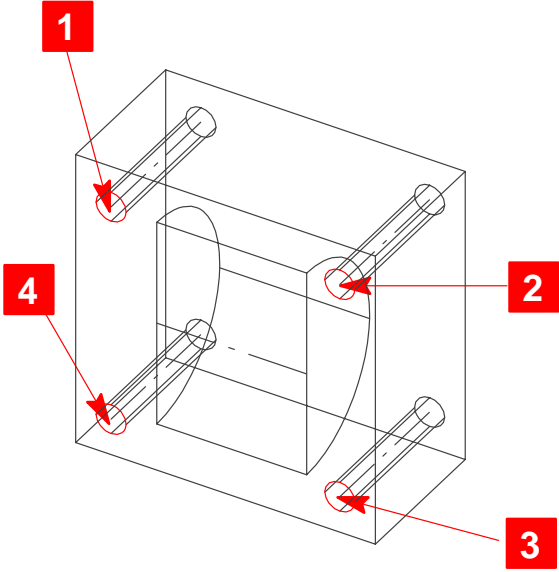
2 shift-pick

3 shift-pick

4 shift-pick



(Done)



Operation Specification form



Cutting Tool Specification – Drill form

Identifier: 10 MM Drill

Cutter Diameter: 10

I-DEAS Warning form

New NC Drill Cutting tool will be created

Things to notice

After entering 10, click in another field to see the picture of the drill change.

Operation Specification form



Machining Parameters form

Hole Depth (on)

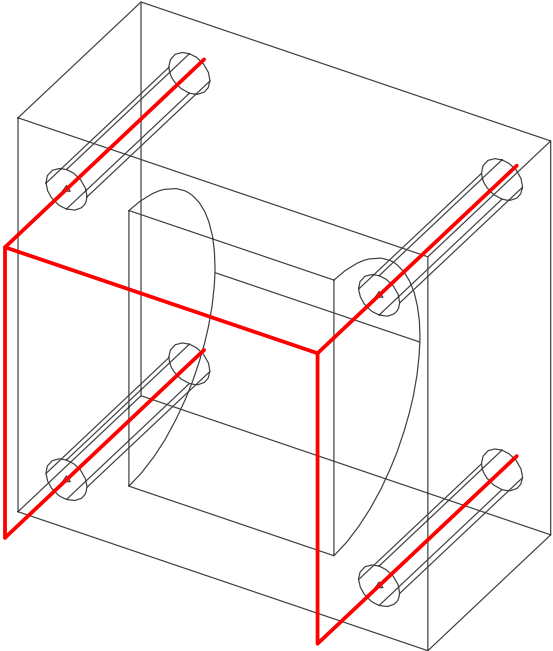
Hole Depth: 50

Operation Specification form



Things to notice

The toolpath for the drilling operation is displayed.



Recovery Point



To animate the tool motion, use the *Animate* icon.



Move the form out of the way if you need to in order to see the tool motion. If desired, you can adjust the speed faster or slower with the sliding bar tool on the form.

Animate Tool form

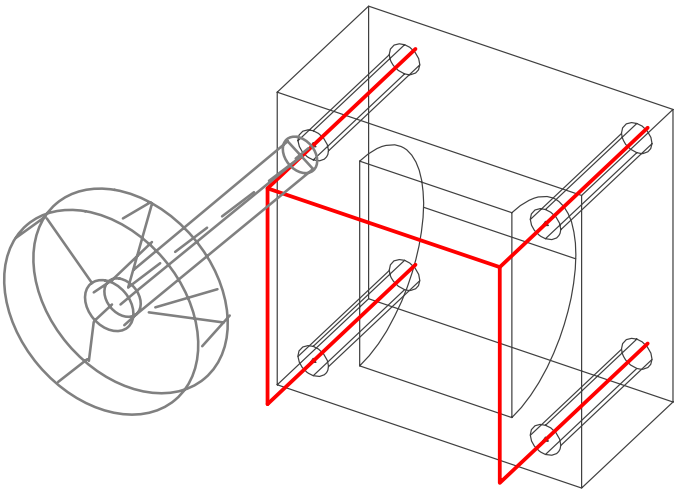
Start the forward animation.



To stop the animation:



Dismiss



You use a volume-clear operation to remove the bulk of the material in a volume.

This will be the first machining operation that you add to OpGroup–2.

Bring up the Job Planning form again.



NC Job Planning form

Job Plan



OpGroup-2 (select)

Click on the *Modify Entity* icon.



OpGroup Specification form



Operation Selection form



Category: *Milling*



Type: *Volume Clear*



Create

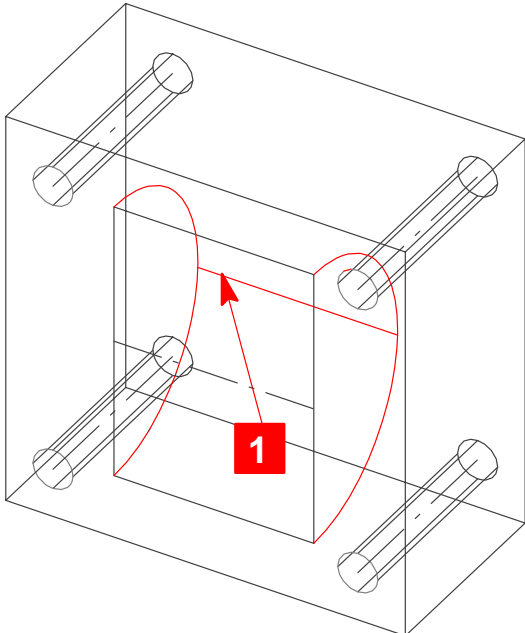
Operation Specification form



1



(Done)



Operation Specification form



Cutting Tool Specification – Mill form



Identifier. 20 MM End-Mill



Style: End Mill

I-DEAS Warning

New NC Mill Cutting Tool will be created



OK

Cutting Tool Specification – Mill form



Cutter Diameter. 20



OK

Operation Specification form



Machining Parameters form

Things to notice

On this form, you can set different machining parameters. For a volume clear operation, you can set the cut pattern, such as spiral in or zig zag. For this tutorial, accept the default value “spiral in.”

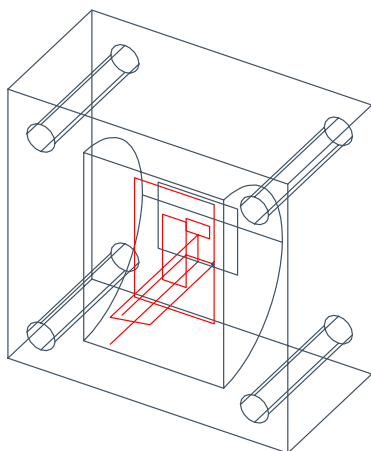


Operation Specification form



Things to notice

Your toolpath may be different than the one shown depending on the size of the pocket you created.



Recovery Point



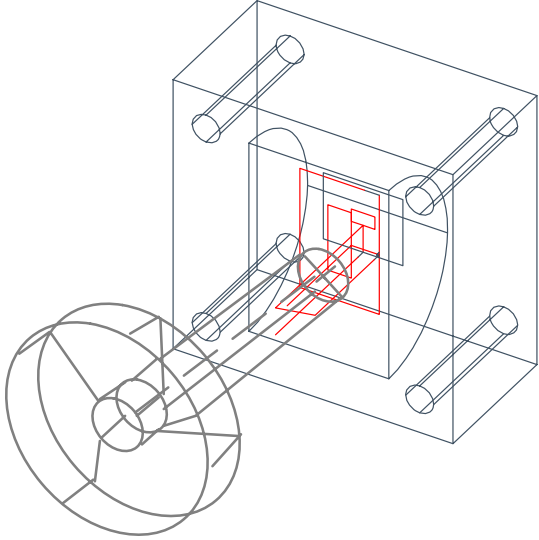
Animate the tool motion.



Animate Tool form



 *Dismiss*



In a copy-mill operation, the tool follows the surface in a given pattern to smooth the surface after the volume-clear operation has been performed.

In this example, you will add the copy-mill operation to OpGroup-2 since both of the machining operations are on the pocket.

Bring up the Job Planning form and modify OpGroup2, adding a copy-mill operation.



NC Job Planning form

Job Plan



OpGroup-2 (select)

Click on the *Modify Entity* icon.



OpGroup Specification form



Operation Selection form



Category: Milling



Type: Copy Mill

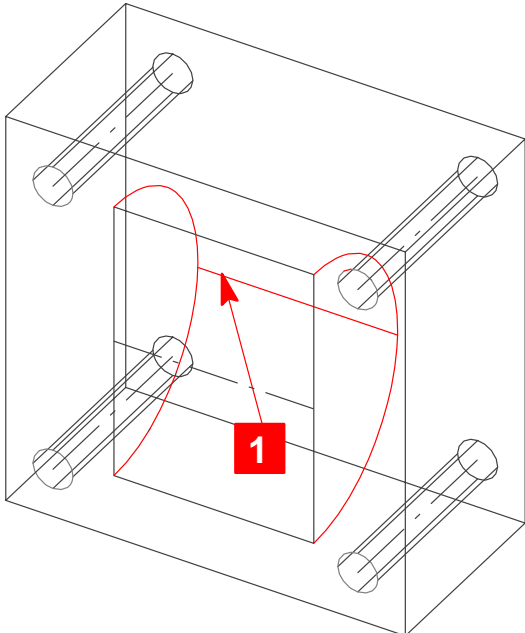


Create

Operation Specification form



1 (if not already selected)



Operation Specification form



Identifier: 10 MM Ball-Mill

Style: Ball Mill

Cutter Diameter: 10

OK

Operation Specification form



Machining Parameters form



Constant Step (on)

50

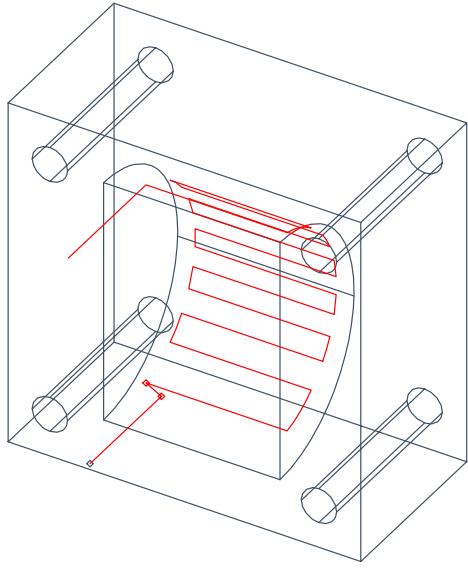
Cut Type: Bi-Directional

OK

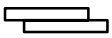


50% is a rather large step, and would give a rough cut. For actual work on the job, you would use a smaller step or use the *Constant Cusp* option, which determines the step to keep the cusp height under a given size.

Operation Specification form



Recovery Point



File

Save

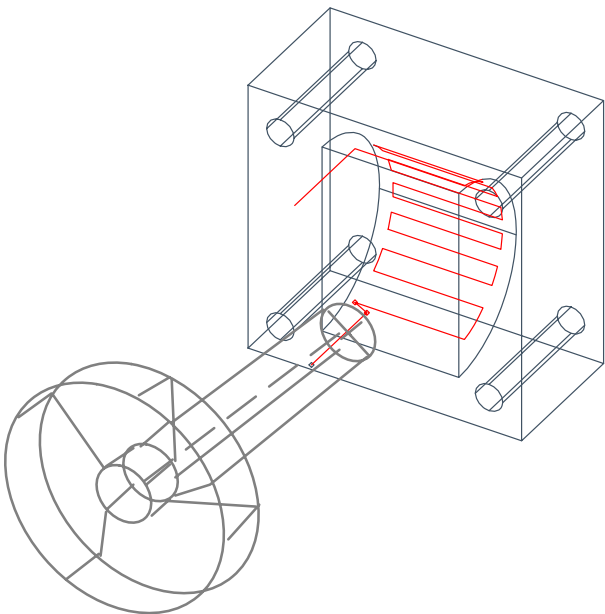
Animate the tool motion.



Animate Tool form



 *Dismiss*



Summary

Notice the icons used in *Generative Machining*:



Job Planning



Setup



OpGroup



Operation

You can use these icons on the Job Planning form or from the *I-DEAS Icons* window icon panel. This tutorial used them from the Job Planning form to make their organization and usage clearer.

You have completed the tutorial.

Things to notice

When you created the NC job, the part was put away and an assembly was created. What you see on the screen is actually an assembly, not a part.

To put away the setup assembly from the workbench, use the *Manage Bins* icon.



Manage form



Setup-1_Assembly (select)



Put Away



Dismiss

Things to notice

Your toolpath may still be displayed. It will go away when you switch applications.

See also...

For additional information on many of the concepts covered in this tutorial, see the following in the I-DEAS *Help* facility:

 *Help, Manuals, Table of Contents*

Manufacturing: Generative Machining User's Guide
Using Generative Machining
Creating a Setup Assembly

What's next?


To continue your learning of the *Manufacturing* application, we recommend you try the tutorials listed in the next level of learning.

 *Help
Tutorials*

Online Tutorials

 Manufacturing

 2 – Advanced Projects

 We suggest that you print these tutorials with the Adobe software provided before using them, as they have not yet been converted to the new online format.

To exit this tutorial, select:

 *File
Exit*

Warning!

Do not use the menu in the *I-DEAS Icons* window to exit. Use the menu in the Acrobat Reader window.

I-DEAS Master Series™ Online Tutorials Copyright

This online information content, is licensed to the user for the period set forth in the applicable license agreement, subject to termination of the license by SDRC Operations, Inc. (SDRC®) at any time, and at all times remains the intellectual property of SDRC. The information contained herein is confidential to SDRC and shall not be copied or reproduced in any form whatsoever, nor be disclosed to anyone other than an authorized representative of the user's employer who is contractually obligated not to disclose same, without express prior written consent of SDRC. The user of this tutorial and the computer program(s) referred to herein retains full control over and is solely responsible for the mechanical design of the user's equipment, machinery, systems, and products. SDRC makes no warranties of any kind, including the warranty of merchantability or fitness for a particular purpose in respect to the equipment, machinery, systems, and products derived or resulting hereunder, and the user assumes all risks and liability for results obtained by the manufacturing, use or implementation of the computer program(s) described herein, whether used singly or in combination with other designs or products. SDRC shall not be liable for any special or consequential damages. SDRC makes no warranty that the equipment, machinery, systems, and products derived or resulting hereunder will not infringe the claims of domestic or foreign patents and further does not warrant against infringement by reason of the use thereof in combination with other design, products, or materials or in the operation of any process. Users shall protect, indemnify and hold harmless SDRC of and from any loss, cost, damage or expense arising from any claim that is in any way associated with the computer program(s) described in this tutorial. Data presented in examples do not necessarily reflect actual test results and should not be used as design criteria.

By acceptance of I-DEAS Master Series, the user agrees to the above conditions and further agrees that this intellectual property will not be exported (or reexported from a country of installation), directly or indirectly, separately or as part of a system, without user or user's employer, at its own cost, first obtaining all licenses from the United States Department of Commerce and any other appropriate agency of the United States government as may be required by law.

© Structural Dynamics Research Corporation 1979, 1980, 1983, 1984, 1986, 1988, 1990, 1991, 1992, 1993, 1994, 1995, 1996, 1997

All rights reserved. No part of this work may be reproduced or transmitted in any form or by any means, electronic or mechanical, including photocopying and recording, or by any information storage or retrieval system without permission in writing from SDRC.

Permission to copy this online information software, or portions thereof, without charge is hereby granted by Structural Dynamics Research Corporation provided that such copying is strictly limited for internal use only and the above copyright notice and Restricted Rights Legend appears on all copies. This permission does not extend to any copying other than as expressly set forth herein. All questions or requests should be addressed to:

Structural Dynamics Research Corporation
2000 Eastman Drive
Milford, Ohio 45150
(513)576-2400

If this software or documentation is delivered to the Department of Defense (DOD) of the U.S. Government, it is delivered with Restricted Rights as follows:

Restricted Rights Legend

Use, duplication, or disclosure by the U.S. Government is subject to restrictions as set forth in subparagraph (c)(1)(ii) of the Rights in Technical Data and Computer Software clause at DFARS 252.227-7013.

If this software or documentation is delivered to any unit or agency of the U.S. government other than DOD, it is delivered with Restricted Rights and use, duplication or disclosure by the U.S. Government is subject to the restrictions as set forth in FAR 52.227-19(c)(2). If the software or documentation is delivered to NASA, it is delivered with Restricted Rights subject to the restrictions set forth in 18-52.227-86(d) of the NASA FAR Supplement.

This software is a Licensed Product of and distributed by SDRC and may only be used according to the terms of that license on the system identified in the License Agreement.

SDRC and SDRC I-DEAS are registered trademarks of Structural Dynamics Research Corporation.

The following are trademarks of Structural Dynamics Research Corporation

I-DEAS

I-DEAS Master Series

All other trademarks or registered trademarks belong to their respective holders.