Pro/ENGINEER® Wildfire® 4.0

Manufacturing Process Planning Help Topic Collection

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Using Pro/PROCESS for MFG

Introduction

About Pro/PROCESS for MFG

Pro/PROCESS for MFG is a stand-alone Pro/ENGINEER module that defines the part machining process steps, material removal, fixtures, and parameter information.

The Pro/PROCESS for MFG part machining process consists of two distinct phases:

1. The process planner defines the process flow of machining.

2. The user details and finalizes the process plan.

After these two steps have been sufficiently defined, the manufacturing engineer, or an NC programmer, creates the NC tool path for actual material removal. The goal of Pro/PROCESS for MFG is to create a process plan with as much detail as desired, document this process, and then use it to create a manufacturing toolpath.

About Defining the Process Plan Work Flow

To define the part machining process plan work flow, the process planner may need to have access to:

1. **A library of tools, holders, workcell and available fixtures.**

   One of the setup steps for process planning involves the documentation and inventory of all tools, fixtures, and holders for easy retrieval by the process planner. The library of machining tools are classified by function, size, and application. The process planner can create these fixtures, holders, and workcell as needed; that is, the database need not be complete before the work begins.

2. **The design part as provided by the design department.**

   The design part is typically in the released format. The released model contains dimensions, tolerances—dimensional and geometric—and surface finish information.

3. **The workpiece geometry as available from a supplier or manufacturing engineer.**

   The workpiece often represents an assembly of a part at some state of machining. It is possible that the starting workpiece for one process planner is the end result of a previous machining operation. Except for workpiece surfaces where the tolerance is sufficient to meet design requirements, the dimensional, surface or tolerance information associated with the design part is used by the process planner to decide on tools and fixtures.

To define the machining process plan work flow, the process planner may need to perform:

- **An assembly of the workpiece and design model.**

  Given the workpiece and design model information, the process planner assembles the two parts in such a way as to provide sufficient machine allowance and co-locate critical features; such as an axis for a boss and reference datum planes.

  Sometimes, the process planner or user creates just the casting model, and then creates the final design model through material removal. This way, the process planner or user can better model the design through the manufacturing process, because the design model incorporates limitations of the manufacturing process.

- **An assembly of the workpiece into a relative fixture.**

  The process planner, or user, needs to define how the workpiece with the reference model assembled inside will be assembled relative to a fixture.

- **The creation of a custom fixture.**

  If there are no preexisting fixtures, then the process planner, or user, passes the workpiece along with manufacturing instructions to the tools department for creation of a custom fixture

- **A simplification of the model representation.**

  The process planner, or user, often wishes to create a representation of a design part that is as simple as possible, yet contains all necessary details in the area to be machined.

- **Workcell and tool definition and selection**.

  Based on process planing requirements such as material, stock allowance, surface finish, and tolerance, the process planner or user defines or retrieves a workcell and may choose a tool for each machining step or NC sequence.

- **A representation of the workpiece with material removed**.

  The process planner or user needs this representation for input to the next machining step and also to document the process.

- **Modifications to the machining steps**.

  After defining all steps, the process planner may reorder the machining steps, add or insert more steps, or delete some of the unnecessary machining operations.

To Use Pro/PROCESS for MFG

The following procedure outlines a typical session in Pro/PROCESS for MFG.

1. Click **File > New** to create a new process assembly, or click **File > Open** to open an existing assembly.

2. Select **Manufacturing** as the **Type**.

3. Select **Process Plan** as the **Sub-type**.

4. Type a name for the process assembly.

5. Click **OK** to open the **MANUFACTURING** menu.

6. Click **Mfg Sequence**, **Step**, or **New Step** to create or redefine a manufacturing step or general step and then click **Done**.

7. If no operation has been created, the operation creation user interface appears.

8. If an operation already exists, the **STEP TYPE** menu appears. Click one of the commands:

   o **Fixture**—Create a typical setup [place part A in fixture B]

   o **Mfg Model**—Assemble Workpieces, Ref Models, General Assemblies and Mfg Assemblies.

   o **Machine**—Create milling, hole making, turning, and WEDM step types which can be performed at this workstation type.

   o **General**—Create all of the step types which can be performed at any workstation type. These steps include inspect, paint, debur, edge break, and so on.

   o **Surface**—Create all of the step types which are specific to surface workcells. These steps do not perform any changes to the component geometries.

   o **Volume**—Create all of the step types which are specific to volume workcells. These steps include heat treating and shrinkage. These steps do not perform any changes to the component geometries.

9. Click **Done** to open the **Step** dialog box, allowing you to define elements specific to the step type. Select components to be assembled directly from the screen or from the Model Tree window.

10. Define additional elements (such as, description of the step, a simplified representation, time, and cost estimates) for the step. Click **OK** in the dialog box when you are satisfied that all desired elements are defined.

11. Define additional steps by clicking **Step** from the **MFG SEQUENCE** menu. The system displays the existing steps in the **STEP LIST** menu. The previous list being referred to is only for the current operation. To list steps for all operations, click **All Operations** from the **SEL STEP** menu.

12. To replay the steps, click **Play Steps** from the **MFG SEQUENCE** menu.

13. Create detail drawings of the manufacturing process by adding the process step model to a drawing. A **Process State** dialog box appears when the model is added to the drawing. The **Process State** dialog box lists the steps in the manufacturing process. If you want to, select the desired step and a simplified

representation, then click **OK**. The **VIEW TYPE** menu appears, from which you can place a view of the model in the specified step.

14. Use Pro/REPORT to create a manufacturing report table for the step, which lists only the components assembled during the active step or a table of manufacturing parameters. The system lists a new set of report symbols, beginning with a `&mfg` prefix, and unique to process steps.

15. When you create a view of another step, set the current step by clicking **Views** from the **DRAWING** menu, and then **Dwg Models > Set State**. The **Set State** command sets the current default state which will be used for the next placed view. Use the **View** and **Modify View** functions to change an existing **Process State** view.

About Specific Uses for Pro/PROCESS for MFG

Specifically, you can use Pro/PROCESS for MFG to complete the following tasks:

- Create and manipulate manufacturing steps which may or may not generate NC sequences.

- Group manufacturing steps into operations where you can define how the model changes with material removal, refixturing, or use of a different tool.

- Leave a manufacturing step in a partially defined state so that the NC planner can complete the step; that is, define the NC tool path.

- Examine the steps with the display of the manufacturing model accurately reflecting the material removal, similar to the **Play Steps** functionality available in Pro/PROCESS for ASSEMBLIES. You can easily pick a step to roll the model back to. Rolling back the model from step to step represents successive processing steps.

- Access such features as workcell, tooling, and site parameters from the manufacturing step level.

- Create process planning documentation reflecting the process planning steps and parameters.

About the Part Machining Process Plan

To define the part machining process plan, the process planner uses:

- Legacy data from previously completed plans.

  Existing Pro/MFG data may be used as a layout skeleton. Often sections of a preexisting plan are used in the current definition. The planner can place text from existing third party data by cutting and pasting the appropriate sections of an old plan, using UDFs from other Pro/MFG or Pro/PROCESS for MFG models, or by using Pro/TOOLKIT functionality.

- Workpiece geometry as a start condition.

The workpiece represents any form of raw stock; bar stock, casting, and so on that is going to be machined during manufacturing operations. It may easily be created by copying the design model and modifying the dimensions or deleting/suppressing features to represent the real workpiece. The benefits of using a workpiece include:

- o Automatic definition of extents of machining when creating manufacturing sequences.

- o Dynamic material removal simulation and gouge checking in Pro/MFG.

- o In-process documentation by capturing removed material.

The workpiece geometry serves as a start condition for the part machining process plan. The engineer knows that by using some manufacturing techniques the start part can be transformed into a finished part. The workpiece, at various stages of machining, also defines the design and configuration of the fixture.

- Design model as an end condition.

The design model represents the machining target. The design part also has the surface finish, dimensions, and tolerances defined. No matter what approach the process planner takes in getting from workpiece geometry to finished geometry, the process goal is to achieve these surface finish, dimensions, and tolerances.

- A basic understanding of the available processing equipment; such as tools, holders, fixtures, and work centers.

To Document the Part Machining Process Plan

In documenting the part machining process plan work flow, the user wants to:

1. Document the process planning steps.

2. After defining a manufacturing process plan step, the user needs to document the process planning step in a company accepted format. There are five classes of process planning steps which require specific documentation:

- o **Material removal**—which includes typical manufacturing steps such as mill, turn, drill, bore, tap, and so on.

- o **Fixturing**—which includes a typical setup drawing; for example, place part A into fixture B.

- o **Manufacturing model**—which includes assembly of material or the creation of additional workpieces.

- o **Non-manufacturing**—which includes inspection, packing, and deburring.

- o **Non-material removal**—which includes shrinkage and plating. The documentation is similar to the material removal step except no geometry simulation is performed; that is, the results of these steps are not reflected in part geometry.

3. Simplify the representation of a part in all non-machined areas.

In some cases, the user wants to simplify the display of any part geometry which is non-critical to the particular machining step in order to simplify the manufacturing model representation.

4. Document the material removal process.

   The user needs to document the material removal process including minimum sufficient dimensioning, tool and holder information, along with any necessary machining instructions.

5. Create drawing views or report tables for each machining process. The end products of the process planning procedure include:

   o The tool selection

   o The holder

   o The fixture list which is cross-referenced to the process plan step

   o The setup drawing which contains a simplified, representative assembly of the workpiece and fixture assembly

   o The process plan drawing which contains the workpiece and the necessary dimensions, tolerances, and instructions to produce that material removal step

6. Create and dimension auxiliary views.

   For some of the drawings, the user may need to create and dimension additional breakout sections or auxiliary views as appropriate.

Configuring Pro/PROCESS for MFG

About Configuring Pro/PROCESS for MFG

Pro/Process for MFG configuration options enable you to customize your design environment.

Your Pro/PROCESS for MFG configuration options, like all Pro/ENGINEER configuration options:

- Are set from the **Options** dialog box (**Tools** > **Options)**.

- Are stored in a `config.pro` file.

- Use the default value unless you manually set the configuration option.

You can set and save multiple combinations of configuration options (`config.pro` file), with each file containing settings unique to certain design projects.

Pro/PROCESS for MFG Help lists the configuration options unique to sheet metal designs. The options are arranged in alphabetical order. Each topic contains the following information:

- Configuration option name.

- Brief description and notes describing the configuration option.

- Default and available variables or values. All default values are followed by an asterisk (*).

To Set Pro/PROCESS for MFG Configuration Options

1. Click **Utilities > Options**. The **Options** dialog box opens.

2. Click the **Show only options loaded from file** check box to see currently loaded configuration options or clear this check box to see all configuration options. The configuration options display.

3. Select the configuration option from the list or type the configuration option name in the **Option** box.

4. In the **Value** box type or select a value.

   Note: The default value is followed by an asterisk (*).

5. Click **Add/Change**. The configuration option and its value appear in the list. A green status icon confirms the change.

6. When you finish configuring Pro/PROCESS for MFG, click **Apply**. The configuration options are set.

Note: We recommend that you set your configuration options before starting a new sheet metal session.

curr_proc_comp_def_color

Specifies the default color used to display the current component in a process assembly. The three decimal values specify percentage of red, green and blue (in this order) in the resulting color. For example, 0 0 49 specifies a medium blue color.

Defaults and available variables:

0.000000 0.000000 0.000000* — Red=0.00, Green=0.00, Blue=0.00

Note: The default value is followed by an asterisk (*).

curr_proc_comp_def_font

Specifies the default font used on the current component in a process assembly.

Defaults and available variables:

solidfont
dotfont
ctrlfont
dashfont
phantomfont

ctrlfont_s_l
ctrlfont_l_l
ctrlfont_s_s
ctrlfont_mid_l
dashfont_s_s
phantomfont_s_s

Note: The default value is followed by an asterisk (*).

prev_proc_comp_def_color

Specify the default color for components added to a process assembly in a previous step. The three decimal values specify percentage of red, green and blue (in this order) in the resulting color. For example, `0 0 49` specifies a medium blue color.

Defaults and available variables:

0.000000 0.000000 0.000000* — Red=0.00, Green=0.00, Blue=0.00

Note: The default value is followed by an asterisk (*).

prev_proc_comp_def_font

Specify the default font for previously added components in a process assembly.

Defaults and available variables:

solidfont
dotfont
ctrlfont
dashfont
phantomfont
ctrlfont_s_l
ctrlfont_l_l
ctrlfont_s_s
ctrlfont_mid_l
dashfont_s_s
phantomfont_s_s

www_add_aux_frame

Customizes the output so you have an additional frame for each process step or for an assembly publication.

Defaults and available variables:

yes—Pro/ENGINEER creates an auxiliary `aux.html` file (for the assembly process-in each step00 directory) to be replaced by your own `<filename>.html file`.

no*—Does not create auxiliary file.

Note: The default value is followed by an asterisk (*).

www_export_geometry_as

Specifies the output format by to one of the values

Defaults and available variables:

cgm_vrml—Formats ouput data to the CGM and VRML formats.

all—Formats output data to the CGM, JPG, and VRML formats.

jpg_vrml*—Formats output data to the JPG and VRML formats.

vrml—Formats output data to VRML format only.

cgm—Formats output data to the CGM and VRML format. Sets up the site to show only CGM.

jpg—Formats output data to the JPG and VRML formats. Sets up the site to show only JPF.

Note: The default value is followed by an asterisk (*).

www_multiple_views

Specifies what views to write to VRML files.

Defaults and available variables:

all—Writes all views in any component to the appropriate VRML files.

top*—Writes only named views that reside in the assembly or process assembly to top-level VRML files.

none—Does not write named views to VRML files.

Note: The default value is followed by an asterisk (*).

www_tree_location

Specifies the location of the model tree in the browser window

Defaults and available variables:

out*—Opens the Model Tree in a separate window.

in—Includes the Model Tree in the Web page, and removes the Tree checkbox from the control panel.

Note: The default value is followed by an asterisk (*).

Process Steps

About Process Assemblies

A process is a Pro/ENGINEER assembly that contains the features defining the manufacturing steps. It follows the naming conventions `process_name.asm` and `process_name.mfg`. A process assembly has dependencies on one or more workpieces and design models. The process object has a required (for Pro/PDM purposes) dependency on the workpiece.

A process allows assembly and manipulation of entire reference models relative to other models in the process assembly. A user can create a partially complete manufacturing model and then retrieve the model into manufacturing to finish defining the machining steps and to generate the toolpath.

The system retrieves the process model in whatever state it exists at the end of the process; that is, retrieves any components and sets the last step as the active step. The system retrieves into memory all components required for the process model and displays only the components that are active from the last step.

To Use Process Mode

In Process mode, you can create process plans to describe manufacturing operations that are applied to produce a product.

1. Click **File > New**.

2. Select **Manufacturing** under **Type** and **Process Plan** under **Sub-type**. Enter a name for the new process assembly.

3. Click **OK** to open the **MANUFACTURING** menu.

4. Click one of the following commands on the **MANUFACTURING**:

   o **Mfg Setup**—Define the workcell library, tooling library, manufacturability database, and fixture library. Opens the **MFG SETUP** menu.

   o **Mfg Sequence**—Manipulate a process step (add, create, redefine and so on). Opens the **MFG SEQUENCE** menu.

   o **Component**—Performs certain assembly component operations. Displays the **COMPONENT** menu.

   o **Simplfd Rep**—Creates, modifies, or sets simplified representations.

   o **Modify**—Modifies process or process component dimensions and features. Opens the **PROCESS MOD** menu.

   o **Regenerate**—Updates modified part and assembly dimensions.

- **Play Steps**—Views assembly at individual steps of the process plan. Opens the **STEP REGEN** menu.

- **Relations**—Adds and edits constraint equations.

- **Program**—Accesses Pro/PROGRAM.

- **Integrate**—Resolves differences between the source and target processes.

MFG SETUP Menu Commands

When you click **Mfg Setup** from the **MANUFACTURING** menu, the **MFG SETUP** menu opens with the following commands:

- **Workcell Lib**—Define and activates the workcell libraries.

- **Tooling Lib**—Define and activates tool libraries.

- **Param Setup**—Sets up manufacturing parameters. Opens the **PARAM SETUP** menu with the following commands:

  - **Site**—Set up the site used by the current operation.

  - **Mach DB**—Set up machinability database files.

- **Mfg Geometry**—Set up the manufacturing geometry. Opens the **MFG GEOMETRY** menu with the following commands:

  - **Mill Volume**—Create a volume to be removed during an NC sequence.

  - **Mill Surface**—Create a user-defined surface quilt that can be referenced by Surface milling NC sequences or by Mill Volumes.

  - **Mill Window**—Create a window for mill NC sequence.

  - **Turn Profile**—Create a profile for turning NC sequence.

  - **Drill Group**—Group axes for drilling NC sequence.

  - **Datum Feats**—Create datum features in the manufacturing model.

MFG SEQUENCE Menu Commands

When you click **Mfg Sequence** from the **MANUFACTURING** menu, the **MFG SEQUENCE** menu opens with the following commands:

- **Operation**—Create and redefines operations and sets the current operation. The current operation is the last operation in the feature list which has not been rolled back. Opens the **Define Operation** menu with the following commands:

  - **Name**—Specify the operation name.

  - **Workcell**—Specify the workcell or machine tool.

You need not specify an exact workcell. The following are new types of workcells:

Surface—Specify grinding machines and any other machine which doesn't change the geometry of a workpiece surface.

Volume—Specify heat treating workcells and any other workcell which does not change the geometry of the part.

General—Specify any workcell which does not affect the geometry of the workpiece.

Mach Sys—Specify the coordinate system for CL output.

Comments—Specify operation comments.

Parameters—Specify operation parameters.

From—Specify location point.

Home—Specify location point.

- **Step**—Create and redefines step features. The types of steps available depends upon the type of workcell defined for the operation. Opens the **STEP TYPE** menu with the following commands:

  o **Fixture**—Create a fixture step.

  o **Mfg Model**—Document the assemblies of workpieces, reference models, general assemblies, and manufacturing assemblies; that is, the addition of stock to be machined.

  o **Machine**—Specify all of the step types which can be performed at a workstation type. Opens the MACH AUX menu. The specific machining step type available depends upon the active operation's workcell type.

  o **General**—Specify all of the step types which can be performed at any workstation type. General step types include inspecting, painting, deburring, edge breaking, and so on.

  o **Surface**—Specify all of the step types which are specific to surface workcells. Surface step types do not perform any changes to the component geometries.

  o **Volume**—Specify all of the step types which are specific to volume workcells. Volume step types include heat treating, plating, and shrinkage.

COMPONENT Menu Commands

When you click **Component** from the **MANUFACTURING** menu, the **COMPONENT** menu opens with the following commands:

- **Package**—Use the Package functionality to move packaged components that are not in the design assembly.

- **Delete**—Delete components and their children from the assembly. Process steps are children of components; therefore, deleting a workpiece deletes process steps which reference it.

- **Suppress**—Suppress steps related to the workpiece to be deleted. Opens the **DELETE/SUPP** menu.

- **Resume**—Resume suppressed components. Opens the **RESUME** menu with the following commands:

  o **All**—Resume all suppressed components.

  o **Layer**—Resume the components on current layer.

  o **Last Set**—Resume the last set of suppressed components.

  o **Feat ID**—Resume a component having a specified ID.

- **Redefine**—Redefine one or more component constraints.

- **Reroute**—Reassign component references.

- **Reorder**—Reorder components.

- **Insert Mode**—Activate or cancels Insert Mode.

- **Pattern**—Create a pattern of a component which has not been patterned.

- **Del Pattern**—Remove a pattern of a component.

- **Adv Utilities**—Access advanced assembly component functionality. Opens the **ADV COMP UTL** menu with the following commands:

  o **Replace**—Replace an existing component with another one.

  o **Copy**—Copy components.

  o **UDF Library**—Group components together into a UDF.

  o **Group**—Create components from UDFs.

  o **Merge**—Merge components into a single part.

  o **Cut Out**—Subtract reference parts from other parts.

MFG MODIFY Menu Commands

When you click **Modify** from the **MANUFACTURING** menu, the **MFG MODIFY** menu lists the following commands:

- **Mod Part**—Open the **MODIFY** menu to modify a part.

- **Mod Assem**—Open the **MODIFY** menu to modify an assembly.

- **Mod Subasm**—Open the **MODIFY** menu to modify a subassembly.

- **Mod Dim**—Open the **MODIFY** menu to modify dimensions.

- **Mod Mach Step**—Open the **STEP LIST** menu to modify parameters for machine steps.

- **Mod Pattern**—Open the **SELECT FEAT** menu to modify machining step pattern dimensions.

STEP REGEN Menu Commands

When you click **Play Steps** from the **MANUFACTURING** menu, the **STEP REGEN** menu lists the following commands:

- **Set Step**—Select a step from the Process Window.

- **PreviousStep**—Roll model back one step.

- **Next Step**—Regenerate model forward one step.

- **Set Operation**—Select an operation from the Process Window.

- **Previous Oper**—Roll model back one operation

- **Next Oper**—Regenerate model forward one operation.

- **Step Info**—Display information for current step.

- **Oper Info**—Display information for current operation.

Select Step Menu

To select steps, use the **Select Step** menu. This menu contains a check mark list of steps, showing the step number and name.

About Tool Features

Tool features enable you to define geometry for creating NC sequences. You can define tool features by selecting the required feature on the **Mfg Geometry** toolbar.

The **Mfg Geometry** Features toolbar contains the following tool features:

- —Create a window for a mill NC sequence. Use this feature to create mill windows of the type silhouette, sketch, or chain.

- —Create a user-defined surface quilt that can be referenced by surface milling NC sequences or by mill volumes.

- —Create a volume to be removed during an NC sequence.

- —Create a profile for a turning NC sequence.

- —Group axes for a drilling NC sequence.

Alternatively, click **Insert** > **Manufacturing Geometry** to define the tool features.

Read About and Create Steps

About Play Steps

Play steps allow you to walk through the manufacturing process; set a specific step and operation, roll the model back one step or operation, and display information for the current step or operation.

About Process Steps

Process steps describe all the actions used to manufacture the product. You can only have one active step at any time. Process step types are: Fixture, Manufacturing Model, Machine, General, Surface, and Volume.

To Create a Machine Step

Machine steps include: milling, turning, hole making.

1. Click **MANUFACTURING > Mfg Sequence** to open the **MFG SEQUENCE** menu.

2. Click **Mfg Sequence > Step** to open the **DEFINE OPER** menu.

3. The system opens the **DEFINE OPER** menu. The specific machining step type available depends upon the active operation's workcell type:

    o   **Name**—Specify the machine step name. This is an optional field.

    o   **Comments**—Specify machine step comments. This is an optional field.

    o   **Tool**—Specify a tool for this machining step. This is an optional field.

    o   **Parameters**—Specify manufacturing parameters for this machining step. This is an optional field.

    o   **References**—Specify references for this machine step. This is an optional field. You can specify machining specific and general process references for this machine step. The Process Refs option allows you to select general component, feature, surface, edge, curve, quilt, datum, dimension or tolerance references to add to this machine step. These references can later be displayed by the manufacturing engineer when completing the machine step in Pro/MFG. The remaining options are specific to the type of machine step.

    o   **Simplified Rep**—Specify a simplified representation for the step. This is an optional field.

    o   **Time Estimate**—Specify a time estimate for the machine step. This is an optional field.

    o   **Cost Estimate**—Specify a cost estimate for the machine step. This is an optional field.

4. Select the feature step fields you wish to define or change and click **Define**.

5. Click **OK** to commit and continue.

About Fixture Steps

Fixture steps allow you to assemble, create, disassemble, and reassemble fixture components.

To Create a Fixture Step

1. Click **Step** from the **MFG SEQUENCE** menu.

1. Click **New Step** from the **STEP LIST** menu.

2. Click **Fixture** from the **STEP TYPE** menu.

3. The system opens the **FIXTURE STEP** dialog box, which contains the following options:

   o **Name**—Specify the fixture name.

   o **Components**—Select components with which to fixture. Opens a menu with commands to **Assemble**, **Create**, **Disassemble**, **Reassemble**, and **Prev State**. **Reassemble** presents a list of previously disassembled fixture components. **Prev State** presents a list of all previous fixture steps.

Note: Use the **COMPONENT** menu to delete or redefine any of the fixture components.

   o **Comments**—Specify fixture comments. This is an optional field.

   o **Simplified Rep**—Specify a simplified representation for the step. This is an optional field.

   o **Time Estimate**—Specify a time estimate for the fixture setup. This is an optional field.

   o **Cost Estimate**—Specify a cost estimate for the fixture setup. This is an optional field.

4. Select the feature step fields you wish to define or change and click **Define**.

5. Click **OK** to commit and continue.

About General Steps

General steps types handle operations which do not involve any change to the geometry of the workpiece. These steps include painting, burnishing, inspection, and so on.

To Create a General Step

1. Click **New Step** from the **STEP LIST** menu.

2. Click **General** from the **STEP TYPE** menu.

3. The system opens the **GEN STEPS** menu and the **STEP: General** dialog box, which contains the following options:

    o   **Name**—Specify the general step name. This is an optional field.

    o   **Type**—Specify type of step. This is a required field.

    o   **Comments**—Specify general step comments. This is an optional field.

    o   **References**—Specify references for this general step. This is an optional field. Opens the **GEN REFS** menu which allows you to select component, feature, surface, edge, curve, quilt, datum, dimension or tolerance references to add to this general step.

    o   **Simplified Rep**—Specify a simplified representation for the step. This is an optional field.

    o   **Time Estimate**—Specify a time estimate for the general step. This is an optional field.

    o   **Cost Estimate**—Specify a cost estimate for the general step. This is an optional field.

    o   Select the feature step fields you wish to define or change and click **Define**.

    o   Click **OK** to commit and continue.

About Volume Steps

Volume steps handle operations which involve scaling the part, such as heat treating and shrinkage. Volume steps do not perform any changes to the component geometries.

To Create a Volume Step

1. Click **New Step** from the **STEP LIST** menu.

2. Click **Volume** from the **STEP TYPE** menu.

3. The system opens the **GEN STEPS** menu and the **STEP: Volume** dialog box, which contains the following options:

    o   **Name**—Specify the volume step name. This is an optional field.

    o   **Type**—Specify type of step. This is a required field.

    o   **Comments**—Specify volume step comments. This is an optional field.

    o   **References**—Specify references for the volume step. This is an optional field, which allows you to select component, feature, surface, edge, curve, quilt, datum, dimension or tolerance references to add to this general step.

    o   **Simplified Rep**—Specify a simplified representation for the step. This is an optional field.

- o **Time Estimate**—Specify a time estimate for the volume step. This is an optional field.

- o **Cost Estimate**—Specify a cost estimate for the volume step. This is an optional field.

- o Select the feature step fields you wish to define or change and click **Define**.

- o Click **OK** to commit and continue.

About Manufacturing Model Steps

Manufacturing model steps allow you to assemble workpieces and reference models through several options, including general manufacturing assemblies. Assembly of workpieces and reference models can be performed throughout the manufacturing process.

To Create a Manufacturing Model Step

1. Click **Step** from the **MFG SEQUENCE** menu.

2. Click **New Step** from the **STEP LIST** menu.

3. Click **Mfg Model** from the **STEP TYPE** menu.

4. The system opens the **STEP: Mfg Model** dialog box,which contains the following options:

   - o **Name**—Specify the manufacturing model setup name.

   - o **Components**—Selects components to manufacture. Opens a menu with options to create or assemble new components or select existing components from Pro/MFG.

   Use the **COMPONENT** menu to delete or redefine any of the manufacturing components.

   - o **Comments**—Specify manufacturing model comments. This is an optional field.

   - o **Simplified Rep**—Specify a simplified representation for the step. This is an optional field.

   - o **Time Estimate**—Specify a time estimate for the manufacturing model setup. This is an optional field.

   - o **Cost Estimate**—Specify a cost estimate for the manufacturing model setup. This is an optional field.

5. Select the feature step fields you wish to define or change and click **Define**.

6. Click **OK** to commit and continue.

About Surface Steps

Surface steps handle operations which involve offsetting one or more surfaces by some amount. Surface steps do not perform any changes to the component geometries.

To Create a Surface Step

1. Click **New Step** from the **STEP LIST** menu.

2. Click **Surface** from the **STEP TYPE** menu.

3. The system opens the **GEN STEPS** menu and the **STEP: Surface** dialog box, which contains the following options:

   o **Name**—Specify the surface step name.

   o **Type**—Specify type of step. This is a required field.

   o **Comments**—Specify surface step comments.

   o **References**—Specify references for the surface step. This is an optional field. You can use it to select component, feature, surface, edge, curve, quilt, datum, dimension or tolerance references to add to this general step.

   o **Simplified Rep**—Specify a simplified representation for the step.

   o **Time Estimate**—Specify a time estimate for the surface step.

   o **Cost Estimate**—Specify a cost estimate for the surface step.

   o Select the feature step fields you wish to define or change and click **Define**.

   o Click **OK** to commit and continue.

View Steps

To View a Process Step

1. Click **Play Steps** from the **MANUFACTURING** menu.

2. Click **Set Step** from the **STEP REGEN** menu. The system opens the **SELECT STEP** menu with the current active step check marked.

3. Select the step you want to view and click **Done**.

4. The system displays the current active step in the manufacturing process and highlights general or process references and material removals in magenta.

Note: Highlighting is performed for all step level commands; for example Next Step, Prev Step, Set Step, but not for any operation level commands; for example Previous Oper, Next Oper, or Set Operation.

To View a Previous or Next Step

1. Click **Play Steps** from the **MANUFACTURING** menu.

2. Click **Previous Step** from the **STEP REGEN** menu to view a previous step. The system displays the previous step in the manufacturing and highlights general or process references and material removals in magenta.

3. Click **Previous Step** from the **STEP REGEN** menu to view another previous step, or click **Done/Return**.

4. To view the next step, click **Next Step**. The system displays the next step in the manufacturing process and highlights general or process references and material removals in magenta.

To View the Process Operation

1. Click **Play Steps** from the **MANUFACTURING** menu.

2. Click **Set Operation** from the **STEP REGEN** menu. The system opens the **SELECT OPER** menu with the current active operation check marked.

3. Select the operation you want to view and click **Done**.

To View the Previous or Next Operation

1. Click **Play Steps** from the **MANUFACTURING** menu.

2. Click **Previous Oper** from the **STEP REGEN** menu. The system displays the model at the end of the previous operation.

3. Click **Next Oper** from the **STEP REGEN** menu to display the model at the end of the next operation, or click **Done/Return**.

Documenting the Process

Create Customized Documentation

About Drawing Mode

You can use Drawing mode to easily create in process documents, similar to the way you create a view of a part or assembly, by selecting a process step from a list. The system creates a default view of the process component at that step.

In Drawing mode, you can create customized documentation for the component process. Views of each step can be placed, component display controlled based on their status in the step, and report tables created using Pro/REPORT.

To Create Views of Process Steps

1. Click **Properties** from the **File** menu.

2. Click **Drawing Models** from the **FILE PROPERTIES** menu to add, remove, or set as current one of the drawing models.

3. Click **Set State** from the **DWG MODELS** menu to set the process state of the current drawing model, and then designate the process representation.

Using the **Process State** dialog box, you can select a process step and simplified representation.

Process State Dialog Box Options

The **Process State** dialog box contains a scrollable list that displays the process component steps. You can select a step to show in the view. If simplified representations are available, you can select one from the drop-down list. The system selects the representation for that process state by default.

The **Process State** dialog box also contains a **Final Mfg State** option which appears at the end of the list of process states. The **Final Mfg State** represents the state which was used when creating views or repeat regions of assembly machining assemblies prior to Pro/ENGINEER Release 18.0. The geometry is in its final state, and the active fixture is the last one activated in Pro/Mfg.

The **Final Mfg State** is useful in two ways:

- It allows you to obtain the state expected prior to Pro/ENGINEER Release 18.0. For example, you may have a machining assembly—which you may or may not have previously worked on in Pro/PROCESS for MFG—which is configured with the expectation that the pre-Release 18.0 state is used when creating the drawing. Hence, this state is necessary for compatibility with legacy models and legacy work habits

- If no fixture was activated in Pro/MFG, then it allows you to create views or repeat regions which always reference the final state of the manufacturing process, regardless of which steps are added, removed, or reordered in the future.

To Enter an Existing Drawing

1. Click **File > Open**.

2. Click **Type > Drawing** from the **File Open** dialog box

3. Enter the file name and click **Open**.

To Open a New Drawing

1. Click **File > New**.

2. Click **Type > Drawing** from the **New** dialog box.

3. Enter the file name and click **OK**.

4. From the **New Drawing** dialog box, you can specify a default model, also the sheet size and orientation for the drawing.

5. Click **OK**.

To Copy a Process Drawing Sheet

1. Select **Move or Copy Sheet** from the **DRAWING** menu.

2. From the **Move Sheet** dialog box, select the sheet after which you want to insert the moved or copied sheet.

3. Select **Copy process sheet** if you want to copy the sheet as a template for another process step.

4. Select a different process state from the **Process Stat**e dialog box and click **OK** to continue.

Note: For maximum performance in regenerating drawings, it is recommended that you create no more than one state per sheet.

The system copies the manufacturing processes and generates a new sheet. The **Copy process sheet** function preserves the scale and orientation of the process component. Click **Cancel** from the **Process State** dialog box to return to the **DRAWING** menu, or select another step and click **OK** to create more copies.

5. Select **Go to Sheet** from the **Views** menu and enter the new sheet number to view the newly generated sheet.

Sheets Menu Commands

If you have a license for Pro/DETAIL, you can use the **Sheets** command in the **DRAWING** menu to create multiple sheet drawings and move items from one sheet to another. You can view the sheets of a multi-sheet drawing using Pro/ENGINEER.

The **SHEETS** menu displays the following options:

- **Previous**—Display the previous sheet.

- **Next**—Display the next sheet.

- **Set Current**—Set a current sheet. This option is only available when there is more than one sheet.

- **Process State**—Set or resets the state for the entire sheet, for both views and repeat regions.

- **Add**—Create a new sheet at the end of the drawing.

- **Remove**—Delete a specified sheet or sheets from the drawing.

- **Reorder**—Move a sheet from its present position to another. If there are only two sheets, the system reorders them automatically.

- **Switch Sheet**—Move items (views, detail and draft items, and drawing tables) from one sheet to another. If the drawing has only one sheet, the system automatically creates a second sheet after you click items to move.

- **Format**—Add a drawing format to the sheet.

When there is more than one sheet in a drawing, an additional tag, SHEET # OF # displays at the bottom of the main window. When working with multi-sheet drawings, keep in mind the following:

- When you switch a projection view to another sheet, it becomes independent. You can then move the parent view, and the projection view on another sheet does not update. If you switch these views again to the same sheet, the projection view immediately becomes a child of the parent.

- You can change drawing scales on each sheet independently.

- Partial views stay unchanged on one sheet when you change the scale on another.

- If you erase a view on one sheet, you can resume it on any other sheet.

Read About Process State

To Change the Process Component State in a View

1. Click **Process State** from the **MODIFY VIEW** menu, then select a view of a process component. The system displays the **Process State** dialog box with the process component state and simplified representation used in the view selected in the lists.

2. Click the process component state and/or the simplified representation you want to change.

3. Click **OK**. The system changes the view process state to the selected process state. The system makes this state the current process component state when creating new views.

To Set Process Component State in New Views

1. Click **Set State** from the **DWG MODELS** menu. The system opens the **Process State** dialog box with the current process component state and simplified representation selected in the lists.

2. Click the process component state and/or the simplified representation you wish to set.

3. Click **OK**. The system sets this state as the current process component state when creating new views.

Process State Dialog Box Options

The **Process State** dialog box contains a scrollable list that displays the process component steps. You can select a step to show in the view. If simplified representations are available, you can select one from the drop-down list. The system selects the representation for that process state by default.

The **Process State** dialog box also contains a **Final Mfg State** option which appears at the end of the list of process states. The **Final Mfg State** represents the state which was used when creating views or repeat regions of assembly machining assemblies prior to Pro/ENGINEER Release 18.0. The geometry is in its final state, and the active fixture is the last one activated in Pro/Mfg.

The **Final Mfg State** is useful in two ways:

- It allows you to obtain the state expected prior to Pro/ENGINEER Release 18.0. For example, you may have a machining assembly—which you may or may not have previously worked on in Pro/PROCESS for MFG—which is configured with the expectation that the pre-Release 18.0 state is used when creating the drawing. Hence, this state is necessary for compatibility with legacy models and legacy work habits

- If no fixture was activated in Pro/MFG, then it allows you to create views or repeat regions which always reference the final state of the manufacturing process, regardless of which steps are added, removed, or reordered in the future.

Specific Process Considerations

About Process-Specific Considerations

Some process-specific considerations include: adding a view or repeat region, modifying a view or repeat region, switching sheets of views or repeat regions, and the default model's process state.

About Adding a View or Repeat Region

When the current default model is a machining process assembly and a view or repeat region of the current default model exists on the current sheet, then the new view or repeat region's process state becomes that of the existing view or repeat region. The simplified representation of the view or repeat region being added becomes that of the current, default model.

About Modifying a View or Repeat Region

When you select a view of a machining process assembly using **Modify View** and **ProcessState** and then change the process state, this change applies to all views and repeat regions of this assembly on the current sheet. This change also applies to any sheet containing child views from the current sheet—-and so on recursively. Use the **Model/Rep** user interface to examine tables describing this behavior.

The system prompts you to confirm or cancel this change if it affects any view or repeat region which you did not originally select for modification. The simplified representation specified only affects the views or repeat regions which you originally selected.

About Switching Sheets of Views or Repeat Regions

When switching sheets for views or repeat regions of machining process assemblies, for the views or repeat regions of each of these assemblies, consider the following:

- If there are no views or repeat regions of the assembly on the target sheet, or the process state of such views or repeat regions is the same as that of the view or repeat region being moved, then nothing changes from the current system behavior. This is the same as the current Pro/PROCESS for ASSEMBLIES behavior.

- If there are views or repeat regions of the assembly on the target sheet, or the process state of such views or repeat regions is not the same as that of the view or repeat region being moved, each complete set of related views simply has its process state changed to that existing on the target sheet.

If you select any view to move whose parent or child view you did not selected to move, the system prompts you to confirm or cancel changing the state of all other sheets upon which related views remain.

About Machining Process Assembly as Default Model

When the current, default model is a machining process assembly, consider the following:

- The **Dwg Models** menu option **Set State** is dimmed except when the current sheet has no views or repeat regions of this assembly.

- When you enter a sheet containing views or repeat regions of this assembly, the current, default process state changes to that of the views or repeat regions on the entered sheet.

- If you use the **Set Model** option to switch the current model to a machining process assembly which appears on the current sheet, the system switches the process state of this newly current model to that appearing on the current sheet.

Reports

To Create a New Report

1. Click **File > New > Report**.

2. Enter the name of the report and click **OK** to open the **New Report** dialog box.

3. Specify a sheet size with **Set Size**, or use the **Retrieve Format** to retrieve a format that you previously created.

4. Click an instance and click **Open** to display a drawing sheet in the active window, and the **REPORT** menu.

5. Click **REPORT > Table**.

6. Click **Create**.

7. Define a repeat region. Click **Repeat Region** from the **TABLE** menu, and then click **Add** from the **TBL REGIONS** menu.

8. Pick the cells that you want to include to repeat with model.

9. Enter title text in a row or column outside of the repeat region (unless you want that text to repeat with every occurrence of model data) by using **Enter Text** and typing the desired text.

10. The repeat region in the table must contain symbol parameter information to be displayed in the table. You can enter these using the keyboard by choosing **Enter Text** from the **TABLE** menu and **Keyboard** from the **ENTER CELL** menu; or you can click **Report Sym** from the **ENTER CELL** menu.

11. Add the process model to the report by clicking **Views** from the **REPORT** menu and entering the name of the process.

12. To add views of the assembly to the report, continue by adding a general view to the sheet. If you do not want views of the model in the report, click **Quit** from the **VIEW TYPE** menu and **Done/Return** from the **VIEWS** menu. The system still adds the model to the report, but it does not display it on the sheet. You can add the drawing views at any time.

13. If necessary, click **Repaint** to display the contents of the table.

14. You can add a drawing format to the report or change it by selecting **Format** from the **SHEETS** menu and **Add/Replace** from the **DRAW FORMAT** menu. You can predefine tables on these drawing formats and save them to be recalled at any time into a report or drawing.

You may also add the drawing table used in the report by including it in a drawing format that you can retrieve. When you add a drawing format containing a table to a report, drawing, or layout, the table becomes independent of the format. If you decide to replace the format, the table highlights, and you can delete it.

Pro/REPORT Parameters for Manufacturing Process Drawings

Drawings of manufacturing processes are the same as drawings of any other Pro/ENGINEER object. However, special parameters are available using Pro/REPORT to create a custom table detailing the component process. An entire list of available system parameters appears in the following table.

When creating a report, it is important to consider the structuring of the symbols in the report. Pro/REPORT parameters used in Pro/PROCESS for MFG are based upon either the current step or operation in the drawing or all steps and/or operations in the drawing.

Parameter Name	Definition
`&mfg.actoper.actstep.comp.name`	Lists the names of all manufacturing processes in the currently active step associated with the currently active operation.
`&mfg.actoper.actstep.comp.type`	Lists the types of all manufacturing processes in the currently active step associated with the currently active operation.
`&mfg.actoper.actstep.comp.param.name`	Lists the names of all parameters for each process component in the currently active step associated with the currently active operation.
`&mfg.actoper.actstep.comp.param.value`	Lists the values of all parameters for each process component in the currently active step associated with the currently active operation.
`&mfg.actoper.actstep.name`	Lists the name of the currently active step associated with the currently active operation.
`&mfg.actoper.actstep.param.name`	Lists the names of all parameters associated with the current process step associated with the currently active operation.
`&mfg.actoper.actstep.param.value`	Lists the values of all parameters associated with the current process step associated with the currently active operation.
`&mfg.actoper.actstep.tool`	Lists the tool of the currently active step associated with the currently active operation.

Parameter Name	Definition
`&mfg.actoper.actstep.type`	Lists the type of the currently active step associated with the currently active operation.
`&mfg.actoper.step.comp.name`	Lists the name for each component associated with the currently active operation.
`&mfg.actoper.step.comp.type`	Lists the types of all manufacturing processes for all steps associated with the currently active operation.
`&mfg.actoper.step.comp.param.name`	Lists the names of all parameters for each process component associated with the currently active operation.
`&mfg.actoper.step.comp.param.value`	Lists the values of all parameters for each process component associated with the currently active operation.
`&mfg.actoper.step.name`	Lists the name for each step associated with the currently active operation.
`&mfg.actoper.step.param.name`	Lists the names of all parameters for each step associated with the currently active operation.
`&mfg.actoper.step.param.value`	Lists the values of all parameters for each step associated with the currently active operation.
`&mfg.actoper.step.tool`	Lists the tool for each step associated with the currently active operation.

Parameter Name	Definition
`&mfg.actoper.step.type`	Lists the type for each step associated with the currently active operation.
`&mfg.oper.step.comp.name`	Lists the names of all components for all operations.
`&mfg.oper.step.comp.param.name`	Lists the names of all parameters for each process component for each step associated with all operations.
`&mfg.oper.step.comp.param.value`	Lists the values of all parameters for each process component for each step associated with all operations.
`&mfg.oper.step.comp.type`	Lists the type of component being processed for each step associated with all operations.
`&mfg.oper.step.name`	Displays the name of each step associated with all operations.
`&mfg.oper.step.param.name`	Lists the names of all parameters associated with the steps associated with all operations.
`&mfg.oper.step.param.value`	Lists the values of all parameters associated with the steps associated with all operations.
`&mfg.oper.step.tool`	Displays the tool for every step associated with all operations.
`&mfg.oper.step.type`	Displays the type for every step associated with all operations.

Repeat Regions in Reports

Repeat regions are user-defined rows, columns, or combinations of rows/columns (cells) that duplicate themselves to accommodate the amount of data that the model currently possesses. They contain the following:

- System and user-defined parameters (such as description, time, and cost) for which the values are extracted from the model that is associated with the report.

- Standard table text

By using repeat regions, your tables that contain report data can expand and contract with varying quantities of data supplied by the models.

If you have a license for Pro/REPORT, you can create a repeat region in any mode in which you can create a table (Drawing, Report, Layout, Diagram, or Format mode). You can nest repeat regions or make them two-directional.

Other Process Functions

About Obtaining Information

Using the main Info menu, you can access general information concerning mass properties, Bill of Materials, measure etc. To obtain process-specific information such as cost, time estimates, and component usage lists, use the **Process** command on the **Info** menu.

The **Process Info** menu has the following commands:

- **Sequence Info**—Display an Information Window containing the textual information from the process sequence, including the description and type of each step, all attribute names, and the corresponding values.

- **Step Info**—Display an Information Window containing the textual information on selected process steps.

Using these options, you can access an information window that displays the complete process sequence. It includes information such as the step type, description, all attributes, and their values. The system saves this information to a file as it is displayed, so you can print it without actually stepping through all of the steps.

About Step Information

You can obtain information about a particular step by using the Info option in the **Select Step** dialog box, or the main **Info > Process** menu. If you choose one of these options, the system displays an Information window containing the following:

- Step number and type

- Machining defined

- Abbreviated description of the step description

- Time estimate

- Cost estimate

- Simplified representation name

- Full description

When you show the status of components in the design assembly, you can add a column in the model tree called process status, which lists the current status of all components (that is, assembled, not assembled, assembling, and so on.)

Simplified Representations

About Using Simplified Representations with Large Design Assemblies

Simplified representations can increase your ability to work effectively with large design assemblies. They improve visual clarity and performance. They are used to simplify the process model by excluding or substituting components for all steps or to simplify only the current state (that is, step). Simplified representations of the design model can also be used when creating process steps in the manufacturing process.

Note: When dealing with simplified representations on models, be sure that references you have removed do not affect downstream applications. For example, if you place a machine coordinate system on a fixture, and then use a simplified representation to remove the fixture for display purposes, it is possible toolpaths will not compute as their references no longer exist.

To Create Simplified Representations for a Process Model

1. Select **Simplfd Rep** from the **MANUFACTURING** menu.

2. Create or set the current representation.

Components are excluded or substituted for only one step in the process assembly by creating or setting the current representation when defining or redefining the step.

To Apply Simplified Representations to a Step

1. Open the **STEP** dialog for the desired step.

2. Click **Simplfd Rep** from the **STEP** dialog box to set or create a simplified representation for the step.

   You can use simplified representations of the design assembly when you create assemble steps in the process assembly.

To Retrieve a Simplified Representation From a Process

1. Create a simplified representation of the process component before adding the design model to the process.

2. Creating a simplified representation of the process component provides the **Retrieve Rep** menu selection when you add a model to the process.

Note: Components excluded in the design model do not appear on the screen in phantom line font but appear in the Model Tree of the assembly where they are selected.

Sample Session

About the Sample Session

This group of Help topics represents a sample session on a process model. The sample session includes retrieving the model, checking the play steps functionality, checking the copy process functionality, defining a new operation, and creating drawings; and presents some basic Pro/PROCESS for MFG features.

To Retrieve the Process Model

1. Select **File > Open**.

2. Type the manufacturing part name. The system regenerates the process model, displays the last step in the process model, and displays the part's model tree.

Example: Retrieved Process Model

The process model is a rough out on the inside of the part.
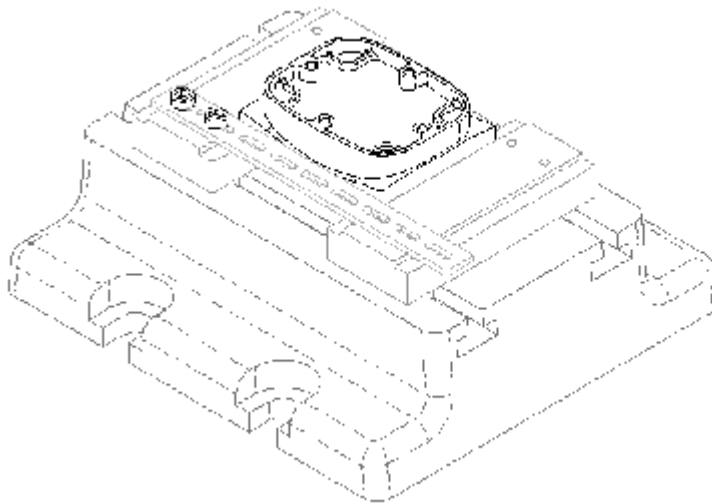
To Create Drawings

1. To create a new drawing sheet click **File > New**.

2. Click **Type > Drawing**.

3. Click **OK** to open the **New Drawing** dialog box.

4. Select a default model and a template.

5. Click **Done** to create the drawing and open the **DRAWING** menu and the **DETAIL** menu.

6. To add or modify views and data placement on the drawing sheet, click **Views > Add View** from the **DRAWING** menu.

To Use the Play Steps Functionality

1. Select **Play Steps > Set Step**. The system displays the **Select Step** menu with the last step checked as the active step.

2. Select the step you wish to set as active and click **OK**.

3. To roll the model forward one step, select **Next Step** from the **Step Regen** menu. The system displays material removals and process references in magenta.

Note: The step display allows you to interactively examine the model.

Example: MFG Model Stock Assembled

The figure below represents Step 1.
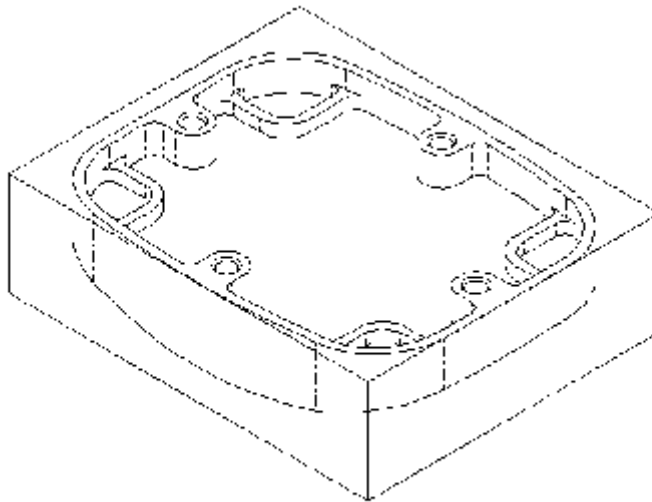
STEP 1: Mfg Model

The following three figures represent Step 2, Step 3, and Step 4 of the model.

STEP 2 FRETTO
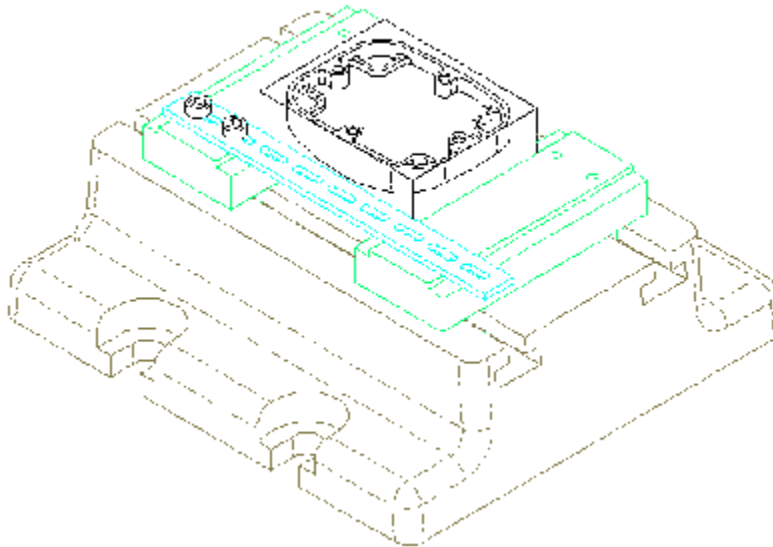
Note: Rolling the model from step to step represents successive processing steps; that is process planning stages.

STEP 3 PROFILE

STEP 4: FACE1
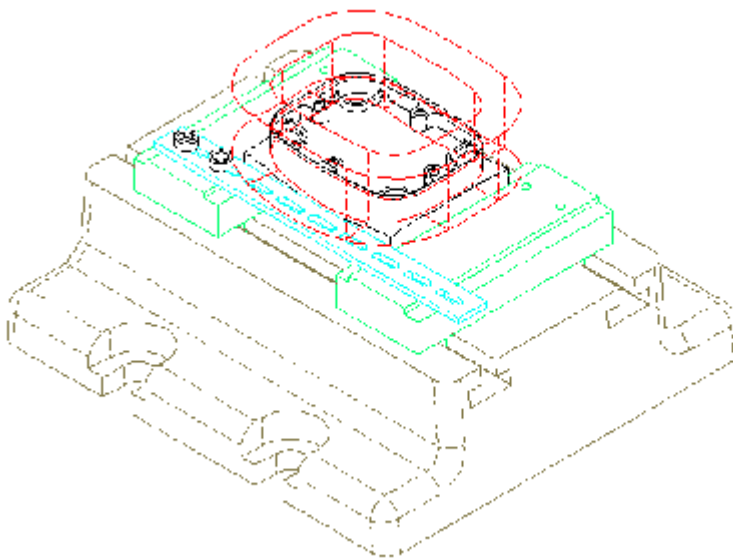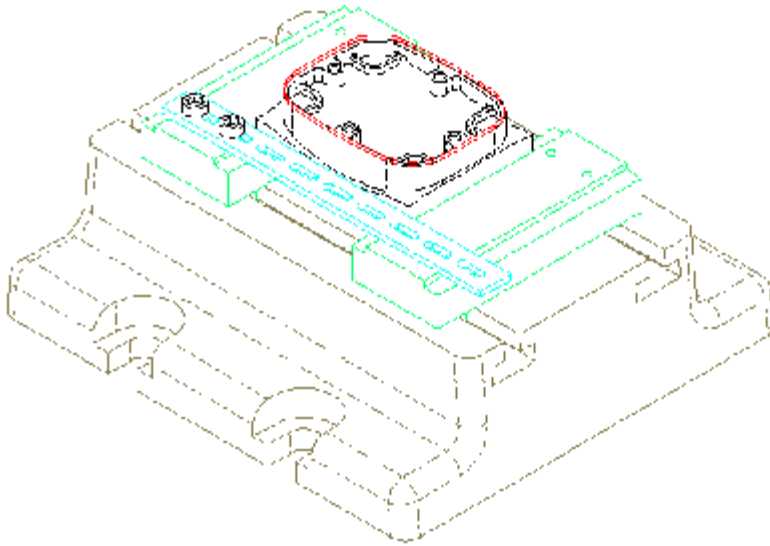
To Use the Copy Process Functionality

The **Copy Process** functionality allows you to refer to a predefined sheet as a template for subsequent sheets. The process plan model is maintained within process plan files. It may be necessary for you to document route sheets and/or process plan sheets using the Pro/DETAIL function.

1. Click **File > Open**.

2. Enter the name of the drawing. The system regenerates the drawing and displays the first sheet in the drawing.

3. To move to the next drawing select **Insert** > **Sheet**. The system displays the next drawing sheet.

4. To copy the process select **Edit** > **Move or Copy Sheet**. The system displays the **Process State** dialog box, from which you can select the process state for the next sheet by clicking **OK**.

5. To set the current sheet, select **View** > **Go to Sheet**. Enter the desired sheet number directly and click **Go To**. You can then navigate to the previous or next sheet by selecting the appropriate option.

Example: Copy Process Functionality

The example drawings shown below are of the cover plan.

Cover Plan Sheet 1 of 3 with Notes
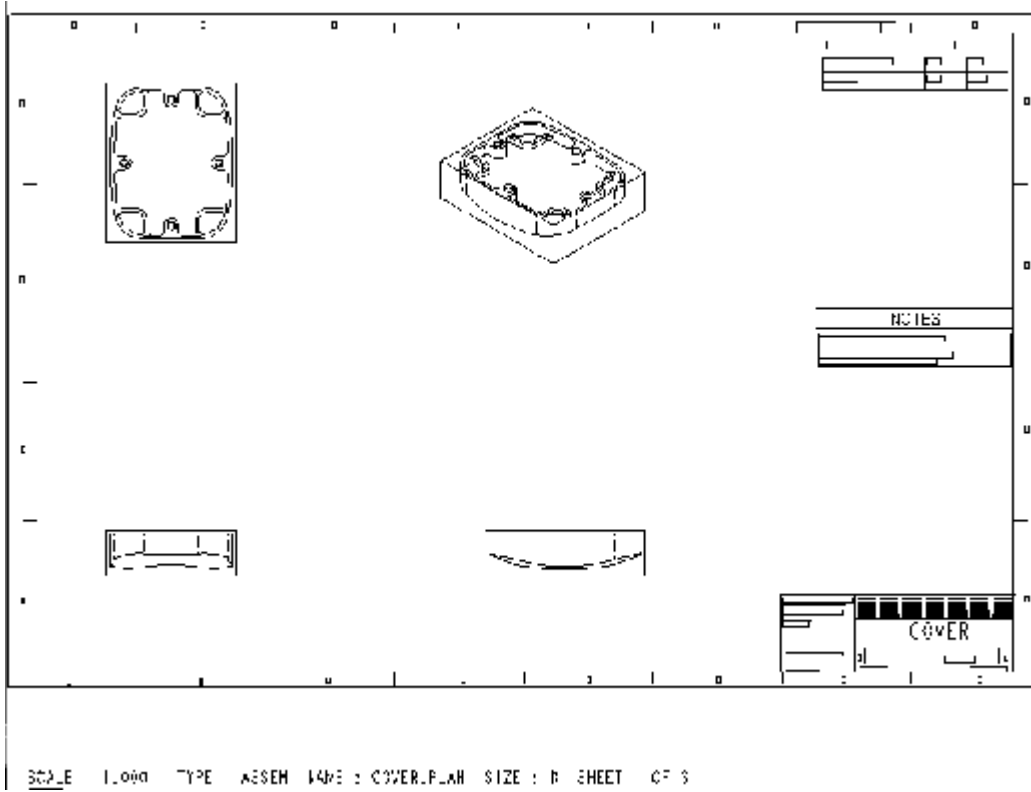
Manufacturing Step	Tool	Time
Mfg Model	None	0.500

D

C

NOTES

Operational Process Design Notes:

Select and Inspect the proper size
machine stock. (Recommend A-10)

NAME : COVER_PLAN   SIZE : D   SHEET 1 OF 3

Cover Plan Sheet 2 of 3 with Notes is shown below
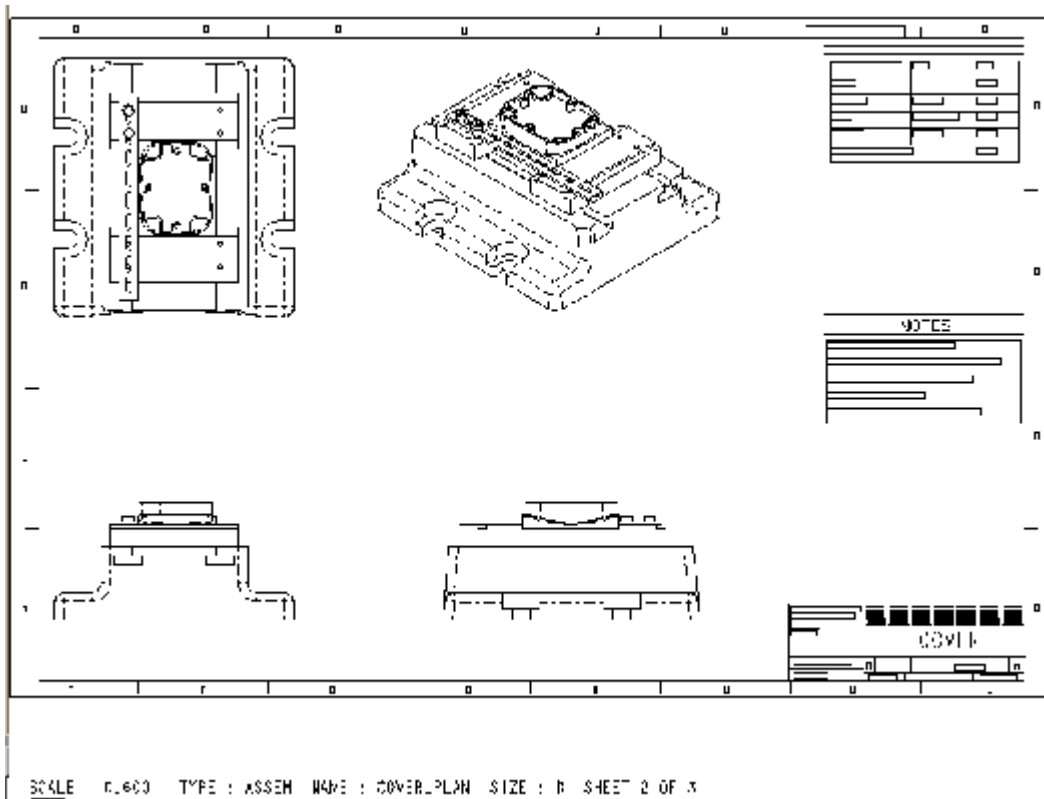
Manufacturing Step	Tool	Time
FSETP0		0.250
PROFILE_1	1_000FEM	0.150
FACE1	2_000SH_MILL	0.250
VOLUME_1	1_000FEM	0.600
Total Operation Time:		1.250

NOTES

Operational Process Design Notes:

Assemble the fixture (in configuration op10).

Profile the outer surface of the part.

Face the top of the part.

Rough out the inside volume of the part.

AME : COVER_PLAN   SIZE : D   SHEET 2 OF 3

Cover Plan Sheet 3 of 3 with Notes is shown below.
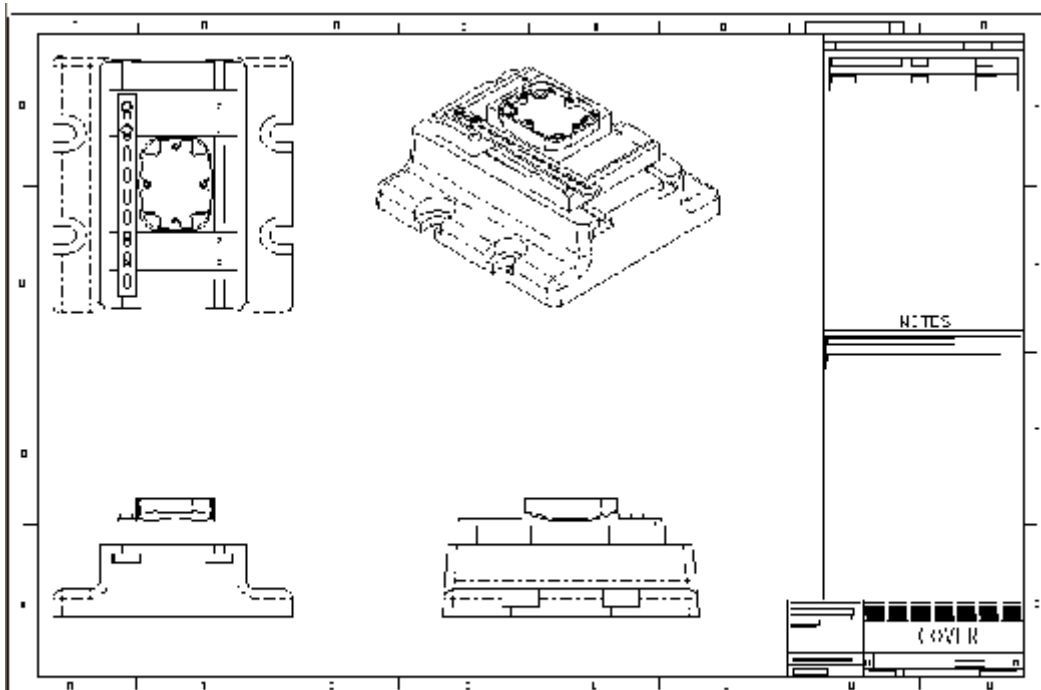
Manufacturing Step	Tool	Time
FSETP0	None	0.250

D

C

NOTES

Operational Process Design Notes:

Assemble the fixture (in configuration op10).

NAME : COVER_PLAN   SIZE : D   SHEET 3 OF 3

Sheet 4 is set as the current (see Copy Process Sheet 4 Set as Current.)
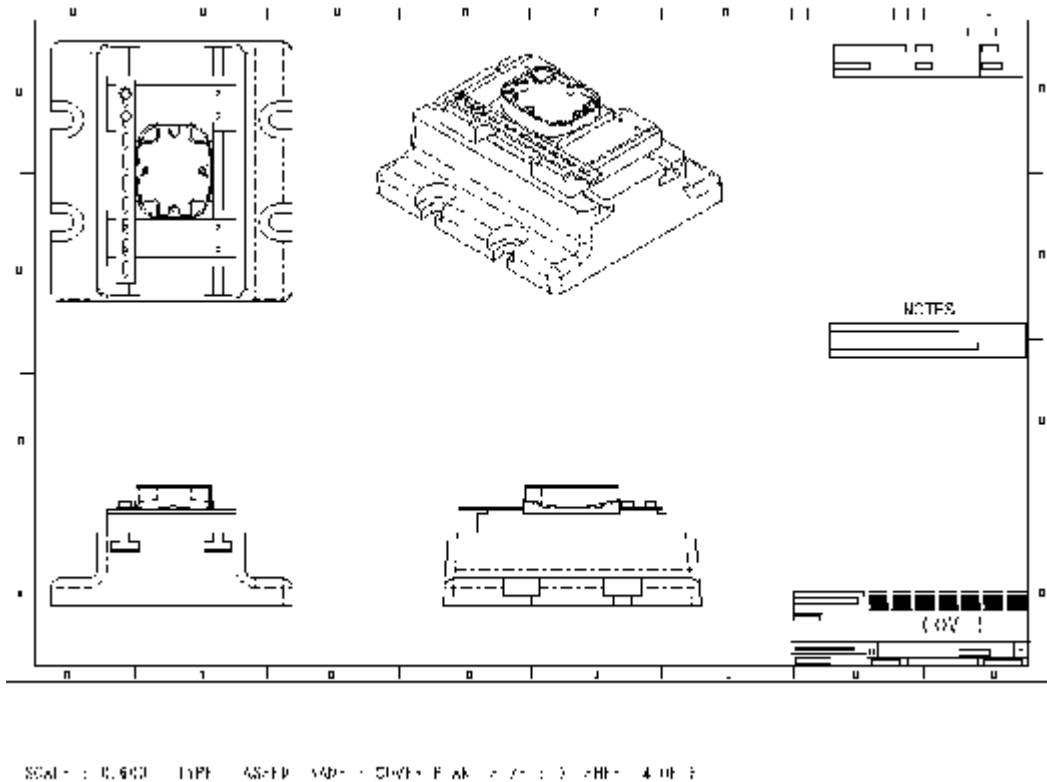
To Define a New Operation

1. Click **File > New**.

2. Click **Type > Manufacturing**, and **Sub-type > Process Plan** to open the **MANUFACTURING** menu.

3. Click **Mfg Sequence** to open the **MFG SEQUENCE** menu.

4. Click **Operation** to open the **DEFINE OPER** menu from which you can define the new operation.

   For this example, **Workcell** is checked along with **Done Oper**, and menu commands **Workcell > Use Prev > OP020** are selected. This indicates that the workcell used for this new step is the same as the one used in a previous operation (**OP020**).

As shown in the dialog box below, the name of the fixture step is defined as SETUP_2, one fixture component is disassembled and then reassembled onto the part, comments are entered, no simplified representation is defined, a time estimate of 0.15 and a cost estimate of 5.00 are supplied.

FIXTURE STEP

Element	Info

Name	SETUP_2
Components	1 fixture compone
Comments	Reassemble the pa
Simplfd Rep	Optional
Time Estimate	Value = 0.150000
Cost Estimate	Value = 5.000000

Define	Refs	Info
OK	Cancel	Preview

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