PC-DMIS Inspection Planner

PC-DMIS™ Enhancement for Versions 3.7 and Above

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PC-DMIS Inspection Planner

Inspection Planner: Introduction

PC-DMIS Inspection Planner, or IP, only works with PC-DMIS Version 3.6 and above.

PC-DMIS™ Inspection Planner (*IP*) is an add-in module that works in conjunction with a supported CAD package and PC-DMIS to aid the Design Engineer or Quality Engineer in designing a plan that determines which features of the geometry and GD&T/dimension to use in the inspection process.

Inspection Planner (*IP*) uses the PC-DMIS CAD engine, providing access to IGES, STEP, and the other translators, as well as PC-DMIS's supported Direct CAD Interfaces™. This gives you wide coverage of available CAD engines and systems.

Since IP runs inside your CAD package, it cuts your learning curve since you will only need to use a small portion of PC-DMIS for Windows to generate the part program.

Inspection Planner supports these CAD packages:

- CATIA V5
- SolidWorks
- Unigraphics

This manual will walk you through the steps to get IP running with your CAD package and will discuss how to use IP commands inside PC-DMIS to automatically generate the PC-DMIS part program.

This documentation covers these topics:

- Using PC-DMIS Inspection Planner for CATIA V5
- Using PC-DMIS Inspection Planner for SolidWorks
- Using PC-DMIS Inspection Planner for Unigraphics
- Using Inspection Planner within PC-DMIS
- Inspection Planner Parameters and Rules

Using PC-DMIS Inspection Planner for CATIA V5

This topic describes how to install and use PC-DMIS Inspection Plan within CATIA V5. IP allows you to perform various sub tasks needed to create an Inspection Plan that you can either store with your CAD data or export as a text file.

The Inspection Planner option must be enabled on your portlock to use the Inspection Planner capabilities for CATIA 5.

Installing Inspection Planner for CATIA V5

1. Log on to the Wilcox ftp site: ftp.wilcoxassoc.com. Browse to the Inspection Planner/CatiaV5/ directory. Download the required CATIA V5 Inspection Planner install file. Download the **InspectionPlanner_CATIA_V5_R13.exe for CATIA V5 version 13** for CATIA V5 release 13 or **InspectionPlanner_CATIA_V5_R14.exe** for CATIA V5 release 14 to a specified directory on your hard drive.
2. Double-click on the **InspectionPlanner_CATIA_V5_R1X.exe** for CATIA V5 version 13 or 14 file to begin the installation of IP for CATIA V5
3. The Setup program will prompt you to select the location of the CATIA V5 installation directory. Browse to the CATIA installation directory (e.g. C:\Program Files\Dassault Systemes\B14), and click **OK**.
4. You will then be prompted to select the location of the PC-DMIS installation directory. Browse to the PC-DMIS installation directory, and click **OK**.
5. The Setup program will then prompt you to select the location where PC-DMIS Inspection Planner for CATIA V5 will be installed. The default directory might look something like this: C:\PCDMISW\InspectionPlanner\CatiaV5.
6. Next, setup will prompt you to verify the location of the CATIA install and the directory for the IP installation.
7. Click **OK** if everything is correct.
8. The Setup program now copies files for **PC-DMIS Inspection Planner for CATIA V5** to this newly created directory.

The Setup program will check to see if the needed file structure and files for CATIA V5 are properly installed in the directory you previously specified. An error will occur if the files do not exist. If everything installs correctly, then an **InspectionPlannerTest** shortcut will be added to the desktop.

Important: The new shortcut must be used to start CATIA V5 to set up the proper environment for Inspection Planner to work within your CATIA V5 install.

To start the PC-DMIS Inspection Plan application

To start a PC-DMIS Inspection Plan session from within your CATIA V5 session, follow this procedure:

1. Start CATIA V5 using the **InspectionPlanner_R**** shortcut which should be on the desktop. You must use this shortcut rather than the regular CATIA V5 shortcut for Inspection Planner to work correctly
2. Within CATIA's Product Structure or Part Design workbenches, you should see three new toolbars; **IP_Tools**, **IP_Features**, and **IP_Commands**.

IP Toolbars for CATIA V5

Once you have started the PC-DMIS Inspection Planner application, you may create, list, and edit IP features, commands, and Inspection Plans.

IP_Tools Toolbar

The **IP_Tools** toolbar contains a number of miscellaneous tools for use in creating, editing, exporting, and using Inspection Plans.

Creating a New Inspection Plan

To create a new PC-DMIS Inspection Plan, follow this procedure:

1. Select the **New Inspection Plan** icon on the toolbar.
2. The **Plan** dialog box appears.

Plan dialog box

3. Type a name for the Plan in the **Label** box.

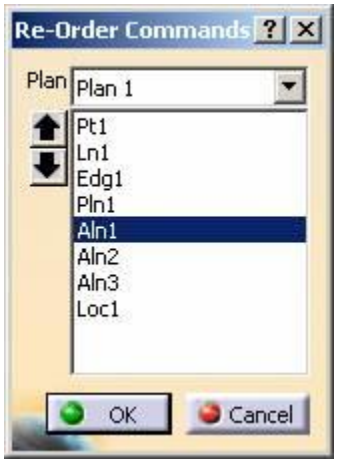
4. Click **OK** to save the Plan's name. This creates a new **InspectionPlanner** node in the feature tree. This node has two children, **Plans** and **IP Features**. The new plan is placed under the **Plans** node.

CATIA Feature tree

Changing the order of the Items in a Plan

To change the order of the commands in a selected plan, follow this procedure:

1. Select the **Reorder Commands** icon on the toolbar.
2. The **Re-Order Commands** dialog box appears.



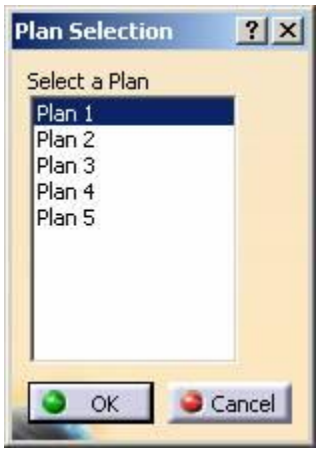
Re-Order Commands dialog box

3. Select the plan to edit from the **Plan** drop-down list.
4. All the items in the plan will appear in the list.
5. To change the order of the items, select an item, and the click the **up arrow** to move it up in the list, or click the **down arrow** to move it down in the list.
6. Select the **OK** button to apply the changes to the plan.

Exporting a Plan to a File

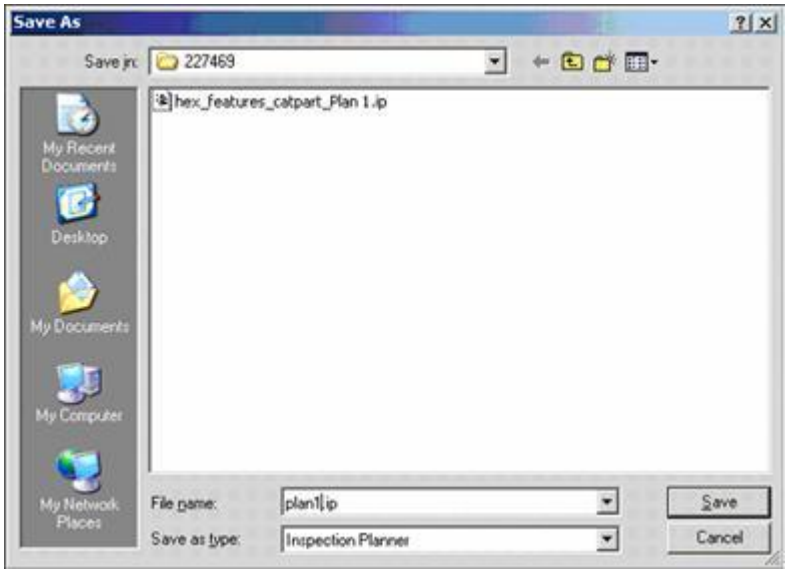
To Export a previously created Inspection Plan for use within PC-DMIS, follow this procedure:

1. Select the **Text Output** icon on the toolbar.
2. The **Plan Selection** dialog box appears.



Plan Selection dialog box

3. Select the plan to export.
4. Click the **OK** button. A standard Windows **Save File** dialog box appears.



Windows save file dialog box

5. Browse to the location where you would like to save the file. Type a name for the Inspection Planner file in the **File name** box
6. Click **Save** to export the file. This text file can be imported into PC-DMIS. See "Importing the Inspection Plan".

Updating Features

Select the **Update** icon on the toolbar. This will update all of the features if the model geometry or assembly has changed.

Activating a Plan

To ensure that all Features or Commands are added to the appropriate plan, follow these steps:

1. Select the **Activate Plan** icon on the toolbar.
2. Select a plan from the feature tree (As discussed in "Creating a New Inspection Plan").
3. The selected plan is now the active plan.

IP_Features Toolbar

Using the **IP_Features** toolbar you can create and add features to an existing plan. Or, if you don't have a plan yet, you can create a feature and IP will automatically create a new plan for you.

Once you have created a new Inspection Plan, you can create features for that Inspection Plan. The general method of creating features is as follows:

1. From the **IP_Features** toolbar, select the feature type you want to create (listed below). A dialog box, specific to the feature you selected, appears. Inspection Planner supports the following features:

   - Point
   - Line
   - Edge Point
   - Plane
   - Cylinder
   - Sphere
   - Circle
   - Round Slot
   - Square Slot

2. Using the mouse, select the face, edge, or vertex from the CAD display that will be used for the feature. You may be asked to select with the mouse again, depending on the type of feature you are defining and the CAD object first selected. The **Open Feature** dialog box will display the correct values provided from the CAD data. You can edit these values as needed.

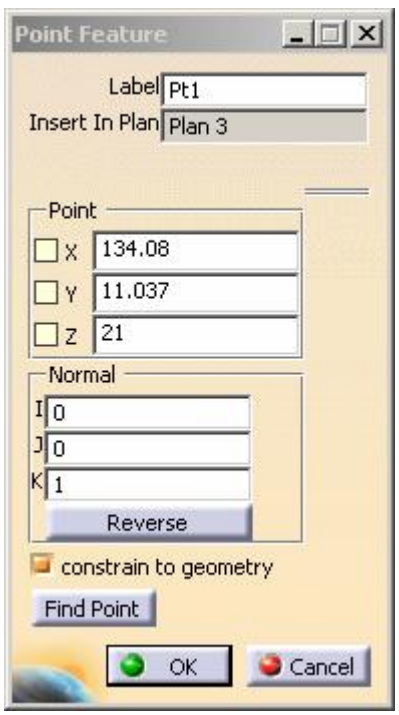
3. Click the **OK** button to accept your changes and create the feature. This feature will be added to the **IP Features** node in the Inspection Planner tree as well as to the currently active plan.

If no plan has been created, then creating any feature or command will automatically create a new plan and place that feature or command in that plan.

The dialog box for each specific type of feature is explained below:

Creating a Point Feature

1. Select the **Point** icon on the toolbar.
2. The **IP Point Feature** dialog box appears.
3. Indicate the location of the point feature by clicking on any surface. The X, Y, and Z values for the selected point appear in the dialog box.

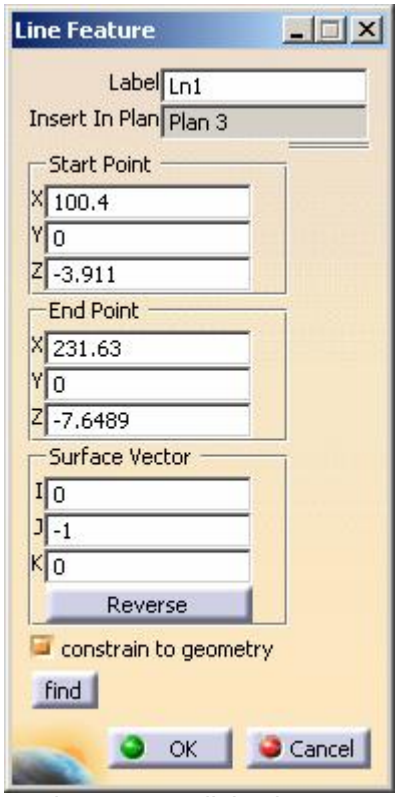


IP Point Feature dialog box

4. Change the **Label** for the point if needed.
5. Select the needed plan from the **Plans** section of the **InspectionPlanner** Node in the feature tree. The selected plan is displayed in the **Insert In Plan** box.
6. Change the values for the **XYZ** coordinates and the **IJK** vector values as needed.
7. Selecting **Reverse** will reverse the direction of the vector.
8. If you select the **constrain to geometry** check box, IP will tie this feature to the selected geometry. If the geometry changes, then so will the feature.
9. If you change the values, then the values no longer reflect the model geometry. You must either select the **Find Point** button to find the closest point on the geometry, or deselect the **constrain to geometry** check box before you can create the point.
10. Click **OK** to accept the current values and add the point feature to the current Inspection Plan.

Creating a Line Feature

1. Select the **Line** icon on the toolbar.
2. The **IP Line Feature** dialog box appears.
3. Indicate the location of the start point of the line feature by clicking the first point on any surface. IP inserts that start point location into the dialog box.
4. Indicate the location of the end point of the line feature by clicking a second point on any surface. IP inserts that end point location into the dialog box.

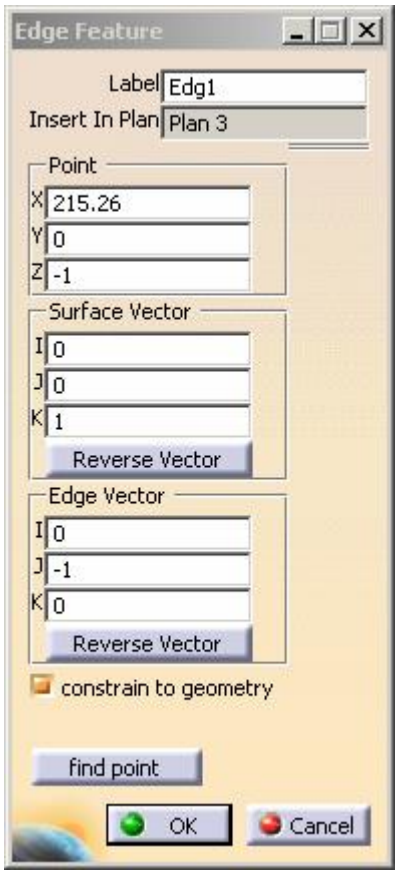


IP Line Feature dialog box

5. Change the **Label** for the line if needed.
6. Select the needed plan from the **Plans** section of the **InspectionPlanner** Node in the feature tree. The selected plan is displayed in the **Insert In Plan** box.
7. Change the values for the **XYZ** coordinates and the **IJK** vector values as needed.
8. Selecting **Reverse** will reverse the direction of the vector.
9. If you select the **constrain to geometry** check box, IP will tie this feature to the selected geometry. If the geometry changes, then so will the feature.
10. If you change the values, then the values no longer reflect the model geometry. You must either select the **find** button to find the closest point on the geometry, or deselect the **constrain to geometry** check box before you can create the line.
11. Click **OK** to accept the current values and add the line feature to the current Inspection Plan.

Creating an Edge Point Feature

1. Select the **Edge Point** icon on the toolbar.
2. The **IP Edge Feature** dialog box appears.
3. Indicate the location of the edge point feature by clicking on any surface near an edge. The point will snap to the nearest edge of the surface. IP inserts the point's location into the dialog box.

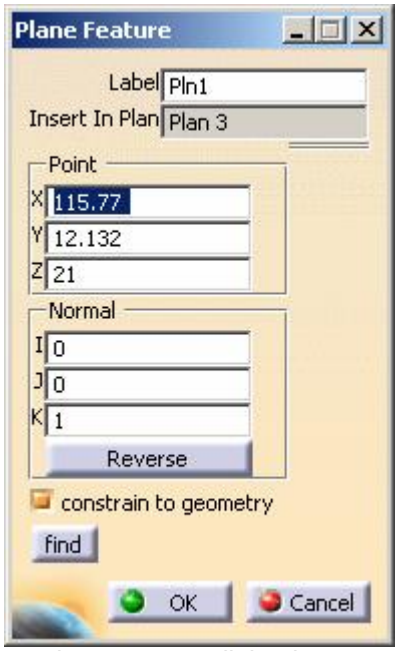


IP Edge Feature dialog box

4. Change the **Label** for the edge point if needed.
5. Select the needed plan from the **Plans** section of the **InspectionPlanner** Node in the feature tree. The selected plan is displayed in the **Insert In Plan** box.
6. Change the values for the **XYZ** coordinates and the **IJK** vector values as needed.
7. Selecting **Reverse** will reverse the direction of the vector.
8. If you select the **constrain to geometry** check box, IP will tie this feature to the selected geometry. If the geometry changes, then so will the feature.
9. If you change the values, then the values no longer reflect the model geometry. You must either select the **find point** button to find the closest point on the geometry, or deselect the **constrain to geometry** check box before you can create the point.
10. Click **OK** to accept the current values and add the edge point feature to the current Inspection Plan.

Creating a Plane Feature

1. Select **Plane** icon on the toolbar.
2. The **IP Plane Feature** dialog box appears.
3. Indicate the location of the plane feature by clicking any surface. IP inserts the plane's location and vector data into the dialog box.

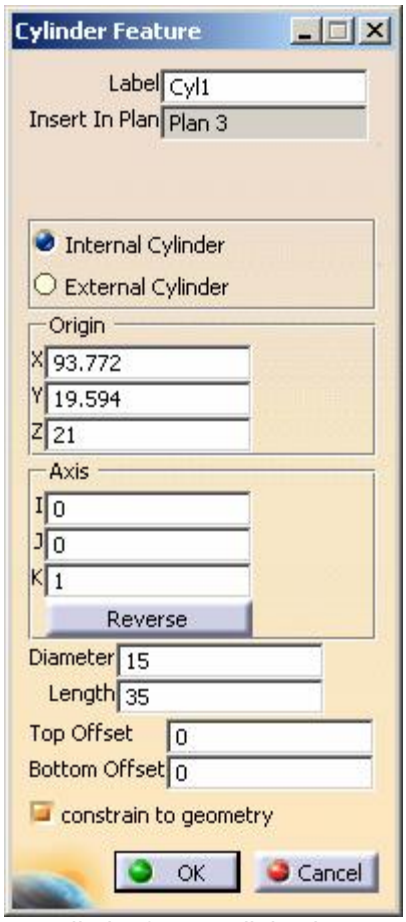


IP Plane Feature dialog box

4. Change the **Label** for the plane if needed.
5. Select the needed plan from the **Plans** section of the **InspectionPlanner** Node in the feature tree. The selected plan is displayed in the **Insert In Plan** box.
6. Change the values for the **XYZ** coordinates and the **IJK** vector values as needed.
7. Selecting **Reverse** will reverse the direction of the vector.
8. If you select the **constrain to geometry** check box, IP will tie this feature to the selected geometry. If the geometry changes, then so will the feature.
9. If you change the values, then the values no longer reflect the model geometry. You must either select the **find** button to find the closest point on the geometry, or deselect the **constrain to geometry** check box before you can create the plane.
10. Click **OK** to accept the current values and add the plane feature to the current Inspection Plan.

Creating a Cylinder Feature

1. Select the **Cylinder** icon on the toolbar.
2. The **IP Cylinder Feature** dialog box appears.
3. Indicate the location of the cylinder feature by clicking the cylindrical surface of a cylinder. IP inserts the cylinder's origin and axis into the dialog box.

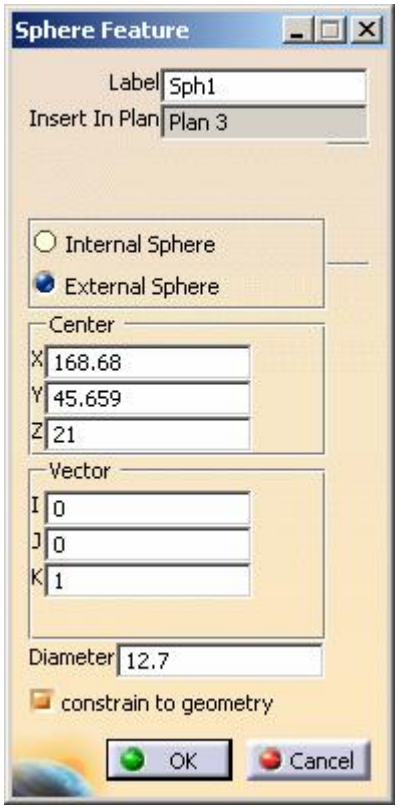


IP Cylinder feature dialog box

4. Change the **Label** for the cylinder if needed.
5. Select the needed plan from the **Plans** section of the **InspectionPlanner** Node in the feature tree. The selected plan is displayed in the **Insert In Plan** box.
6. Select either an **Internal Cylinder** or **External Cylinder**.
7. Change the values for the **XYZ** coordinates and the **IJK** vector values as needed.
8. Selecting **Reverse** will reverse the direction of the vector.
9. Specify the **Diameter** and **Length** of the cylinder.
10. Specify the **Top Offset**. The **Top Offset** value will increase or decrease the length of the cylinder on the end where the vector is defined. A positive value will increase the length of the cylinder in the direction of the vector.
11. Specify the **Bottom Offset**. The **Bottom Offset** value will increase or decrease the length of the cylinder on the opposite end from where the vector is defined. A positive vector will decrease the length of the cylinder in the direction of the vector.
12. If you select the **constrain to geometry** check box, IP will tie this feature to the selected geometry. If the geometry changes, then so will the feature.
13. If you change the values, then the values no longer reflect the model geometry. You must deselect the **constrain to geometry** check box before you can create the cylinder.
14. Click **OK** to accept the current values and add the cylinder feature to the current Inspection Plan.

Creating a Sphere Feature

1. Select the **Sphere** icon on the toolbar.
2. The **IP Sphere Feature** dialog box appears.
3. Indicate the location of the sphere by selecting a circular edge or spherical face of the sphere. IP calculates the sphere's location and vector from where you clicked.



IP Sphere feature dialog box

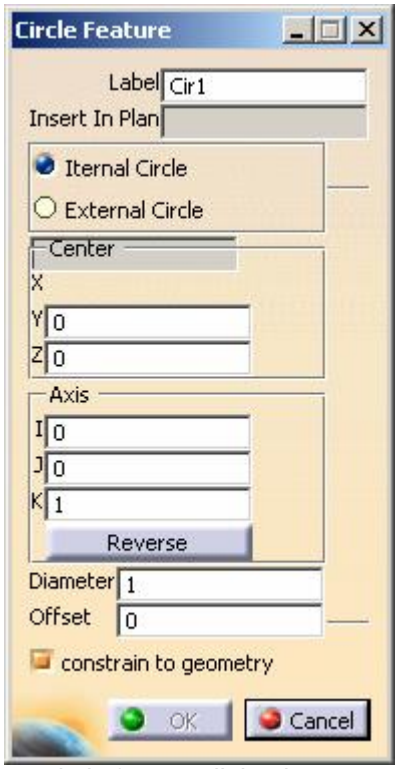
4. Change the **Label** for the sphere if needed.
5. Select the needed plan from the **Plans** section of the **InspectionPlanner** Node in the feature tree. The selected plan is displayed in the **Insert In Plan** box.
6. Select either an **Internal** or **External Sphere**.
7. Change the values for the **XYZ** coordinates and the **IJK** vector values as needed.
8. Specify the **Diameter** of the sphere.
9. If you select the **constrain to geometry** check box, IP will tie this feature to the selected geometry. If the geometry changes, then so will the feature.
10. If you change the values, then the values no longer reflect the model geometry. You must deselect the **constrain to geometry** check box before you can create the sphere.

The vector is never tied to the geometry, and can be modified while keeping the sphere constrained to the model geometry. Therefore, constraining to geometry has not effect on Vector values.

11. Click **OK** to accept the current values and add the sphere feature to the current Inspection Plan.

Creating a Circle Feature

1. Select the **Circle** icon on the toolbar.
2. The **IP Circle Feature** dialog box appears.
3. Indicate the location of the circle feature by clicking a circular edge or cylindrical surface of the circle feature. IP inserts the circle's axis and center into the dialog box.

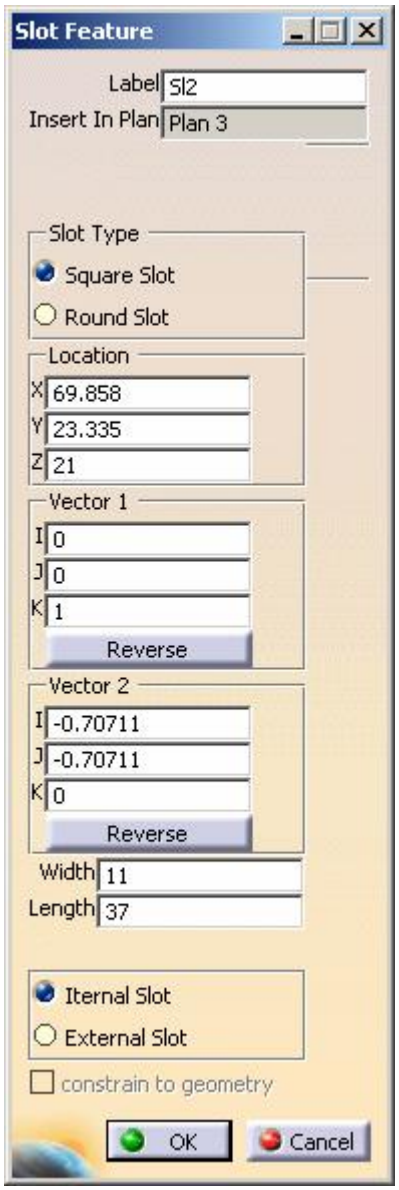


IP Circle feature dialog box

4. Change the **Label** for the circle if needed.
5. Select the needed plan from the **Plans** section of the **InspectionPlanner** Node in the feature tree. The selected plan is displayed in the **Insert In Plan** box.
6. Select either an **Internal** or **External Circle**.
7. Change the values for the **XYZ** coordinates and the **IJK** vector values as needed.
8. Selecting **Reverse** will reverse the direction of the vector.
9. Specify the **Diameter** and **Offset**. The **Offset** value will transform the center of the circle along the feature's vector by the specified positive or negative amount.
10. If you select the **constrain to geometry** check box, IP will tie this feature to the selected geometry. If the geometry changes, then so will the feature.
11. If you change the values, then the values no longer reflect the model geometry. You must deselect the **constrain to geometry check box** before you can create the circle.
12. Click **OK** to accept the current values and add the circle feature to the current Inspection Plan.

Creating Round or Square Slot Features

1. Select the **Round Slot** or **Square Slot** icon on the toolbar.
2. The **IP Slot Feature** dialog box appears. The selected slot type will be selected based on the icon that was clicked. You can change the slot type inside the dialog box as well.
3. Indicate the location of the slot by selecting the face that the slot is cut out of. Select near the edge of the slot. IP will insert the location and vector data into the dialog box.



IP Slot Feature dialog box

4. Change the **Label** for the slot if needed.
5. Select the needed plan from the **Plans** section of the **InspectionPlanner** Node in the feature tree. The selected plan is displayed in the **Insert In Plan** box.
6. Select either **Round** or **Square Slot**.
7. Change the values for the **XYZ** coordinates and the **IJK** vector values as needed.
8. Selecting **Reverse** will reverse the direction of the vector.

9. Specify the **Width** and **Length** of the slot.
10. Select either **Internal** or **External Slot**.
11. If you select the **constrain to geometry** check box, IP will tie this feature to the selected geometry. If the geometry changes, then so will the feature.
12. If you change the values, then the values no longer reflect the model geometry. You must deselect the **constrain to geometry check box** before you can create the slot.
13. Click **OK** to accept the current values and add the slot feature to the current Inspection Plan.

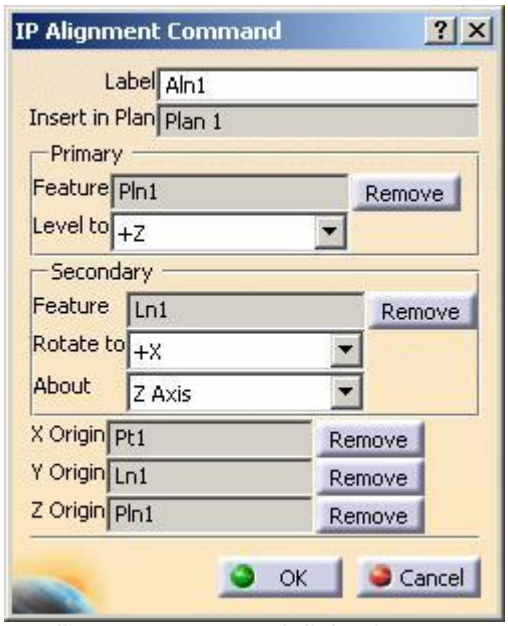
IP_Commands Toolbar

Using the **IP_Commands** toolbar, you can create, translate and rotate alignments. Adding location dimensions and constructed features as well as inserting comments into your part program is also done from the **IP_Commands** Toolbar.

Creating Alignments

Once you have created your features, you can create or modify alignments.

1. Select the **Alignment** icon on the toolbar.
2. The **IP Alignment Command** dialog box appears.



IP Alignment Command dialog box

3. If needed, type an ID for this alignment in the **Label** box.
4. Select the needed plan from the **Plans** section of the **InspectionPlanner** Node in the feature tree. The selected plan is displayed in the **Insert In Plan** box.
5. In the **Primary** alignment area, indicate the axis you want to **Level to** for the primary alignment IP Feature. Select the proper axis in the drop-down list. The default axis is **+Z.**
6. Next, select the primary alignment IP Feature by selecting the label for it from the model window or by selecting it from the feature tree.

7. In the **Secondary** alignment section, indicate the axis to **Rotate to** and the axis to rotate **About** for the secondary alignment IP feature. Select the proper axes in the drop-down lists.
8. Select the secondary alignment IP Feature by selecting the label for it in the model window or by selecting it in the feature tree.
9. As you select the primary and secondary IP features, they are also set, as appropriate, in the **X**, **Y**, and **Z Origin** boxes.
10. You can change any of the IP features by first selecting the edit box for that feature and then selecting a new IP feature.
11. Click **OK** to accept the current values and add the **IP Alignment** command to the current Inspection Plan.

Translating Alignments

You can translate (or move) your Inspection Plan's current alignment by an offset distance.

1. Select the **Translation** icon on the toolbar.
2. The **IP Translation Command** dialog box appears.

IP Translation Command dialog box

3. If needed, type an ID for the alignment you want to translate in the **Label** box.
4. Select the needed plan from the **Plans** section of the **InspectionPlanner** Node in the feature tree. The selected plan is displayed in the **Insert In Plan** box.
5. Type the values for the translation along the X, Y, and Z axes in the **X**, **Y**, and **Z Axis** boxes.
6. Click **OK** to accept the current values and add the IP translation command to the current Inspection Plan's alignment.

Rotating Alignments

You can rotate your Inspection Plan's current alignment by a specified angle.

1. Select the **Rotation** icon on the toolbar.
2. The **IP Rotation Command** dialog box appears.

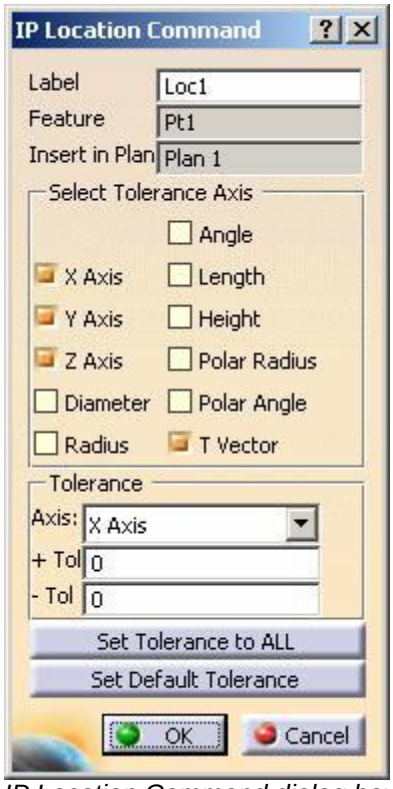
IP Rotation Command dialog box

3. If needed, type an ID for the alignment you want to rotate in the **Label** box.
4. Select the needed plan from the **Plans** section of the **InspectionPlanner** Node in the feature tree. The selected plan is displayed in the **Insert In Plan** box.
5. Type the angle of the rotation in the **Angle** box.
6. Select the axis (X, Y, or Z) you want to rotate about in the **Axis** box.
7. Click **OK** to accept the current values and add the **IP Rotation** command to the current Inspection Plan.

Creating Location Dimensions

If you want to create a location dimension for any feature, you can use the **Location** icon.

1. Select the **Location** icon on the toolbar.
2. The **IP Location Command** dialog box appears.



IP Location Command dialog box

3. If needed, type an ID for this location in the **Label** box.
4. Select the needed plan from the **Plans** section of the **InspectionPlanner** Node in the feature tree. The selected plan is displayed in the **Insert In Plan** box.
5. Select the IP feature to be used for this IP Location from the model window or by selecting it from the feature tree. It will appear in the **Feature** box. Additionally, the appropriate default axes will be selected. For example, if an IP point is selected, then the **X**, **Y**, **Z**, and **T Vector** axes will be selected.
6. For each axis selected, type appropriate positive and negative tolerances. There is a different set of positive and negative tolerances for each axis. Select the needed **Axis** from the drop-down box and change the values in the **+ Tol** and **–Tol** boxes.
7. If the same tolerances are wanted for more than one axis, click the **Set Tolerance to ALL** button. This sets the specified tolerances for all selected axes.
8. If more than one IP Location command will be created, then click the **Set Default Tolerances** button. This sets the default tolerances for all axes to the currently specified values. Next time a new IP Location is created, it will start out with the default tolerance values that were set.
9. Click **OK** to accept the current values and add the **IP Location** command to the current Inspection Plan.

Inserting Comments

Comments come in three types: Operator, Programmer, or Report. This allows you to insert a specific type of comment into your Inspection Plan, providing instructions to operators, programmer notes, or notes that will show up on your Inspection Plan reports.

1. Select the **Comment** icon on the toolbar.
2. The **IP Comment Command** dialog box appears.

IP Comment Command dialog box

3. If needed, type an ID for this comment in the **Label** box. The default is C1 meaning the first comment in the plan. Additional comments will be C2, C3, etc. Modify these comment labels as needed.
4. Select the needed plan from the **Plans** section of the **InspectionPlanner** Node in the feature tree. The selected plan is displayed in the **Insert In Plan** box.

5. Edit the comment in the **Comment** box.
6. Select the type of comment to create (Operator, Programmer, or Report) from the **Type** box.

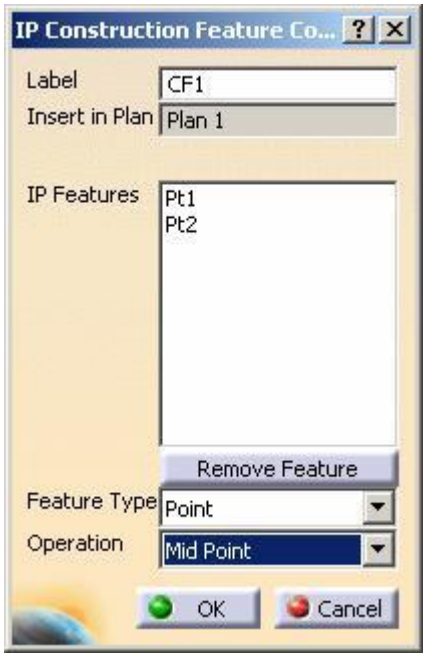
   - Operator comments appear as message boxes whenever the resulting part program is executed. They are useful for giving instructions to the operator at the measuring machine.
   - Programmer comments will not be visible to the operator in the resulting part program. But if someone opens up the part program and looks at the code they will be able to see the programmer comments.
   - Report comments send the specified comments into the report that gets generated once the part program finishes execution.

7. Click **OK** to accept the current values and add the **IP Comment** command to the current Inspection Plan.

Constructing Features

If you want to construct features from other features, you can use the **Construction** icon.

1. Select the **Construction Feature** icon on the toolbar.
2. The **IP Construction Feature Command** dialog box appears.



IP Construction Feature dialog box

3. If needed, type an ID for this constructed feature in the **Label** box.
4. Select the needed plan from the **Plans** section of the **InspectionPlanner** Node in the feature tree. The selected plan is displayed in the **Insert In Plan** box.
5. Select the IP features to be included in this construction feature from the model window or by selecting them from the feature tree. As you select features, IP adds them to the **IP Features** list. To remove a feature from the list, select that feature in the list, and then click the **Remove Feature** button.
6. Select the feature type to construct from the **Feature Type** drop down list and select the type of operation to be performed for that feature from the **Operation** drop down list.

See "Appendix A: Constructed Features" for more information about the construction operations that can be performed and the related feature types that can be created.

7. Click **OK** and the constructed feature will be added to the Inspection Plan.

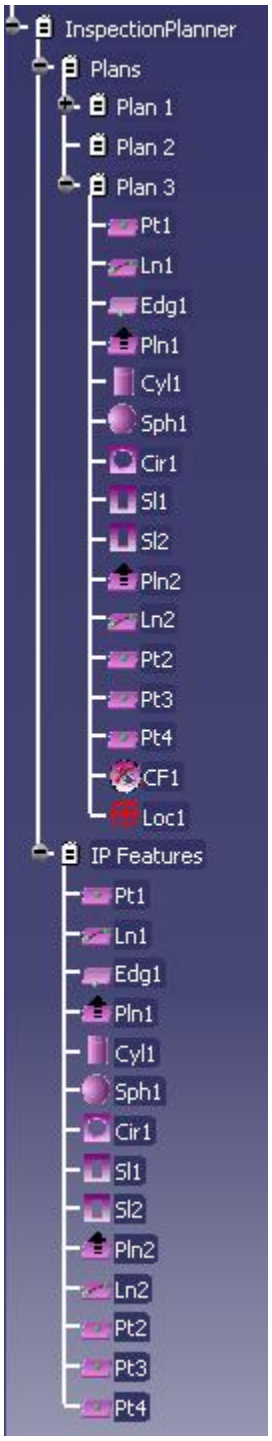
Adding an Existing Feature to the Current Plan

To add an existing CATIA V5 feature to the active Inspection Plan, follow these steps:

1. Select the **Feature** icon on the toolbar. No dialog box appears.

2. Select the IP feature to be added to the Inspection Plan from the model window, or select it from the feature tree.

Editing your Inspection Plan in CATIA 5



To edit commands of your Inspection Plan you have already created you will need to use the feature tree for CATIA 5. This will allow you to go back and make changes to the values of your Inspection Plan.

You can also use the Reorder Commands button to change the order of the commands in your Inspection Plan.

To Edit your Inspection Plan:

1. Double-click on any of the features in the **IP Features** list, or Alignments, Translations, Rotations, Locations, Comments, or Constructions in the **Plan** list.

Note: You may also double-click on the feature label in the graphics display to edit the values.

2. Edit values in the applicable dialog box to the needed values. For example, edit the nominal information in the **Circle Feature** dialog box for a Circle.
3. Click **OK** to save the changed values or click **Cancel** to abort any changes that have been made.
4. Click the **Reorder Commands** button to change the order of commands in your Inspection Plan. See the "Changing the order of the Items in a Plan" topic for more information.
5. To rename the plan, double-click the **Plan** name and change the name in the **Plan** dialog box. Click **OK** to save.
6. Click the **Text Output** button to save your changed Inspection Plan. See the "Exporting a Plan to a File" topic for more information.

Using PC-DMIS Inspection Planner for SolidWorks

This topic describes how to install and use PC-DMIS Inspection Planner with SolidWorks. It shows how to perform various sub tasks needed to create an Inspection Plan that you can either store with your CAD data or export as a text file.

The **Inspection Planner** option must be enabled on your portlock to use the Inspection Planner capabilities for SolidWorks.

Installing Inspection Planner for SolidWorks

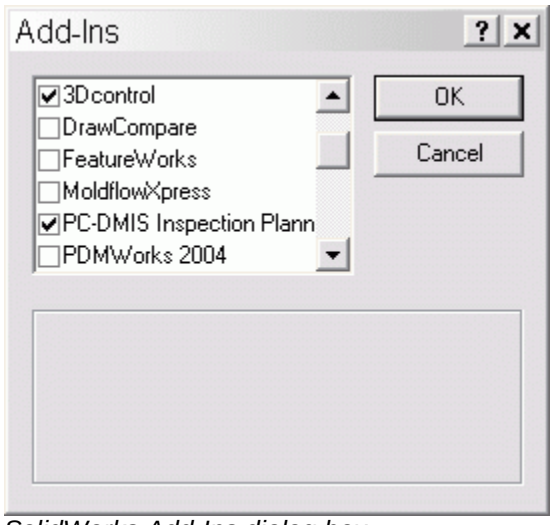
1. Log on to the Wilcox ftp site: ftp.wilcoxassoc.com. Browse to the InspectionPlanner/SolidWorks directory. Enter the directory of the desired version and download the install executable, **Install_PCDMIS_xxx_IPSolidWorks.exe,** file to a specified directory on your hard drive.
2. Double-click on the downloaded .exe file to begin the installation of **IP** for **SolidWorks**
3. The Setup program will then prompt you to select the location where to install PC-DMIS Inspection Planner for SolidWorks. The default directory might look something like this; C:\PCDMISW\InspectionPlanner\SolidWorks.
4. The Setup program will then copy files for **PC-DMIS Inspection Planner for SolidWorks** to this newly created directory.

The Setup program will verify that the needed file structure and files for SolidWorks are installed where you previously specified. An error will occur if the files do not exist.

To start the PC-DMIS Inspection Plan application

To start a PC-DMIS Inspection Plan session from within your SolidWorks session, follow this procedure:

1. Start SolidWorks.
2. Open the SolidWorks **Add-Ins** dialog box by selecting **Tools | Add-Ins…**
3. Ensure that the **PC-DMIS Inspection Planner** check box gets selected.
4. Click **OK** to activate Inspection Planner inside SolidWorks.



SolidWorks Add-Ins dialog box.

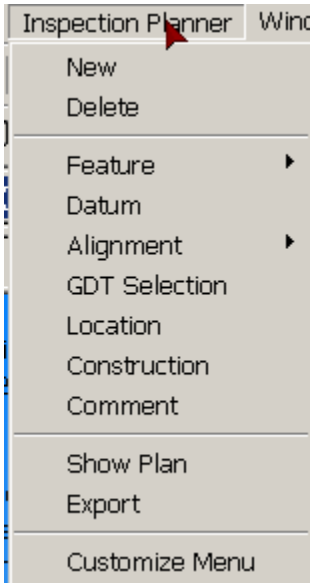
5. There should now be an **Inspection Planner** menu option in the SolidWorks menu bar.

Inspection Planner in SolidWorks toolbar.

Once you have started the PC-DMIS Inspection Planner application, you may create, list, and edit IP features, commands, and Inspection Plans.

Inspection Planner Menu Items

Selecting the **Inspection Planner** menu in the SolidWorks menu bar displays the **Inspection Planner** sub-menus and menu items. These menu items contain the tools for creating, editing, exporting, and using Inspection Plans.

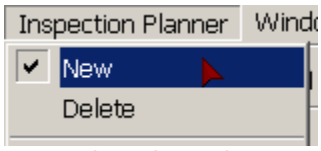


Inspection Planner menus

Creating a New Inspection Plan

To create a new PC-DMIS Inspection Plan, follow this procedure:

1. Select **New** from the **Inspection Planner** menu.
2. IP displays a check mark in front of the **New** menu item indicating that an Inspection Plan exists in the SolidWorks part.



Inspection Plan exists.

If a plan already exists in the SolidWorks part, you will be asked if you want to replace the existing plan.

Deleting the Inspection Plan

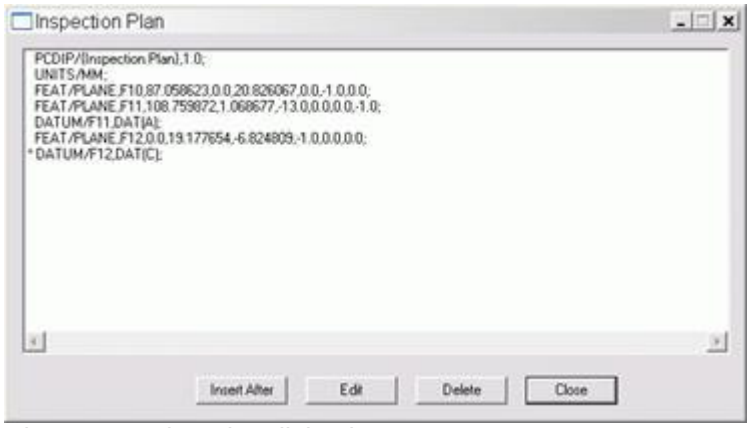
To delete the current Inspection Plan from the SolidWorks part:

1. Select **Delete** from the Inspection Planner menu.
2. IP deletes the current Inspection Plan.

Showing the current Inspection Plan

To display the current Inspection Plan in the SolidWorks part:

1. Select **Show Plan** in the **Inspection Planner** menu.
2. The **Inspection Plan** dialog box appears.



Show Inspection Plan dialog box

3. You can edit the Inspection Plan using this dialog box.

   - **Insert After** – Select a line in the plan, and click the **Insert After** button. This sets the insertion point in the plan. IP inserts all new objects after this line.
   - **Edit** – Select a line in the plan, and click the **Edit** button. IP displays the dialog box for that object, allowing you to edit its contents
   - **Delete** – Select a line in the plan, and click the **Delete** button. IP deletes the selected line from the plan.
   - **Close** – Selecting the **Close** button closes the Inspection Plan dialog box.

Exporting the current Plan to a File

To Export the current Inspection Plan for use within PC-DMIS, follow this procedure:

1. Select **Export** from the **Inspection Planner** menu. The **Save As** dialog box appears.

Save As dialog box.

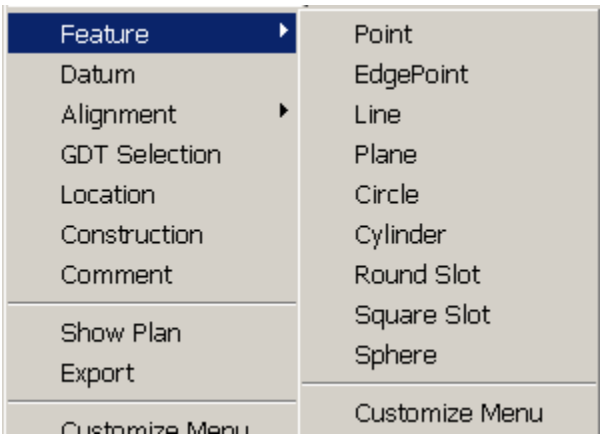
2. Browse to the location where you would like to save the file. Specify a name for the Inspection Planner file in the **File name** box.
3. Click **Save** to export the file. This text file can then be imported into PC-DMIS. See "Importing the Inspection Plan".

Creating Features

Once you have created a new Inspection Plan, you can create features for that Inspection Plan. To create features, use this general method:

1. From the **Inspection Planner** menu, select the **Feature** sub-menu, and then select the feature that you want to create. A dialog box, specific to the feature you selected, appears. Inspection Planner supports the following features:

   - Point
   - Edge Point
   - Line
   - Plane
   - Circle
   - Cylinder
   - Round Slot
   - Square Slot
   - Sphere



Feature menu

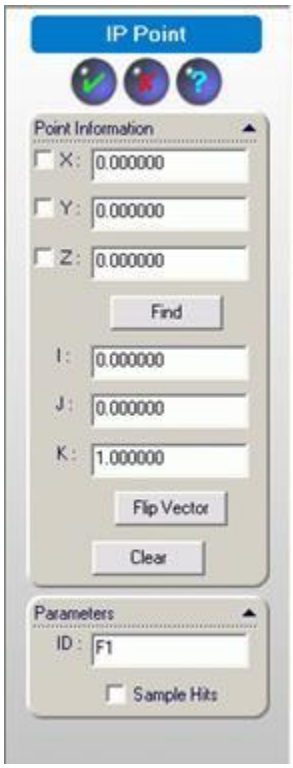
2. Using the mouse, select the face, edge, or vertex from the CAD display that will be used for the feature. IP may ask you to select with the mouse again, depending on the type of feature you are defining and the CAD object first selected. The **Open Feature** dialog box will display the correct values provided from the CAD data. You can edit these values as needed.
3. Click the **OK** (the green check mark) button to accept your changes and create the feature. This feature will be added to the Inspection Planner tree as well as to the currently active plan.

You must create an Inspection Plan before you can create any features.

The dialog box for each specific type of feature is explained below:

Creating a Point Feature

1. Select **Point** menu item from the **Feature** sub-menu.
2. The **IP Point** dialog box appears.
3. Indicate the location of the point feature by clicking on any surface. IP will put the XYZ coordinate and IJK vector information for the point into the dialog box.

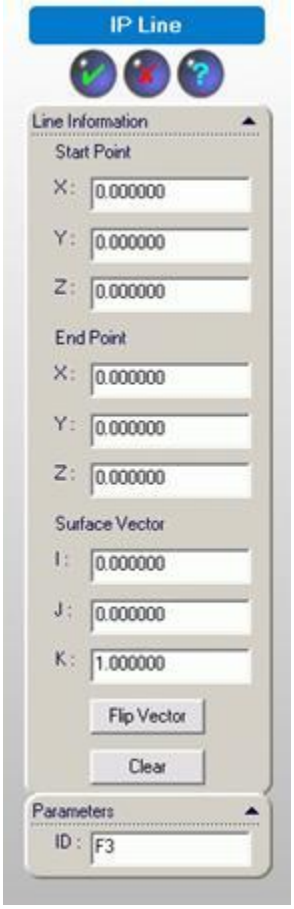


IP Point dialog box

4. Change the values for the **XYZ** coordinates and the **IJK** vector values as needed. If you change the values, then the values no longer reflect the model geometry. You must select the **Find** button to find the closest point on the geometry before you can create the point.
5. Clicking **Flip Vector** will reverse the direction of the vector.
6. Clicking **Clear** will clear the values from the dialog box.
7. Change the **ID** if needed.
8. Select the **Sample Hits** check box if you want samples hits taken during the measurement of this feature.
9. Click **OK** (green check mark) to accept the current values and add the point feature to the current Inspection Plan.

Creating a Line Feature

1. Select the **Line** menu item from the **Feature** sub-menu.
2. The **IP Line** dialog box appears.
3. Indicate the location of the start point of the line feature by clicking the first point on any surface. IP inserts that start point location into the dialog box.
4. Indicate the location of the end point of the line feature by clicking a second point on any surface. IP inserts that end point location into the dialog box.

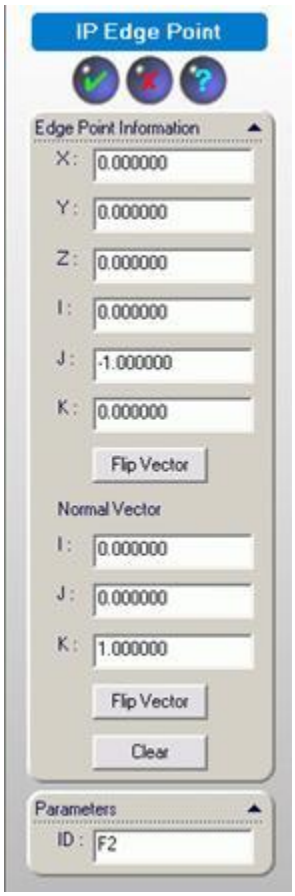


IP Line dialog box

5. Change the values for the **XYZ** coordinates and the **IJK** vector values as needed.
6. Selecting **Flip Vector** will reverse the direction of the vector.
7. Selecting **Clear** will clear the values from the dialog box.
8. Change the **ID** if needed.
9. Click **OK** (green check mark) to accept the current values and add the line feature to the current Inspection Plan.

Creating an Edge Point Feature

1. Select the **EdgePoint** menu item from the **Feature** sub-menu.
2. The **IP Edge Point** dialog box appears.
3. Indicate the location of the edge point feature by clicking on any surface near an edge. The point will snap to the nearest edge of the surface. IP inserts the point's location into the dialog box.

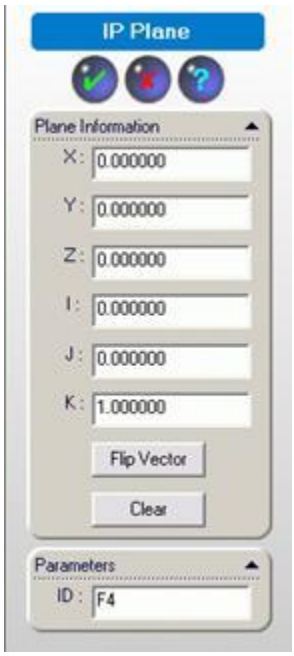


IP Edge dialog box

4. Change the values for the **XYZ** coordinates and the **IJK** vector values as needed.
5. Selecting **Flip Vector** will reverse the direction of the vector.
6. Selecting **Clear** will clear the values from the dialog box.
7. Change the **ID** if needed.
8. Click **OK** (green check mark) to accept the current values and add the edge point feature to the current Inspection Plan.

Creating a Plane Feature

1. Select **Plane** menu item from the **Feature** sub-menu.
2. The **IP Plane** dialog box appears.
3. Indicate the location of the plane feature by clicking any surface. IP inserts the plane's location and vector data into the dialog box.

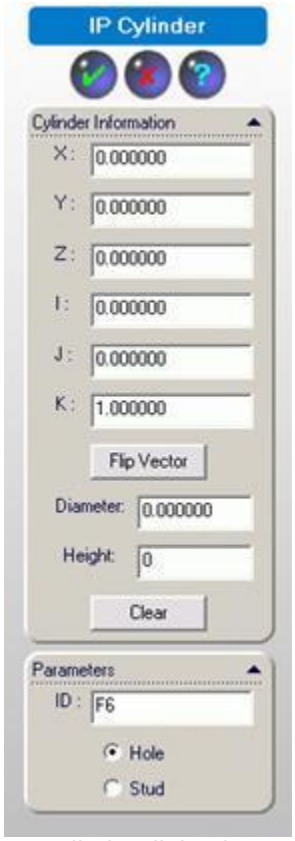


IP Plane dialog box

4. Change the values for the **XYZ** coordinates and the **IJK** vector values as needed.
5. Clicking **Flip Vector** will reverse the direction of the vector.
6. Clicking **Clear** will clear the values from the dialog box.
7. Change the **ID** if needed.
8. Click **OK** (green check mark) to accept the current values and add the **Plane** feature to the current Inspection Plan.

Creating a Cylinder Feature

1. Select **Cylinder** menu item from the **Feature** sub-menu.
2. The **IP Cylinder** dialog box appears.
3. Indicate the location of the cylinder feature by clicking the cylindrical surface of a cylinder. IP inserts the cylinder's XYZ and IJK information into the dialog box.

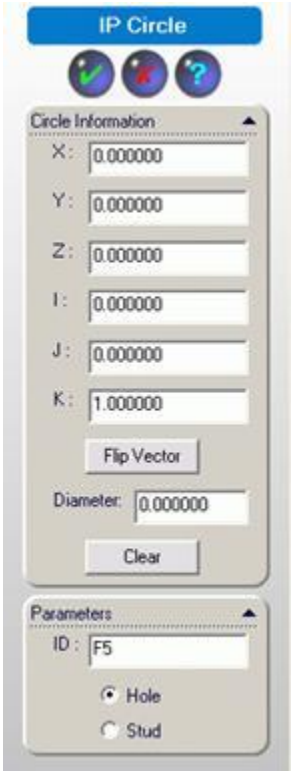


IP Cylinder dialog box

4. Change the values for the **XYZ** coordinates and the **IJK** vector values as needed.
5. Selecting **Flip Vector** will reverse the direction of the vector.
6. Specify the **Diameter** and **Height** of the cylinder.
7. Selecting **Clear** will clear the values from the dialog box.
8. Change the **ID** if needed.
9. Select either **Hole** or **Stud** to determine whether it's an internal or external cylinder.
10. Click **OK** (green check mark) to accept the current values and add the **Cylinder** feature to the current Inspection Plan.

Creating a Circle Feature

1. Select **Circle** menu item from the **Feature** sub-menu.
2. The **IP Circle** dialog box appears.
3. Indicate the location of the circle feature by clicking a circular edge or cylindrical surface of the circle feature. IP inserts the circle's XYZ center and IJK vector into the dialog box.

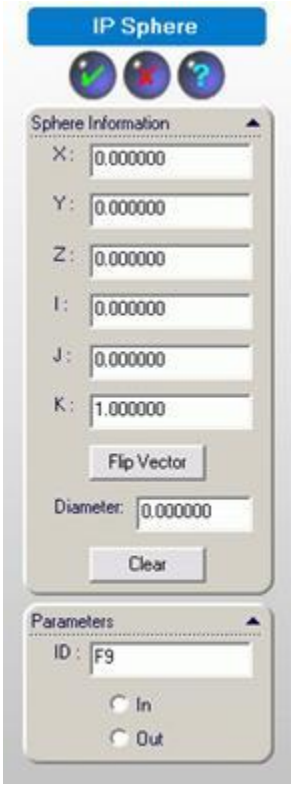


IP Circle dialog box

4. Change the values for the **XYZ** coordinates and the **IJK** vector values as needed.
5. Selecting **Flip Vector** will reverse the direction of the vector.
6. Type the **Diameter** of the circle.
7. Selecting **Clear** will clear the values from the dialog box.
8. Change the **ID** if needed.
9. Select either **Hole** or **Stud**.
10. Click **OK** (green check mark) to accept the current values and add the **Circle** feature to the current Inspection Plan.

Creating a Sphere Feature

1. Select **Sphere** menu item from the **Feature** sub-menu.
2. The **IP Sphere** dialog box appears.
3. Indicate the location of the sphere by clicking a circular edge or spherical face of the sphere. IP calculates the sphere's location and vector from where you clicked.

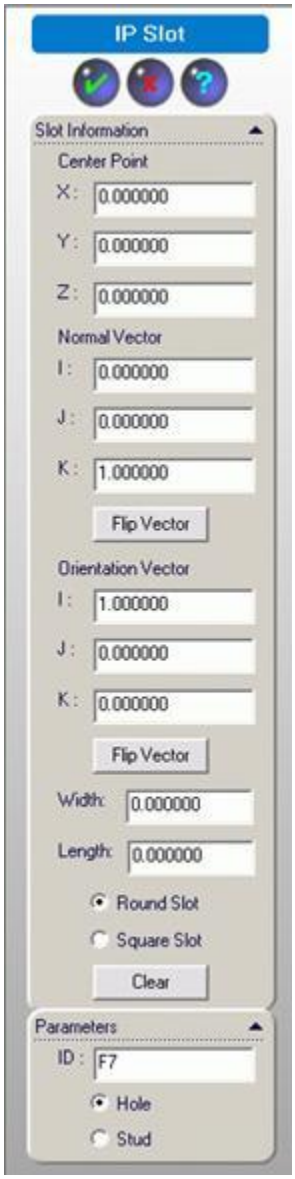


IP Sphere dialog box

4. Change the values for the **XYZ** coordinates and the **IJK** vector values as needed.
5. Selecting **Flip Vector** will reverse the direction of the vector.
6. Type a **Diameter** for the sphere.
7. Selecting **Clear** will clear the values from the dialog box.
8. Change the **ID** if needed.
9. Select either **In** or **Out** to specify whether or not the feature is an internal or external sphere.
10. Click **OK** (green check mark) to accept the current values and add the **Sphere** feature to the current Inspection Plan.

Creating Round or Square Slot Features

1. Select either **Round Slot** or **Square Slot** from the **Feature** sub-menu.
2. The **IP Slot** dialog box appears. The selected slot type will be selected based on the menu item that was clicked. You can change the slot type inside the dialog box as well.
3. Indicate the location of the slot by selecting the face that the slot is cut out of. Select near the edge of the slot. IP will insert the center point and vector information into the dialog box.



IP Slot dialog box

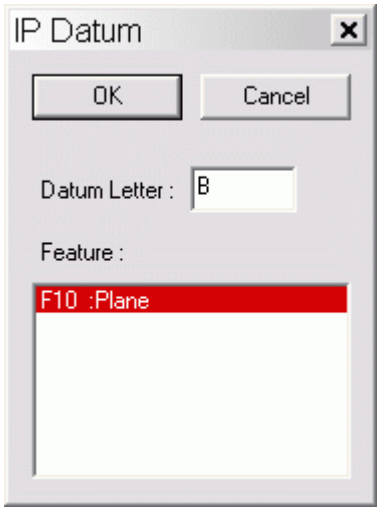
4. Change the values for the **XYZ** coordinates and the **IJK** normal vector values as needed.
5. Change the values for the **IJK** orientation vector values as needed.
6. Selecting **Flip Vector** will reverse the direction of the normal or orientation vectors.
7. Specify the **Width** and **Length** of the slot.
8. Select either **Round** or **Square** Slot.

9. Selecting **Clear** will clear the values from the dialog box.
10. Change the **ID** if desired
11. Select either **Hole** or **Stud**.
12. Click **OK** (green check mark) to accept the current values and add the **Slot** feature to the current Inspection Plan.

Constructing Datum Features

If you want to construct datum features, you can use the **Datum** menu option,

1. Select **Datum** from the **Inspection Planner** menu.
2. The **IP Datum** feature dialog box appears.



IP Datum feature dialog

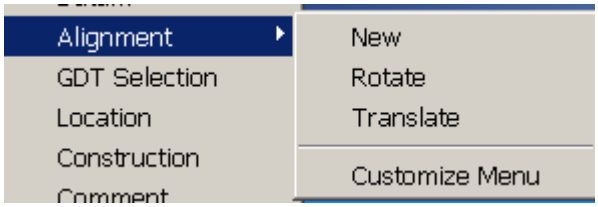
3. Specify the datum by:

   - Selecting the datum from the graphic window, or…
   - Selecting the IP features to be included in this IP datum feature by selecting them from the feature list at the bottom of the dialog box.

4. Change the **Datum Letter** if needed.
5. Click **OK** to add the **Datum** feature to the Inspection Plan.

Creating Alignments

The **Alignment** sub-menu provides you with menu items to create, rotate, and translate alignments.



Alignment menu.

Creating New Alignments

Once you have created your features, you can create or modify alignments.

1. Select **New** from the **Alignment** menu.
2. The **IP Alignment** dialog box appears.

IP Alignment dialog box

3. If needed, type an ID for this alignment in the **Label** box.
4. In the **Primary** alignment section, indicate the axis you want to **Level to** for the primary alignment IP feature**.** Select the proper axis from the drop-down list. The default axis is **ZPLUS.**
5. Select the primary alignment IP feature by selecting the proper feature in the **Datum / Feature** list. Click in the **Primary Feature** box, and then press your keyboard's **Enter** key.
6. In the **Secondary** alignment section, indicate the axis to **Rotate to** and the axis to rotate **About** for the secondary alignment IP feature. Select the proper axes in the drop-down lists.
7. Select the secondary alignment IP **Feature** by selecting the proper feature in the **Datum / Feature** list. Click in the **Secondary Feature** box then press your keyboard's **Enter** key.
8. As you select the primary and secondary IP features, they are also set, as appropriate, in the **X**, **Y**, and **Z Origin** boxes.
9. Selecting **Clear** will clear the values from the dialog box.

10. Any of the IP features can be changed by selecting the proper feature in the **Datum / Feature** list. Simply click in the **Feature** box then press the **Enter** key.
11. Click **OK** to accept the current values and add the **IP Alignment** command to the current Inspection Plan.

Rotating Alignments

You can rotate your Inspection Plan's current alignment by a specified angle.

1. Select **Rotate** from the **Alignment** menu.
2. The **Rotate Alignment** dialog box appears.

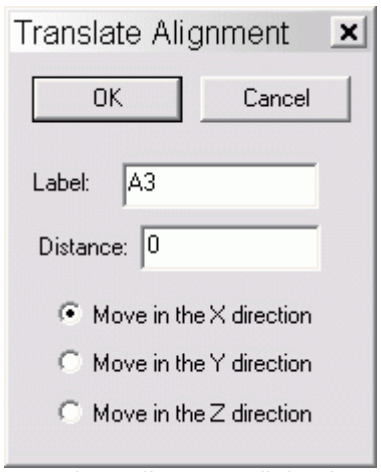
Rotate Alignment dialog box

3. If needed, type an ID for the alignment you want to rotate in the **Label** box.
4. Type the angle of the rotation in the **Angle** box.
5. Select the axis (X, Y, or Z) you want to rotate about in the **Axis** box.
6. Click **OK** to accept the current values and add the **Rotate Alignment** command to the current Inspection Plan.

Translating Alignments

You can translate (or move) your Inspection Plan's current alignment by an offset distance.

1. Select **Translation** from the **Alignment** menu.
2. The **Translate Alignment** dialog box appears.



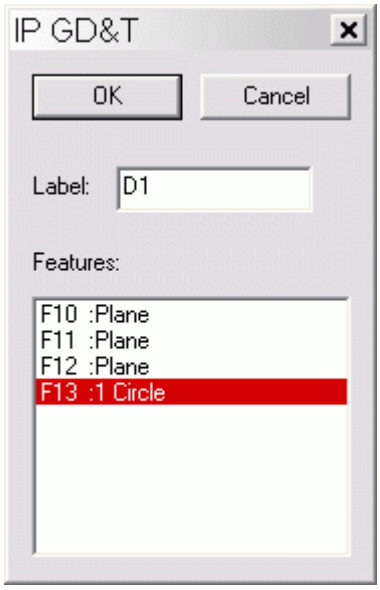
Translate Alignment dialog box

3. If needed, type an ID for the alignment you want to translate in the **Label** box.
4. Type the values for the translation along the X, Y, or Z axes in the **Distance** box.
5. Specify which axes direction to move along by selecting **Move in the X direction**, **Move in the Y direction**, or **Move in the Z direction**.
6. Click **OK** to accept the current values and add the **Translate Alignment** command to the current Inspection Plan's alignment.

Constructing GD&T Features

If you want to construct features from tolerances (GD&T), you can use the **GD&T Selection** menu option,

1. Select **GD&T** Selection from the **Inspection Planner** menu.
2. Select a **GD&T** feature from the graphic window.
3. The **IP GD&T** dialog box appears. The feature for the GD&T feature will be highlighted in the feature list.



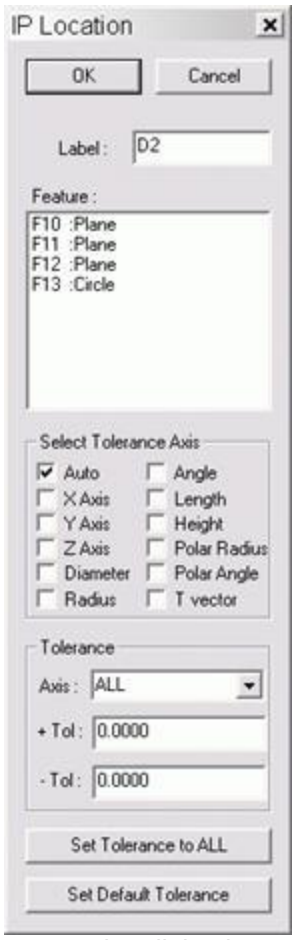
IP GD&T dialog box

4. If needed, type an ID for this alignment in the **Label** box.
5. You may change the associated feature by selecting a new feature from the **Features** list.
6. Click **OK** to add the GD&T constructed feature to the Inspection Plan.

Creating Location Dimensions

If you want to create a location dimension for a feature, you can use the **Location** menu option.

1. Select **Location** from the **Inspection Planner** menu.
2. The **IP Location** dialog box appears.



IP Location dialog box

3. Select the IP feature to be used for this IP Location from the model window or by selecting it from the feature tree. IP adds it to the **Feature** box.
4. When you select the IP feature, IP uses the appropriate default axes. For example, if you select IP point, then the IP selects the **X**, **Y**, **Z**, and **T Vector** axes.
5. For each axis selected, type appropriate positive and negative tolerances. There is a different set of positive and negative tolerances for each axis. Select the needed **Axis** from the drop-down box and change the values in the **+ Tol** and **–Tol** boxes.

6. If the same tolerances are wanted for more than one axis, click the **Set Tolerance to ALL** button. This sets the specified tolerances for all selected axes.
7. If more than one IP Location command will be created, then click the **Set Default Tolerances** button. This sets the default tolerances for all axes to the currently specified values. Next time a new IP Location is created, it will start out with the default tolerance values that were set.
8. Click **OK** to accept the current values and add the **IP Location** command to the current Inspection Plan.

Constructing Features

If you want to construct features from other features, you can use the **Construction menu** option.

1. Select **Construction** from the **Inspection Planner** menu.
2. The **Constructed Feature** dialog box appears.

Constructed Feature dialog box

3. Select the IP features to be included in this IP Construction Feature by selecting them from the **Feature** list.
4. Select the feature type to construct from the **Feature Type** drop down list and select the type of operation to be performed for that feature from the **Operation** drop down list.

See "Appendix A: Constructed Features" for more information about the construction operations that can be performed and the related feature types that can be created.

5. Click **OK** and the **Constructed feature** will be added to the Inspection Plan.

Inserting Comments

Comments come in three types: Operator, Programmer, or Report. This allows you to insert a specific type of comment into your Inspection Plan, providing instructions to operators, programmer notes, or notes that will show up on your Inspection Plan reports.

1. Select **Comment** from the **Inspection Planner** menu
2. The **IP Comment** dialog box appears.

IP Comment dialog box

3. Edit the comment in the **Comment** box.
4. Select the type of comment to create: **Operator, Report, or Programmer.**

   - Operator comments appear as message boxes whenever the resulting part program is executed. They are useful for giving instructions to the operator at the measuring machine.
   - Programmer comments will not be visible to the operator in the resulting part program. But if someone opens up the part program and looks at the code they will be able to see the programmer comments.
   - Report comments send the specified comments into the report that gets generated once the part program finishes execution.

5. Click **OK** to accept the current values and add the **IP Comment** command to the current Inspection Plan.

Using PC-DMIS Inspection Planner for Unigraphics

This topic describes how to install and use PC-DMIS Inspection Planner within Unigraphics. IP allows you to perform various sub tasks needed to create an Inspection Plan that you can either store with your CAD data or export as a text file.

The **Inspection Planner** option must be enabled on your portlock to use the Inspection Planner capabilities for Unigraphics.

To install the PC-DMIS Inspection Planner

To install the PC-DMIS Inspection Planner for access from within the Unigraphics CAD system (NX 2.0 and later), follow this procedure:

1. Log on to the Wilcox ftp site: ftp.wilcoxassoc.com. Browse to the /InspectionPlanner/Unigraphics/ directory. Enter the directory of the desired version and download the install executable, **Install_PCDMIS_370_IPUnigraphics.exe,** file to a specified directory on your hard drive.
2. Double-click on the **Install_PCDMIS_370_IPUnigraphics.exe** file to begin the installation of IP for Unigraphics**.** Follow the instructions to install IP for Unigraphics.

The Setup program will verify the proper installation of Unigraphics on your system. It will fail if it does not find the Unigraphics installation.

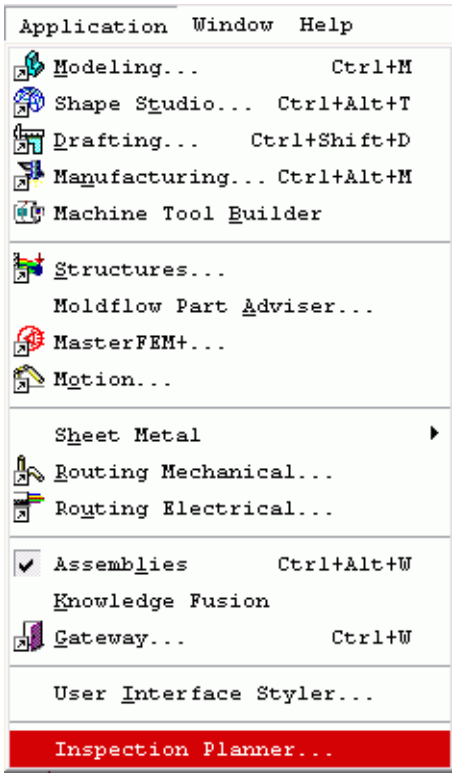
3. Start Unigraphics and you should see **Inspection Planner…** in the **Application** menu.

The PC-DMIS Inspection Plan application will now be available from within your Unigraphics sessions.

To start the PC-DMIS Inspection Plan application

To start a PC-DMIS Inspection Plan session from within your Unigraphics session, follow this procedure:

1. Start Unigraphics software.
2. Open your part file.
3. Switch to the Inspection Planner application by selecting **Application | Inspection Planner…**



Start Inspection Planner Application

4. Inspection Planner launches and the **Inspection Planner** toolbar appears.

PC-DMIS Inspection Planner Toolbar – only New Plan enabled

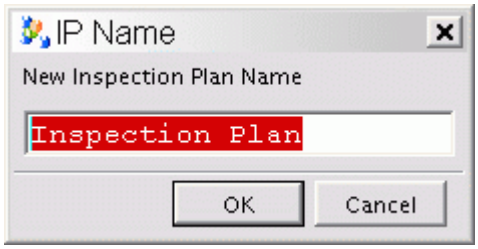
Once the PC-DMIS Inspection Planner application launches you may create, list, and edit Inspection Plans.

Except for the **New Plan** icon, the **Inspection Plan** menu and the other toolbar icons will remain grayed out until you create an Inspection Plan.

To Create a New PC-DMIS Inspection Plan

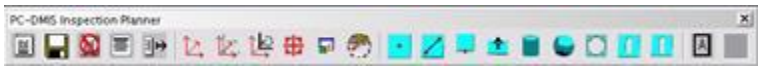
To create a PC-DMIS Inspection Plan, follow this procedure:

1. Start a new Inspection Plan by selecting the **Inspection Planner | New** menu option or select the **New Inspection Plan** icon in the toolbar. This displays the **IP Name** dialog box.



IP Name dialog box

2. Type the name for the new Inspection Plan and Click **OK**. This creates a new Inspection Plan and adds the default header information to it. The rest of the **Inspection Plan** menu and toolbar icons become available for selection.



Active PC-DMIS Inspection Planner Toolbar

If you ever want to start over, select the **Inspection Planner | Delete** menu option to delete the current Inspection Plan.

Creating Features

Once you have created a new Inspection Plan, you can create features for that plan. To create features, use this general method:

1. From the **Inspection Planner** menu, select the **Feature** sub-menu, and then select the feature that you want to create. A dialog box, specific to the feature you selected, appears. Inspection Planner supports the following features:

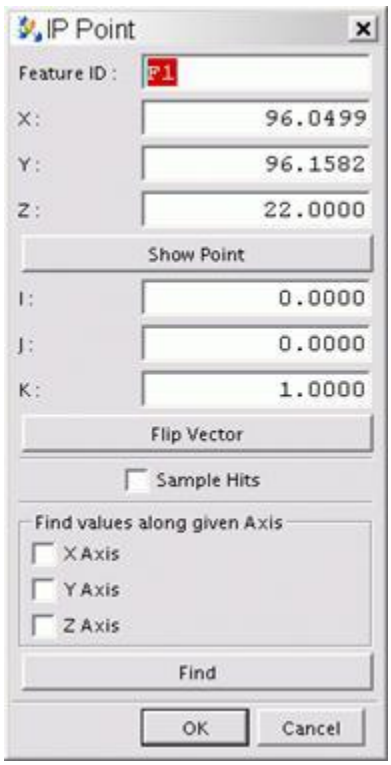
   - Point
   - Line
   - Edge Point
   - Plane
   - Cylinder
   - Sphere
   - Circle
   - Round Slot
   - Square Slot

2. Using the mouse, select the face, edge, or vertex from the CAD display that will be used for the feature. IP may ask you to select with the mouse again, depending on the type of feature you are defining and the CAD object first selected. The **Open Feature** dialog box will display the correct values provided from the CAD data. You can edit these values as needed.
3. Click the **OK** button to accept your changes and create the feature in the Inspection Plan.

The dialog box for each specific type of feature is explained below:

Creating a Point Feature

1. Select **Inspection Planner | Feature | Point** or the **Point** icon on the toolbar.
2. Indicate the location of the point feature by clicking on any surface. The **IP Point** feature dialog box appears. IP will put the XYZ coordinate and IJK vector information for the point into the dialog box.

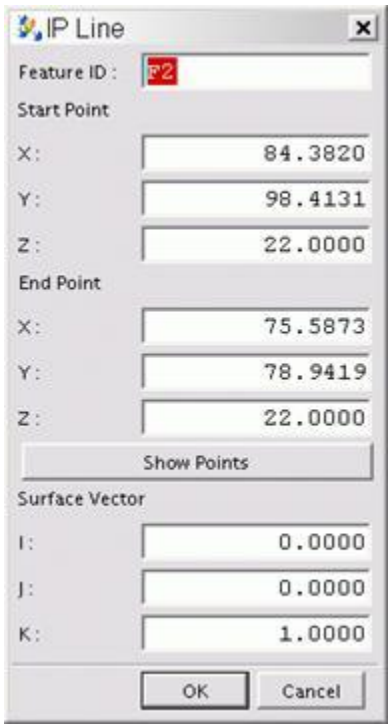


IP Point dialog box

3. Change the values for the **XYZ** coordinates and the **IJK** vector values as needed.
4. Click the **Show Point** button to display the point 3D CAD view.
5. Click the **Flip Vector** button to flip the currently assigned vector.
6. Click the **Sample Hits** option if you want sample hits to be taken for the point. These hits are taken around the nominal point.
7. Select the check boxes next to the **X**, **Y**, and **Z Axis** options to find values along these axes.
8. Click **OK** to accept the current values and add the point feature to the current Inspection Plan.

Creating a Line Feature

1. Select **Inspection Planner | Feature | Line** or the **Line** icon on the toolbar.
2. Indicate the location of the start point of the line feature by clicking the first point on any surface. IP inserts that start point location into the dialog box.
3. Indicate the location of the end point of the line feature by clicking a second point on any surface. IP inserts that end point location into the dialog box.

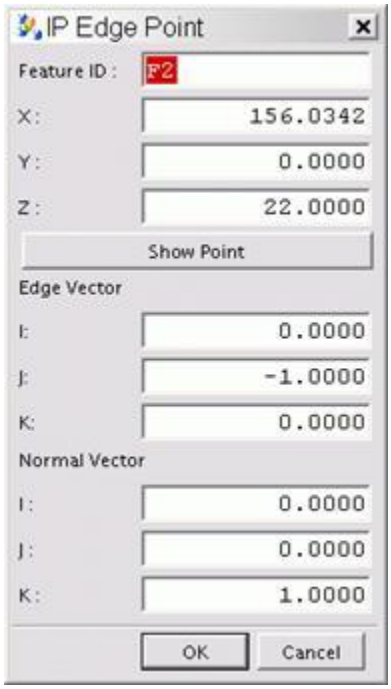


IP Line dialog box

4. Change the values for the **XYZ** coordinates and the **IJK** vector values as needed.
5. Click the **Show Point** button to display the point 3D CAD view.
6. Click **OK** to accept the current values and add the line feature to the current Inspection Plan.

Creating an Edge Point Feature

1. Select **Inspection Planner | Feature | Edge Point** or the **Edge Point** icon on the toolbar.
2. Indicate the location of the edge point feature by clicking on any surface near an edge. The point will snap to the nearest edge of the surface. The **IP Edge Point** dialog box appears containing the point's location.

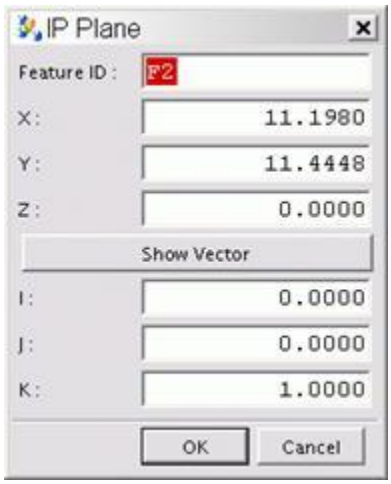


IP Edge Point dialog box

3. Change the values for the **XYZ** coordinates and the **IJK** vector values as needed.
4. Click the **Show Point** button to display the point 3D CAD view.
5. Click **OK** to accept the current values and add the edge point feature to the current Inspection Plan.

Creating a Plane Feature

1. Select **Inspection Planner | Feature | Plane** or the **Plane** icon on the toolbar.
2. Indicate the location of the plane feature by clicking any face. **The IP Plane** dialog box appears containing the plane's location and vector data.

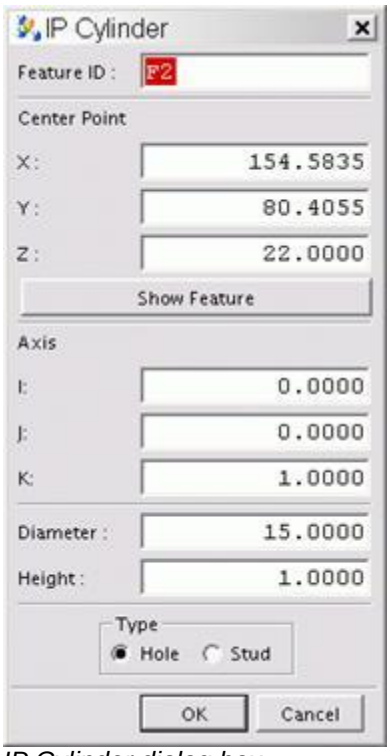


IP Plane dialog box

3. Change the values for the **XYZ** coordinates and the **IJK** vector values as needed.
4. Click the **Show Vector** button to display the vector 3D CAD view.
5. Click **OK** to accept the current values and add the plane feature to the current Inspection Plan.

Creating a Cylinder Feature

1. Select **Inspection Planner | Feature | Cylinder** or the **Cylinder** icon on the toolbar.
2. Indicate the location of the cylinder feature by clicking the circular edge or cylindrical surface of the cylinder. The **IP Cylinder** dialog box appears containing the cylinder's XYZ and IJK information.

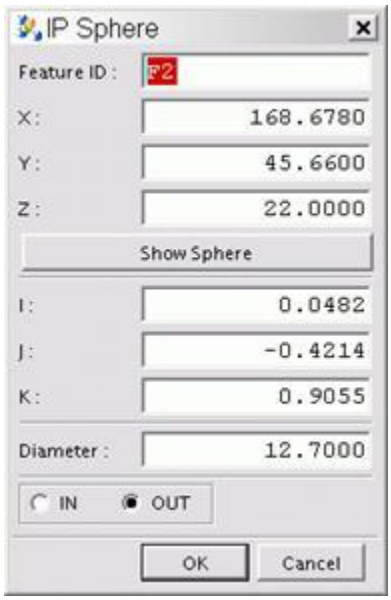


IP Cylinder dialog box

3. Change the values for the **XYZ** coordinates and the **IJK** vector values as needed.
4. Click the **Show Feature** button to display the Cylinder 3D CAD view.
5. Type the **Diameter** and **Height** of the cylinder.
6. Select the Type of feature: **Hole** or **Stud**.
7. Click **OK** to accept the current values and add the cylinder feature to the current Inspection Plan.

Creating a Sphere Feature

1. Select **Inspection Planner | Feature | Sphere** or the **Sphere** icon on the toolbar.
2. Indicate the location of the sphere by clicking a circular edge or spherical face of the sphere. The **IP Sphere** dialog box appears containing the sphere's location and vector information.

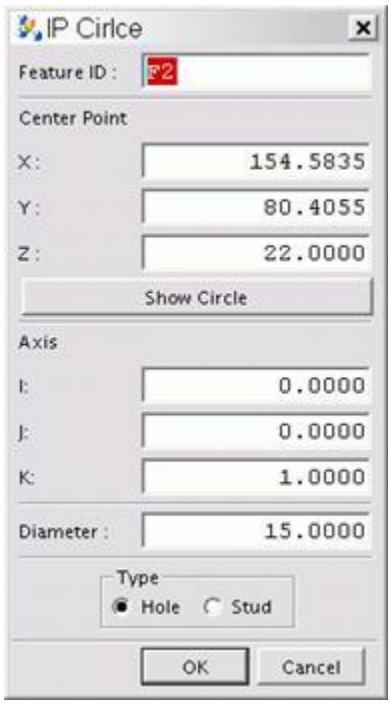


IP Sphere dialog box

3. Change the values for the **XYZ** coordinates and the **IJK** vector values as needed.
4. Click the **Show Sphere** button to display the Sphere 3D CAD view.
5. Type a **Diameter** for the sphere.
6. Select either **In** or **Out** to specify whether or not the feature is an internal or external sphere
7. Click **OK** to accept the current values and add the sphere feature to the current Inspection Plan.

Creating a Circle Feature

1. Select **Inspection Planner | Feature | Circle** or the **Circle** icon on the toolbar.
2. Indicate the location of the circle feature by selecting a circular edge or cylindrical surface of the circle feature. The **IP Circle** dialog box appears containing the circle's XYZ center and IJK vector.

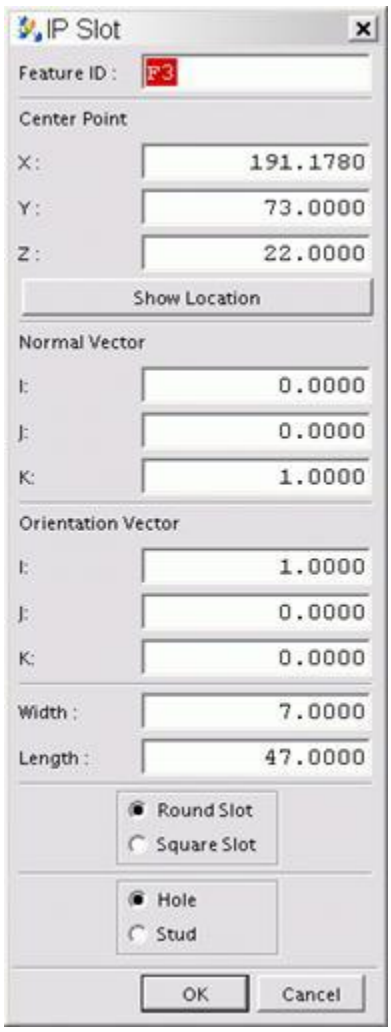


IP Circle dialog box

3. Change the values for the **XYZ** coordinates and the **IJK** vector values as needed.
4. Click the **Show Circle** button to display the Circle 3D CAD view.
5. Type the **Diameter** of the circle.
6. Select either **Hole** or **Stud** to specify whether or not the feature is an internal or external circle.
7. Click **OK** to accept the current values and add the circle feature to the current Inspection Plan.

Creating Round Slot or Square Slot Features

1. Select the **Inspection Planner | Feature | Round Slot** or **Square Slot** menu items. Or select the **Round** or **Square Slot** icon on the toolbar.
2. Indicate the location of the round slot by selecting a face or edge of the round slot feature.
3. IP may ask you to select the opposite edge or face of the round slot.
4. The **IP Slot** dialog box appears.



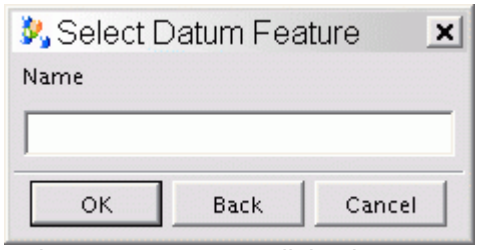
IP Slot dialog box

5. Change the values for the **XYZ** coordinates and the **IJK** vector values as needed.
6. Click the **Show Location** button to show the location of the slot 3D CAD view.
7. Type the **Width** and **Length** of the slot.
8. Select either **Round** or **Square** Slot.
9. Select either **Hole** or **Stud** to determine whether the slot is an internal or external slot.
10. Click **OK** to accept the current values and add the slot feature to the current Inspection Plan.

Creating Commands for Datum

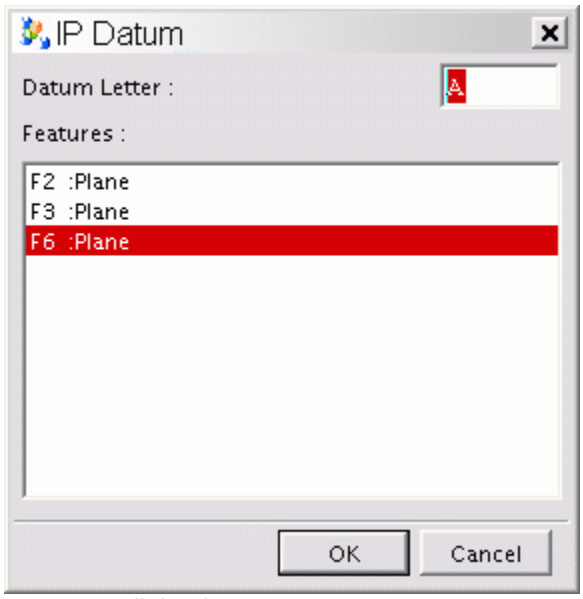
If your CAD has datum items defined, you can create Inspection Planner commands for them.

1. Select **Inspection Planner | Datum** menu or the **Datum** icon.
2. The **Select Datum Feature** dialog box appears.



Select Datum Feature dialog box

3. Select the appropriate datum symbol from the 3D CAD view.
4. The **IP Datum** definition dialog box appears.



IP Datum dialog box

IP highlights the feature associated with the datum in both the 3D CAD view and the **Features** list in the **IP Datum** dialog box.

5. If you want to change the **Datum Letter**, select the datum letter in the dialog box and enter the new letter.
6. If you want to change the feature associated with the datum, select the new feature in the **Features** list. The newly selected feature will be highlighted in the 3D CAD view.

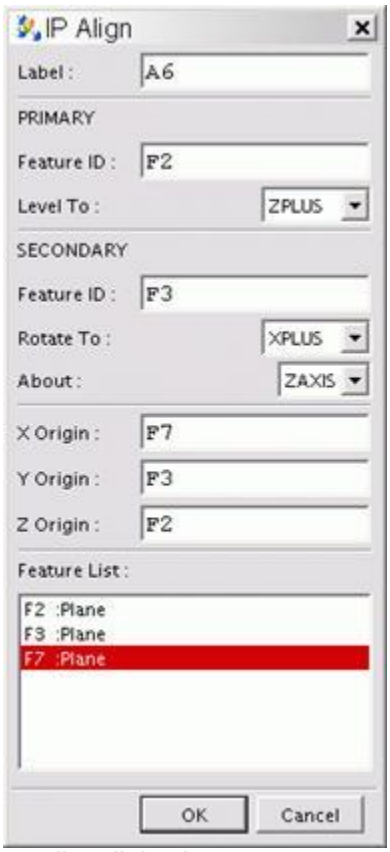
This only changes the feature associated with the datum for the Inspection Plan. It does not affect the datum's association in the CAD file in any way.

7. Click **OK** to add the datum to the Inspection Plan. The associated feature will also be added to the Inspection Plan if it was not already in the plan.

Creating Alignments

Once you have created your features and datum commands, you can create or modify alignments.

1. Select the **Inspection Planner | Alignment | New** menu option, or the **New Alignment** icon on the toolbar. The **IP Align** dialog box appears.



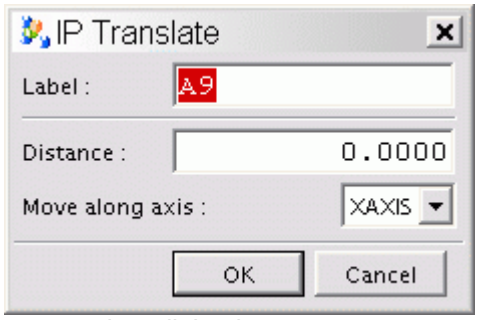
IP Align dialog box

2. If needed, type an ID for this alignment in the **Label** box.
3. From the **Feature List,** select the feature required to **Level To**. Click in the **PRIMARY Feature ID** box. Press **Enter** and IP adds the highlighted feature to the **Feature ID** box. Choose the needed axis from the **Level To** box
4. From the **Feature List,** select the feature required to **Rotate To**. Click in the **SECONDARY Feature ID** box. Press **Enter** and IP adds the highlighted feature to the **Feature ID** box. Choose the needed axes from the **Rotate To** and **About** boxes.
5. From the **Feature List,** select the feature required to establish an **Origin**. Click in the **(X, Y, or Z) Origin** box. Press **Enter** and IP adds the highlighted feature to the specified **Origin** box. Continue the process until each of the XYZ boxes are filled with the needed features.
6. Click **OK** and the specified **Alignment** will be entered into the current Inspection Plan.

Translating Alignments

You can translate (or move) your Inspection Plan's current alignment by an offset distance.

1. Select the **Inspection Planner | Alignment | Translate** menu option, or the **Translate Alignment** icon on the toolbar. The **IP Translate** dialog box appears.



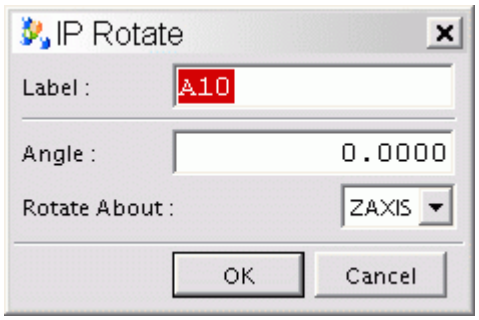
IP Translate dialog box

2. Type the required distance to move the alignment in the **Distance** box, and select the axis from the **Move along axis** box.
3. Click **OK** and the specified alignment will be translated to the distance specified along the chosen axis and added to the Inspection Plan.

Rotating Alignments

You can rotate your Inspection Plan's current alignment by a specified angle.

1. Select the **Inspection Planner | Alignment | Rotate** menu option, or the **Rotate Alignment** icon on the toolbar. The **IP Rotate** dialog box appears.



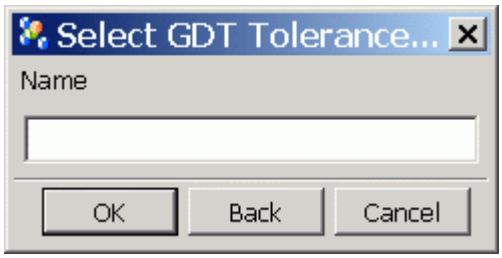
IP Rotate dialog box

2. Type the required angle (in degrees) in the **Angle** box, and select the axis from the **Rotate About** box.
3. Click **OK,** and IP will rotate the Inspection Plan's alignment about the specified axis

Creating Tolerances

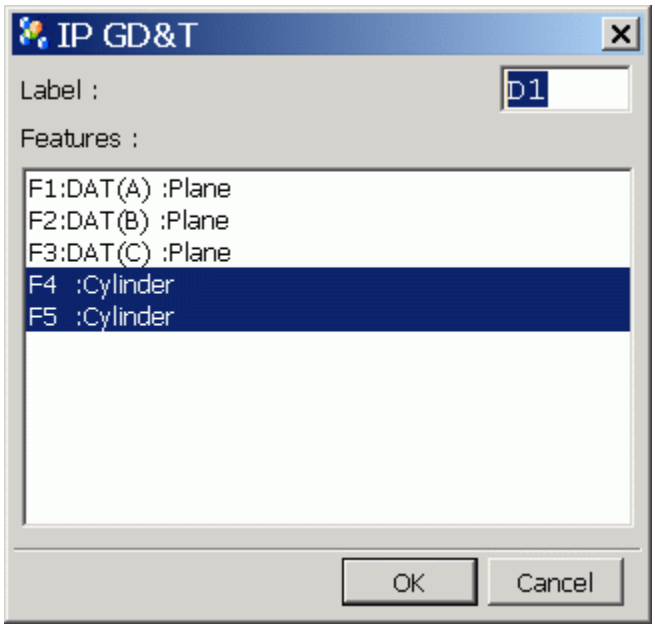
The **Tolerance** menu option allows you to select GD&T Feature Control Frame symbols to create IP tolerances.

1. Select **Inspection Planner | GDT Selection** from the menu.
2. The **Select Tolerance Feature** dialog box appears.



Select GDT Tolerance Feature dialog box

3. Select the appropriate Feature Control Frame symbol from the 3D CAD view.
4. The **IP GD&T** definition dialog box appears.



IP GD&T dialog box

IP highlights the feature(s) associated with the tolerance in both the 3D CAD view and the feature list in the **IP GD&T** dialog box.

5. If you want to change the **Label**, select the label in the dialog box and type a new letter.
6. If you want to change the feature(s) associated with the tolerance, select the new feature(s) in the **Features** list. The newly selected feature(s) will be highlighted in the 3D CAD view.

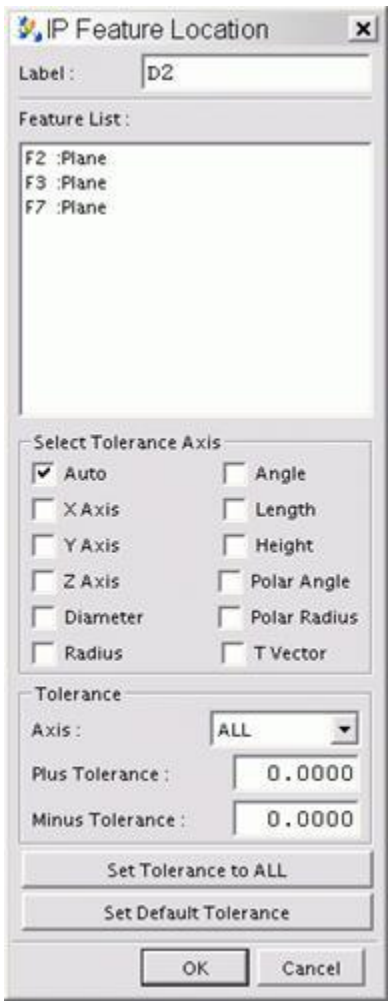
This only changes the feature(s) associated with the tolerance for the Inspection Plan only. It does not effect tolerance's association in the CAD file in any way.

7. Click **OK** to add the Tolerance Feature Control Frame to the Inspection Plan. IP also adds the associated feature(s) to the Inspection Plan if not already in the plan.

Creating Location Dimensions

If you want to create a location dimension for any features, you can use the **Location** menu option.

1. Select **Inspection Planner | Location** from the menu or the **Location** icon from the toolbar. The **IP Feature Location** dialog box appears showing a list of all the IP features.



IP Feature Location dialog box

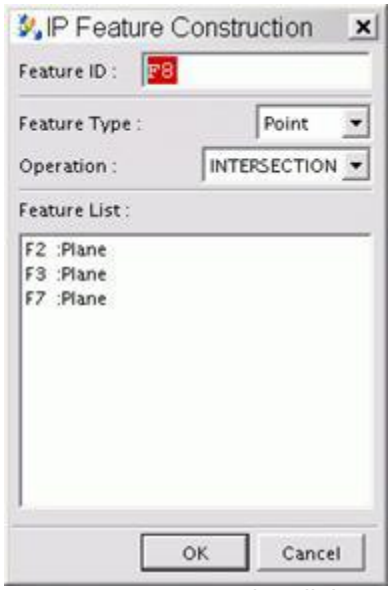
2. Select the feature from the List or select the feature's label from the 3D CAD view. It will be added to the **Feature List** box.

3. When the IP feature is selected from the **Feature List**, the appropriate default axes will be selected. For example, if an IP point is selected, then the **X**, **Y**, **Z**, and **T Vector** axes will be selected.
4. For each axis selected, type appropriate positive and negative tolerances. There is a different set of positive and negative tolerances for each axis. Select the needed **Axis** from the drop-down box and change the values in the **Plus Tolerance** and **Minus Tolerance** boxes.
5. If the same tolerances are wanted for more than one axis, click the **Set Tolerance to ALL** button. This sets the specified tolerances for all selected axes.
6. If more than one IP Location command will be created, click the **Set Default Tolerances** button. This sets the default tolerances for all axes to the currently specified values. Next time a new IP Location is created, it will start out with the default tolerance values that were set.
7. Click **OK** to accept the current values or changes that have been made.

Constructing Features

If you want to construct features from other features, you can use the **Construction** option.

1. Select the **Inspection Planner | Construction** menu option or **Construction** icon in the toolbar. The **IP Feature Construction** dialog box appears letting you construct the desired feature from the list of features in the current Inspection Plan.



IP Feature Construction dialog

2. Select the features that are needed for the construction from the **Feature List** box.
3. Select the Feature type to construct from the **Feature Type** drop down list and select the type of operation to be performed for that feature from the **Operation** drop down list.

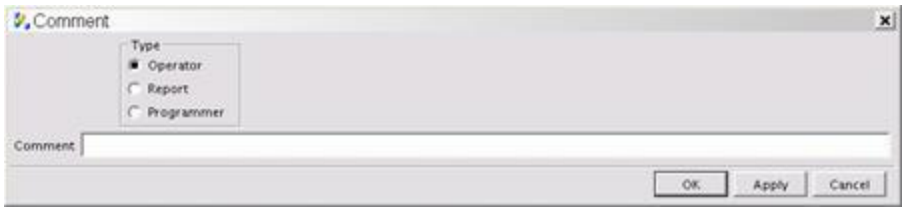
See "Appendix A: Constructed Features" for more information about the construction operations that can be performed and the related feature types that can be created.

4. Click **OK** and the **Constructed** feature will be added to the Inspection Plan.

Inserting Comments

Comments come in three types: Operator, Programmer, or Report. This allows you to insert a specific type of comment into your Inspection Plan, providing instructions to operators, programmer notes, or notes that will show up on your Inspection Plan reports.

If you want to insert comments into the Inspection Plan, select the **Inspection Planner | Comment** menu option or **Comment** icon in the toolbar. A **Comment** dialog box appears.



Comment dialog box

Use the **Comment** dialog box to select the type of comment (Operator, Report, or Programmer), type the comment, and click **OK** to insert it into the Inspection Plan.

- Operator comments appear as message boxes whenever the resulting part program is executed. They are useful for giving instructions to the operator at the measuring machine.
- Programmer comments will not be visible to the operator in the resulting part program. But if someone opens up the part program and looks at the code they will be able to see the programmer comments.
- Report comments send the specified comments into the report that gets generated once the part program finishes execution.

Displaying the Inspection Plan

At any time you can display the entire Inspection Plan. To do this, select the **Inspection Planner | Show Plan** menu option. Your CAD package will display a dialog showing the Inspection Plan.

Inspection Plan display dialog box

The statements include:

- Header
- Comments
- Measured features
- Datum features
- Dimensions
- Alignments
- Rules
- Report options

- You can edit any command by selecting the command line and clicking the **Edit** button in the display dialog
- You can delete any command by selecting the command line and clicking the **Delete** button in the display dialog.
- You can set the insert position by selecting the command line and clicking the **Insert After** button in the display dialog. Any new commands will get inserted at that point.
- You can keep this plan open during the entire planning process.

Exporting Your Inspection Plan

The **Inspection Planner | Export** menu option, or the **Export** icon on the toolbar, allows you to specify a text file to which IP will save the current Inspection Plan. You can import this text file into PC-DMIS. See "Importing the Inspection Plan".

Using Inspection Planner within PC-DMIS

The following topics describe how to use the new functionality added to PC-DMIS for Windows to automatically create a part program from your Inspection Plan. To create your part program you need to do the following:

- Import the Inspection Plan you exported from your CAD package.
- Perform an optimization step on the imported plan,
- Ensure that the probe won't collide with the part by inserting proper move commands.

Once you have completed these simple tasks, you can then execute your imported inspection plan as a newly created PC-DMIS part program.

If you have problems using the Inspection Planner commands inside PC-DMIS, ensure that there is an *InsPlan.dll* file located in the directory where you installed PC-DMIS.

Inspection Planner Default File (IPD)

You must have an Inspection Planner Default file, or (IPD) to import an Inspection Plan into PC-DMIS. The "Creating and Modifying an Inspection Planner Default (IPD) file" provides more information on this file.

The **IP Measure** option must be enabled on your portlock to use the Inspection Planner capabilities that are discussed in this section.

Importing the Inspection Plan

You can import the Inspection Plan and any rules by either importing a CAD file that has the Inspection Plan tied to it, or by importing a previously exported Inspection Plan.

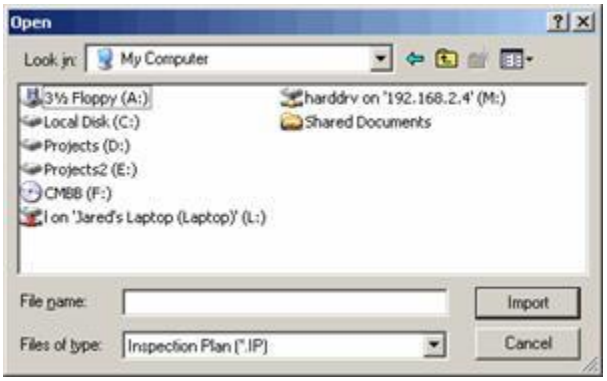
To import the Inspection Plan tied to a CAD model:

1. Select **File | Import** and then select the menu item to import that CAD data.
2. Follow any on-screen instructions.

For specifics on importing CAD data, see the “Using Advanced File Options” chapter in the main PC-DMIS manual.

To import the textual, exported Inspection Plan:

1. Select **File | Import | Inspection Plan**. An **Open** dialog box appears letting you select a file with an “.IP” filename extension.



Open dialog box

2. Browse to the directory containing your Inspection Plan.
3. Select the Inspection Plan, and click **Import**.
4. Follow any on-screen instructions.

- Select the **IPD** file that will be applied to the imported Inspection Plan if you have not previously selected it. See the "Creating and Modifying an Inspection Planner Default (IPD) file" topic for more information.
- If the insertion point is not at the end of the part program, you will be prompted to move the cursor to the end of the part program before continuing.

- Specify the **Optimize Path** options and click **OK**, or click **Skip** to ignore this step. See the "Performing the Path Optimization" topic for more information. Review the "Path Optimization Summary" and click **OK**.
- Specify the options for "Automatically Inserting Move Commands" and click **OK** to complete this process or click **Cancel** to skip this step.

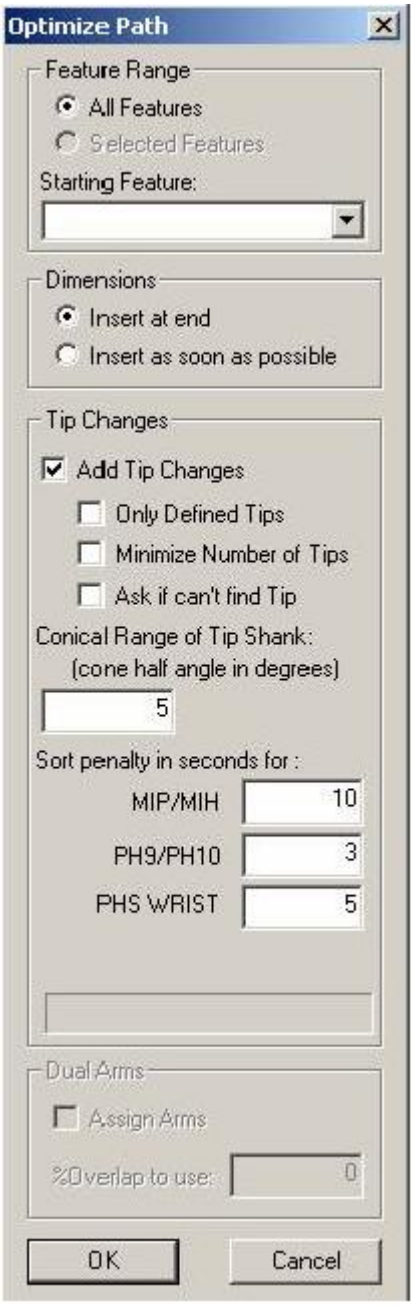
Your imported Inspection Plan will be proceeded by a start comment that provides basic information for the imported Inspection Plan (date/time, IP file name with path, IPD file name and path). An end comment is also added to indicate the end of the translated Inspection Plan.

Performing the Path Optimization

Once PC-DMIS finishes importing your inspection plan, you will see that the PC-DMIS edit window contains the commands needed to measure the desired features. Next, you need to optimize the order PC-DMIS takes to measure the features and what tip angles to use and when. This is called a “path optimization”.

To perform a path optimization:

1. Select **Edit | Optimize Path.** the Optimize Path dialog box appears.



Optimize Path dialog box

2. Determine what features you want to optimize. you can choose the **All Features** option button or the **Selected Features** option from the **Features Range** area. ***All Features*** sorts all the features, **Selected Features** only sorts those features selected in the edit window.

The **Selected Features** option only becomes enabled if you select multiple features from the edit window *before* accessing the **Optimize Path** dialog box.

3. Choose a feature from the **Starting Feature** drop-down list. Path optimization will start from this selected feature.

4. Decide when to insert dimensions from your inspection plan into the part program by selecting the appropriate options from the **Dimensions** area. You can insert dimensions at the end of all the measured features by selecting **Insert at end** or as soon as possible after each measured feature by selecting **Insert as soon as possible**.
5. Determine whether or not you want to allow PC-DMIS to insert tip changes. If so, select the **Add Tip Changes** check box. The items in the **Tip Changes** area become enabled for selection and you should follow the bullet list here:

   - Select the **Only Defined Tips** check box if you want PC-DMIS to assign only defined tips to features. If an appropriate tip can not be found to measure a feature, then the feature will be assigned T?A?B?. This feature will be added to the list of **Features without tips** which is displayed to the user in the summary dialog at the completion of the Optimize Path process. If you clear this check box, PC-DMIS will also use undefined tips. Prior to execution, PC-DMIS will require that you calibrate any undefined tips.
   - Select the **Minimize Number of Tips** check box if you want PC-DMIS to use a minimal amount of tips to measure the features in your part program. PC-DMIS will only change the tip's angle when absolutely necessary. A progress bar at the bottom of the dialog box appears when you select this check box.
   - Select the **Ask if can't find Tip** check box if you want PC-DMIS to prompt you when it cannot determine the optimal tip for a given feature. This will allow you to manually specify the most appropriate tip.
   - Type an angle value into the **Conical Range of Tip Shank** box. This determines the conical tolerance for added tip changes. This allows PC-DMIS to utilize a tip that has a shank vector that is within the tolerance of the optimal vector angle for a given feature. For features such as points, lines, and planes there is a built in conical range of 90 degrees since a plane with a vector of 0, 0, 1 could be measured by t1a0b0 or t1a90b0. In the case of these features, PC-DMIS adds the user entered value to the built-in range. The proposed tip angle is also checked by running collision detection (silently) to determine if the tip will actually work.
   - **Sort penalty in seconds for: MIP/MIH, PH9/PH10, PHS WRIST** – These values in seconds are an approximation of the time taken by a CMM to change tips for various categories of probes. The default penalties mean that all features measured with a given tip will be grouped together and sorted within that tip group. For example, If the penalty were set to zero, this would allow the Optimize Path process to sort features solely based on the distance travelled between features while completely ignoring tip changes.

6. Click **OK** to perform the path optimization; PC-DMIS does the following:

   - Takes the tip vector and the cone tolerance and determines the best tip angle for each feature. For example, the optimal tip angle for a cylinder will be based on the cylinder vector, which may or may not correspond to an exact tip angle.
   - Sorts the features by the tips used to measure them.
   - Determines the best path for the probe to take based on distances between features and the tip change.
   - Adds dimensions either at the end of the program or after each feature.
   - Adds constructed features as soon as possible.

See the "Dual Arm Path Optimization" topic for information on Dual Arm programs.

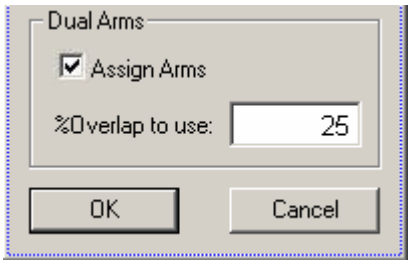
PC-DMIS will not sort across alignment or loadprobe commands. Additionally, PC-DMIS preserves any motion commands or other parameters that may affect measurement, such as retract distance, prehit distance, etc.

Dual Arm Path Optimization

Path Optimization for dual arm programs are similar to single arm programs with a few exceptions. The **Dual Arms** area of the **Optimize Path** dialog box is enabled and the **Starting Feature** pull-down list is hidden. To complete Path Optimization for dual arms, follow the procedure described in "Performing the Path Optimization" and then complete the following steps:

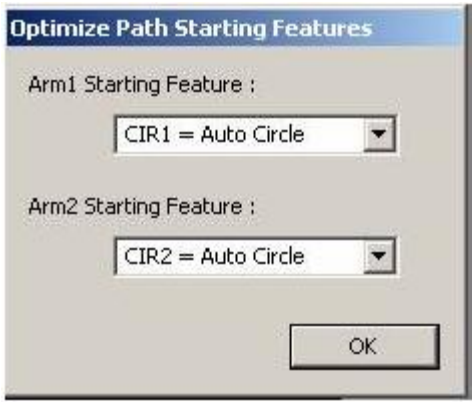
1. Select the **Assign Arms** check box. The Optimize Path process will assign arms to each of the **Selected Features** (or **All Features**).

    - If all probe hits of a feature can be measured by Arm1, then it will be assigned to Arm1.
    - If Arm1 cannot measure a feature, but Arm2 can reach all of the probe hits that feature, then it is assigned to Arm2.
    - If neither arm can measure the feature, then Arm1 is assigned and the feature is added to the list of **Dual Arm Errors** / **Features that cannot be measured** which is displayed to the user in the summary dialog at the completion of the Optimize Path process.



Dual Arms are of the Optimize Path dialog box

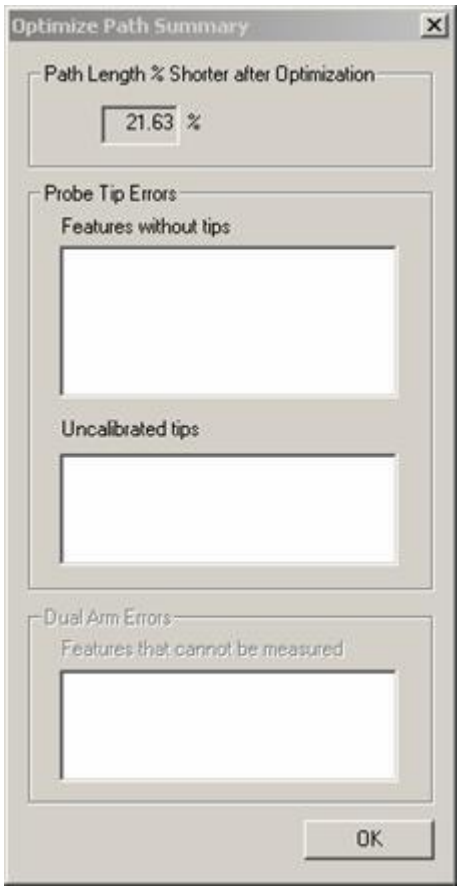
2. Specify the Overlap percentage in the **%Overlap to use.** This controls how the machine volume is divided between the two arms. At 0%, each arm would only be allowed to measure features that are within the half of the machine volume that is accessible to that arm. At 100%, Arm1 would be assigned to all the features.
3. Click **OK** to begin the Path Optimization process. This displays the **Optimize Path Starting Features** dialog box. This allows you to specify the starting feature for each arm



Optimize Path Starting Features dialog box

Path Optimization Summary

Once the Path optimization has completed, the **Optimize Path Summary** dialog box shows the results of the path optimization.



Optimize Path Summary dialog box

The dialog box reports the following information:

Path Length % Shorter after Optimization – This value refers to the percent reduction of the optimized path length compared to the normal path length. For dual arm machines, it gives a percentage for both arms.

Probe Tip Errors – Features that were not assigned to a probe tip are listed in the **Features without tips** list. You may need to define new probe tips to ensure that each feature has a tip that can measure it. The **Uncalibrated tips** list shows the uncalibrated probe tips that you plan to use to measure features in your part program. You may need to calibrate these tips before executing the part program.

Dual Arm Errors – Features that the program was unable to measure by either arm will be included in this list.

Void Detection

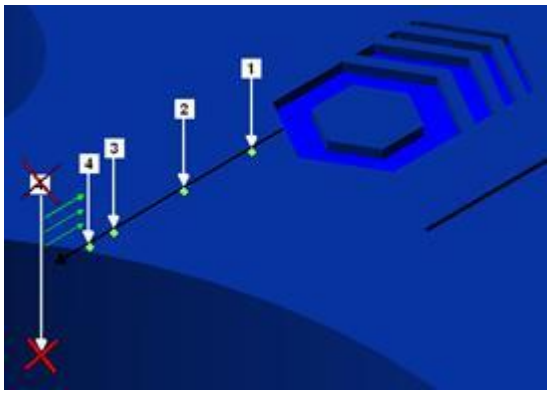
Void Detection prevents hits from being taken in empty spaces (such as holes). This functionality has been added to these Auto Features:

- Auto Vector Point
- Auto Surface Point
- Auto Edge Point
- Auto Line
- Auto Plane
- Auto Circle
- Auto Round Slot
- Auto Cylinder

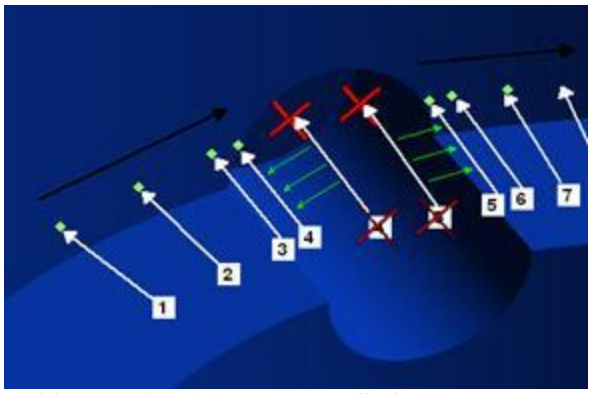
Without Void Detection, an auto feature may place hits in holes and other empty spaces in the CAD surface and the part.

PC-DMIS uses void detection if your hardware key (or portlock) has been programmed with the **IP measure** item. PC-DMIS automatically applies void detection to the generation of the probe hits when you create a supported auto feature by using the parameters from corresponding **Auto Feature** dialog box (such as **# hits**, **Start Angle** and **End Angle** for an auto circle). Any probe hits that would normally fall into a void are moved so that they reside on the surface of the selected feature, at least, a probe radius distance from any edge of that surface. Requested sample hits for Auto Circles or Auto Cylinders are also automatically generated with void detection.

The following examples show when Void Detection would be useful for accurately and safely measuring an Auto Feature. Hits denoted with an “X” are determined to be Voids and are corrected to the edge of the auto feature surface.



Void Detection for an Auto Plane Feature



Void Detection for an Auto Cylinder Feature

Automatically Inserting Move Commands

Once you import your part program and have finished Path Optimization, you should ensure that when the probe moves to measure your features, it will not collide with your part. Collision Avoidance is accomplished by inserting move commands. To do this, use PC-DMIS's **Auto Insert Move** menu option to automatically create clearance moves for a range of features:

Note: Move commands can be placed between the range of features specified, but not prior to the first feature. A clear path is assumed to the probe start position and the first feature.

1. Select the **Operation | Graphics Display Window | Auto Insert Moves** menu option. The **Automatically create clearance moves** dialog box appears.

Automatically create clearance moves

2. Select the first feature for the range of features from the **Start** list.
3. Select the last feature for the range of features from the **End** list.
4. Type a value in the **Collision safety** box. This value provides a buffer zone around the probe tip so that PC-DMIS considers close misses as collisions.
5. Type a value in the **Insert clearance moves** box. This value defines the distance that the probe moves away from the part when it detects a collision while trying to move the probe to the next feature. PC-DMIS attempts to go directly to the next feature, but compensates for collisions by inserting clearance move commands. It continues this process until it defines a collision free path to the next feature. More than one move command may be inserted between features.
6. Select the **Delete existing moves** check box if you want to delete any pre-existing move commands in the part program.

For Dual Arm programs, PC-DMIS will insert “Move Exclusive” commands as necessary to guard against the two arms colliding during execution.

Inspection Planner Parameters and Rules

The **Inspection Planner Default (IPD)** file is used to define the parameters for **Inspection Planner** within PC-DMIS. This file allows you to determine how to take hits from features within the **Inspection Plan**. Feature parameters are specified for Auto Features, Constructed Features, and Dimensions. You can also specify how you want to display comments and features.

The **Inspection Planner Rules (IPR)** script is used to specify rules for how automatic processes are performed on the **Inspection Plan**. Rules can be modified for certain criteria. For example, the number of hits taken on a circle based upon the diameter of the circle and so forth.

Creating and Modifying an Inspection Planner Default (IPD) file

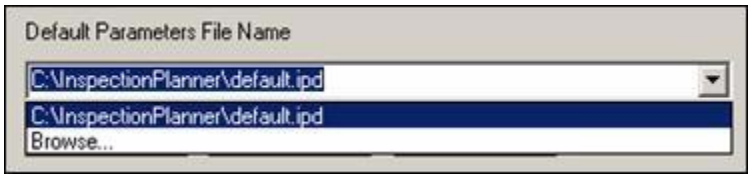
To create a new **IPD** file or make changes to an existing IPD file, follow this procedure:

1. Select the **Edit | Preferences | Inspection Plan Defaults** menu option. The Modify Default Parameters dialog box appears.

The **Modify Default Parameters** dialog box is password protected if password protection has been enabled for other settings in PC-DMIS. See the "Setup Options: General Tab" topic in the core PC-DMIS reference manual for more information.

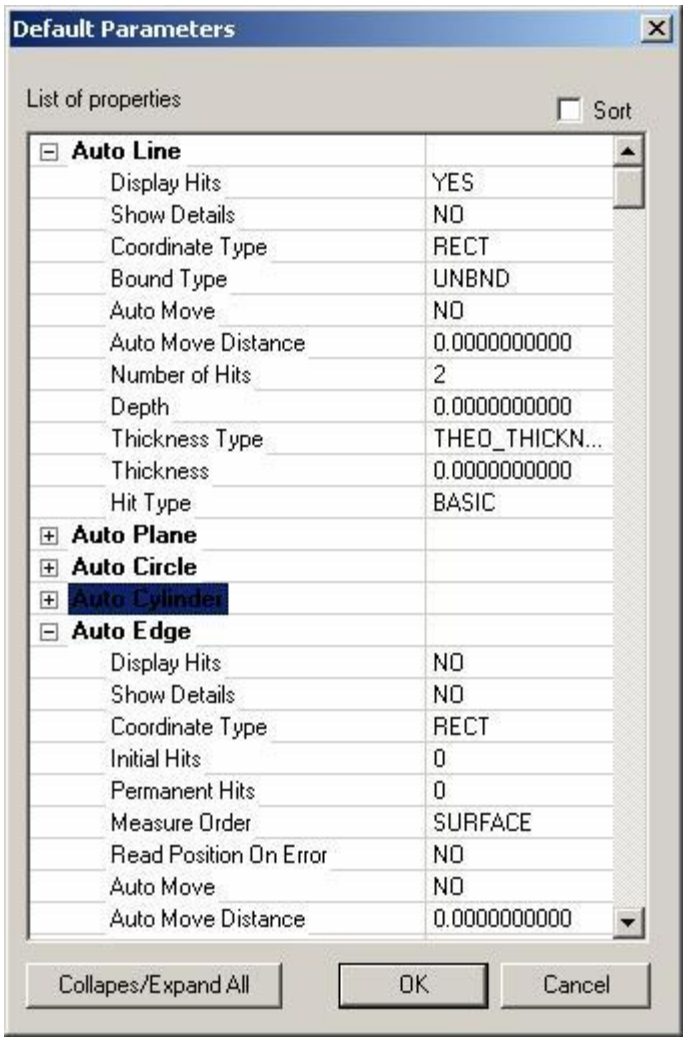
Modify Default Parameters – Inspection Planner Default File

2. From the **Default Parameters File Name** drop-down select or browse to the file you want to modify or open. Click **Browse…** to open a select file dialog box if the IPD file is not already listed.



File Name list box - IPD

3. Click the **Open** button to modify or open an existing IPD file. Or if you want to create a new IPD file, click **Create**. The **Default Parameters** dialog box opens for the selected or new IPD file.



Default Parameters for IP

4. To edit a parameter, from the right column, click on that parameter's value. A drop-down list becomes visible.
5. Select the drop down list, and finally choose a different value. These values may represent distance, amount, or some measured value. You can select values from option lists or toggle fields.

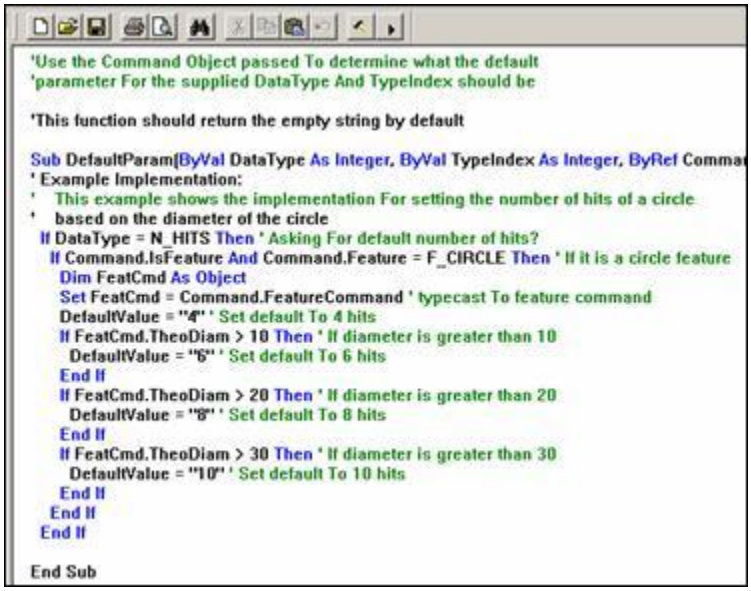
   - Option lists provide a list of choices relevant to the associated item.
   - Toggle fields provide only two choices, such as ON/OFF, YES/NO, or TRUE/FALSE.

6. Click the **Sort** check box if you want to sort the **List of properties** alphabetically.
7. Click the **Collapse/Expand All** button to collapse or expand the **List of properties**.
8. Click **OK** to open the **Save As** dialog box, or **Cancel** to abort any changes that have been made.
9. Click **Save** to save the IPD file.
10. Click **Set as Default** if you want to make the file listed in the **Default Parameters File Name** box the default file.
11. Click **Exit** when finished.

Inspection Planner Rules (IPR) script

IPR scripts are basic scripts that determine how features are measured within your part program. This script is applied as your Inspection Plan is imported into your part program.

The PC-DMIS **Basic Script Editor** can be used to create **IPR** scripts.



```
'Use the Command Object passed To determine what the default
'parameter For the supplied DataType And TypeIndex should be

'This function should return the empty string by default

Sub DefaultParam[ByVal DataType As Integer, ByVal TypeIndex As Integer, ByRef Commar
' Example Implementation:
'   This example shows the implementation For setting the number of hits of a circle
'   based on the diameter of the circle
 If DataType = N_HITS Then ' Asking For default number of hits?
  If Command.IsFeature And Command.Feature = F_CIRCLE Then ' If it is a circle feature
   Dim FeatCmd As Object
   Set FeatCmd = Command.FeatureCommand ' typecast To feature command
   DefaultValue = "4" ' Set default To 4 hits
   If FeatCmd.TheoDiam > 10 Then ' If diameter is greater than 10
    DefaultValue = "6" ' Set default To 6 hits
   End If
   If FeatCmd.TheoDiam > 20 Then ' If diameter is greater than 20
    DefaultValue = "8" ' Set default To 8 hits
   End If
   If FeatCmd.TheoDiam > 30 Then ' If diameter is greater than 30
    DefaultValue = "10" ' Set default To 10 hits
   End If
  End If
 End If

End Sub
```

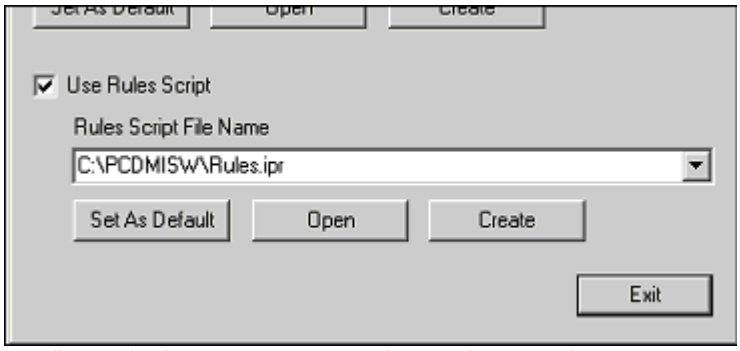
Basic Script Editor containing sample code for IP rules

The example in the above figure shows rules that will change the number of hits that are taken depending on the diameter of the circle.

To make changes to the Inspection Planner Rules (IPR) script, follow this procedure:

1. Select the **Edit | Preferences | Inspection Plan Defaults** menu option. The **Modify Default Parameters** dialog box appears.

The **Modify Default Parameters** dialog box is password protected if password protection has been enabled for other settings in PC-DMIS. See the "Setup Options: General Tab" topic in the core PC-DMIS reference manual for more information.



Modify Default Parameters – Rules Scripts Section

2. Select the **Use Rules Script** check box.
3. From the **Rules Script File Name** drop-down select or browse to the file you want to modify. Click **Browse…** to open a select file dialog box if the **IPR** file is not already listed.

File Name list box - IPR

4. Click **Open** to modify an existing **IPR** file or click **Create** to open the default **IPR** script. This will open the selected file in the **Basic Script Editor**. When using **Create** a new script will be populated with a default IPR script inside of the **Basic Script Editor**.
5. Edit your **IPR** script using the **Basic Script Editor**.
6. Click the **Save** Icon to save your finished script.
7. Click **Close** to exit the **Basic Script Editor**.

Setting the Default IPR Script

1. Select the **Edit | Preferences | Inspection Plan Defaults** menu option. The **Modify Default Parameters** dialog box appears.
2. From the **Rules Script File Name** drop-down select or browse to the needed file.
3. Click **Set as Default** to make the file listed in the **Rules Script File Name** box the default file.
4. Click **Exit** when finished.

Appendix A: IP - Constructed Features

This section in the Inspection Planner documentation provides guidelines and information about the construction of features. For each CAD package, you have the ability to construct features based on existing Inspection Plan features.

The list below shows available construction operations. It discusses possible feature types under each operation section.

1. **Best Fit** - Constructs a Best Fit feature from the inputs. Using the **Best Fit** operation, you can create a *line, plane, circle, cylinder, cone, or sphere.* The following table lists how many inputs you will need to construct your feature.

Best Fit Feature To Construct	Number of Input Features Needed
Line	2
Plane	3
Circle	3
Cylinder	6
Cone	6
Sphere	5

2. **Best Fit with Recomp**- Constructs Best Fit with Recomp feature using inputs. At least *one input must be a point* Using the **Best Fit with Recomp** operation you can create a line, plane, circle, cylinder, cone, or sphere. The following table lists how many inputs you will need to construct your feature.

Best Fit Recomp Feature To Construct	Number of Input Features Needed
Line	2
Plane	3
Circle	3
Cylinder	6
Cone	6
Sphere	5

Best Fit and **Best Fit with Recomp** cylinders can be constructed from two circles. The input circles must be of type *Constructed Best Fit (BF)*, *Best Fit Recompensate (BFRE)*, or *Measured circles*. The total amount of hits in each circle must be at least three.

3. **Cast** - Constructs the specified feature type at centroid of the input feature. Only one input feature of any type is needed. Using the Cast operation you can create a *point, line, plane, circle, cylinder, cone, or sphere.*
4. **Drop** – Constructs a point feature when first feature is dropped onto the second line feature. Two input features are needed. The 1st feature *can be any type*. The 2nd feature must be a *cone*, *cylinder*, *line*, or *slot*.
5. **Intersect** - Constructs the specified feature intersection of the 2 input features. Using the **Intersect** operation, you can create a *point, line,* or *circle.*

- **Intersect Point** - Constructs a point at the intersection of the linear attributes of 2 features. The input types for either input feature should be a *circle, cone, cylinder, line* or *slot*.
- **Intersect Line** – Constructs a line at the intersection of two planes. The input features must be *planes*.
- **Intersect Circle** – Constructs a circle at the intersection of a circle, cone, cylinder, or sphere feature with a plane, cone or cylinder feature.

6. **Mid** - Constructs a point, line, or plane midway between the two input features..

   - **Midpoint or Midplane** – Constructs the point or plane feature midway between the centroids of *any input feature*.
   - **Midline –** Constructs the line midway between *line*, *cone*, *cylinder*, *slot*, or *plane* input features**.**

7. **Offset** - Constructs the specified feature based on the centroids of the input features and moved by the offset distance specified. The offset distance is given in terms of XYZ values. Using the **Offset** operation, you can create a point, line, or plane. The following table lists how many inputs you will need to construct your feature.

Offset Feature To Construct	**Number of Input Features Needed**
Point	1
Line	2
Plane	3

8. **Origin** - Constructs a point, line, or plane at the alignment origin. No input features are needed.
9. **Parallel** - Constructs a line or plane feature parallel to first input feature and passing through the second input feature.
10. **Perpendicular** - Constructs a line or plane feature perpendicular to first input feature and passing through second input feature.
11. **Pierce** - Constructs a point feature where the 1st input feature pierces the 2nd input feature. The order that the input features are selected is important. The 1st feature can be a *cone*, *cylinder*, *line*, *slot*, *circle* or *ellipse*. The 2nd feature can be a *cone*, *cylinder*, *plane*, *sphere*, *circle* or *ellipse*. If the 1st feature is a line, than the direction is important.
12. **Project** – Constructs a point, line, plane, circle, cylinder, cone, or sphere onto the selected plane, or the current work plane, when no plane is specified.
13. **Reverse** - Constructs a line, plane, circle, cylinder, cone or sphere with the same centroid and the same feature type as the input feature with the vector reversed.

Glossary

I

IP: This is the acronym for PC-DMIS Inspection Planner.

IPD: This is the acronym for Inspection Planner Defaults. Defaults are defined in a file that contains the parameters that are applied to the Inspection Plan.

IPR: This is the acronym for Inspection Planner Rules. A rules script is created using Basic Script Editor within PC-DMIS. Rules are applied to the Inspection Plan.

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