



TEAMCENTER

Weight and Balance Management — Usage

Teamcenter 2412

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1. About Weight and Balance Management

In many industries, such as aerospace, automotive, and construction, managing the weight and balance of a product is crucial. An overweight product is less efficient and shows reduced performance. An out-of-balance product has less stability and movability.



As a good practice, companies manage the weight and balance properties of their product right from the concept through the service phases.

Typically, the targets for weights and the center of gravity limits are managed in different systems. Using the Teamcenter Weight and Balance Management solution, you can collaborate with all your stakeholders on a single PLM platform. Weight engineers can set their targets independent of the product and the ownership of the product and they can do so early on, during the product development lifecycle.

Example:

A company manufactures cars and uses Weight and Balance Management. Their initial targets are based on the limited geometrical data that is available with them. At this stage, they have the estimated weights. As their product matures, they have more realistic weight and center of gravity data. While rolling up this data, the administrator defines which weight should take precedence in the rollup. Based on this, Teamcenter picks up the best available value for rollup from the available values, for estimated weight, design weight, and actual or as-measured weight. A business user generates a rollup report for future use or to share with the manager.

Where do I go from here?

 Administrator	
How can I deploy and administer Weight and Balance Management?	See <i>Weight and Balance Management — Deployment and Administration</i> .
 Business User	
How can I calculate mass and balance rollup for a structure?	See Calculate mass and balance rollup for a structure .
How can I view the existing rollup reports?	See View existing rollup reports .
How can I download rollup reports?	See Download rollup reports .

2. Weight and Balance Management terms

Term	Description
Roll up	To accumulate. The rollup functionality calculates the cumulative total of the children and rolls it up on the parent.
Actual mass	As-measured mass based on a physical part or assembly that is weighed on a scale.
Asserted mass	Mass that can be overridden by a user to account for the anticipated changes to the design or geometry of part or assembly.
Evaluated (Estimated) mass	An estimated mass based on empirical data or a similar part or assembly.
Budgeted mass	Mass that is a target mass to be achieved, which is typically set and managed by the Weight Engineer.
From Design mass	Calculated by CAD applications, based on the CAD geometry and material assigned to the geometry or solid body.
Precedence	Also called maturity. A rollup calculation selects the mass value based on the maturity assigned to the mass type. For each BOM line, the mass value from the mass type with the highest maturity is used for mass rollup calculations.
Coating's mass	The mass of coating materials, such as primers and paints. Using Teamcenter Integrated Material Management, you can specify the mass of coating materials. If the mass for coatings is specified for structure components, it is taken into account for rollup and is displayed in the rollup reports.

3. View and manage weight and balance data

You can view and manage the weight and balance data of structure elements in the **Mass Properties** section within **Weight and Balance**. **Mass Properties** summarizes all mass and balance properties related to the selected structure element.

Procedure

1. Select the structure element (part) in the BOM, for which you want to view the weight and balance data.
2. Go to **Weight and Balance**.

The **Mass Properties** section displays all weight and balance information for the selected structure element.

3. (Optional) Set **Asserted**, **Actual**, or **Estimated** mass in Teamcenter for the selected component.

The mass published from the CAD applications based on geometry is published to the **From Design** mass property.



To make a cell in the table editable, double-click in it. Then, add new values or modify or delete existing values. When you exit the cell, the edited data in the cell is automatically saved.

Note:

- If Teamcenter is integrated with NX or CATIA, the **From Design** column shows the data from NX or CATIA.
- You cannot modify the data for the **From Design** and **From Design (Coated)** weight types.

4. Set a column arrangement for BOM


You can set the column arrangement to view the mass and balance rollup properties for a structure.

1. Choose **Table Settings**  > **Arrange**.
2. In the **Arrange** panel, choose **Column Arrangements**  > **Mass and Balance**.
3. Click **Arrange**.
4. For more information, see [Arrange, wrap text, and save the order of columns](#).



5. Add or update the mass values for different weight types

In Teamcenter, you can enter the mass for a part or an assembly occurrence for all weight types except for the **From Design** weight type, which is reserved for mass from the CAD geometry. The **From Design** mass value is automatically updated as the design is modeled and saved from the CAD application.

Your access privileges decide if you can enter or edit the mass values for a particular weight type. Typically, **Budgeted** values are accessible only to users with specific privileges.

1. Search for and open the structure.
2. Click the **Edit** .

The editable cells are activated.

3. Enter or update the mass values as required.
4. Save your changes by clicking **Save Edits** . To cancel your edits, click **Cancel Edits** .


Adding minimum or maximum values for weight or Center of Mass

You can specify the minimum or maximum weight for structures. This may be required to account for limitations due to manufacturing tolerance or other such considerations.



When rollup is calculated with minimum and maximum values, the report shows the rolled up value for minimum and maximum weights for the structure.

When the calculated rollup values are outside the specified minimum and maximum ranges, the values are highlighted in the rollup report. If the minimum or maximum value is not defined, the budgeted values are used for comparing the upper limit. The comparison with the minimum and maximum values is performed only for mass values and not for balance values.

To specify the minimum and maximum values for an occurrence:

1. Click **Edit** .

The editable cells are activated.

2. Enter or update the mass values as required in the **Min Weight**, **Max Weight**, and **Budgeted Mass** columns.
3. Save your changes by clicking **Save Edits** . To cancel your edits, click **Cancel Edits** .

Similarly you can set the minimum and maximum values for Center of Mass (CoM) for the top-level assembly or a subassembly to ensure the rolled-up CoM is within the desired limits required by the product design considerations.

The minimum and maximum CoM values are entered in the **Overview** tab.

1. Select the structure element and click the **Overview** tab.
2. Enter or update the following CoM values as required:
 - **Min CoM X (m)**
 - **Min CoM Y (m)**
 - **Min CoM Z (m)**
 - **Max CoM X (m)**
 - **Max CoM Y (m)**
 - **Max CoM Z (m)**

6. Adding weight or Center of Mass values for miscellaneous items

For some structures, a realistic weight and balance analysis requires the inclusion of the parts that may not be a part of CAD and for which the mass values cannot be sourced from the **From Design** weight type. You must manually enter the mass and Center of Mass (CoM) values for these miscellaneous items such as passengers, cargo, or fluids to ensure that the weight and the CoM of these are included in the rollup.

Similarly, you must also enter the Moment of Inertia (Mol) and Product of Inertia (Pol) values for miscellaneous items.



The precedence of manually added values is governed by the same preference as that for other mass values.

If the user-entered values have a higher precedence over the CAD values for rollup, the rollup calculation considers the user-entered values for CoM, Mol, and Pol.

For partly entered data, where some values may be missing, the value is assumed as **Zero**.





7. Revise or replace a parameter value

Revise and replace

You can revise a selected parameter and replace the existing revision in the product with the new revision by clicking . This action does not affect other occurrences of the existing revision. However, you can click  to display the **Replace Revision** dialog box where you can select other revisions to replace with the latest revision.

You can also revise multiple (selected) parameters in the same way. For this, you must confirm the action by clicking **Revise and Replace** in the confirmation dialog box.

Save a new revision of a parameter

1. Select the structure element and click the **Parameters** tab.
2. Select the mass parameter from the **Parameters** list and click **Open**  in the **Name** column.
3. Choose **More Commands**  > **New**  > **Save As** .

The **Save As** panel is displayed.

4. Enter the required details.
5. Click **Save**.

The system creates a new revision of the selected parameter and displays its **Overview** panel.

6. Choose **More Commands**  > **Edit**  > **Save Edits**  to save the new revision.

The system associates the new revision of the parameter with the project, replacing the previous revision.

7. Edit the values of the new parameter revision as appropriate.

8. Generating rollup reports with a coating's mass data

If you have Teamcenter Integrated Material Management, you can specify the weights of coating materials such as primers and paints. If the weight values for these coatings are specified for the structure components, these are taken into account for rollup and are displayed in the rollup reports.


Specifically, these values are displayed in the **Coatings Mass [kg]** column in the rollup report. If the Integrated Material Management Software is not installed, this column is not displayed.

9. Specify asserted values for center of mass, moment of inertia, and product of inertia

The weight and balance engineering user specifies the center of gravity or CoM limits at the product level or assembly level. This is required to ensure that the rolled-up CoM is within the specified CoM limits.

To set or modify the values for CoM, you must have write access to the product structure you are trying to update.

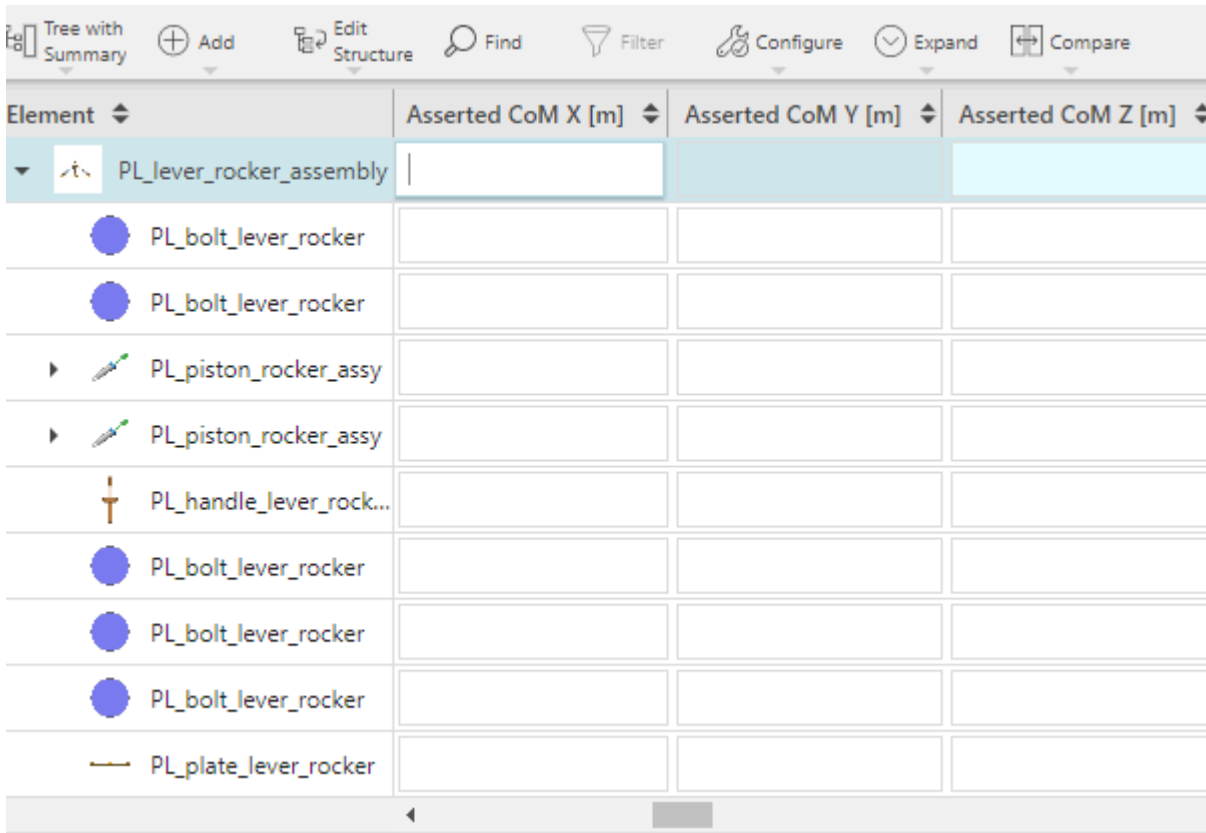
To specify asserted values:

1. Search for and open the structure.
2. Click **Edit** .

The editable cells are activated.

3. Enter or update the values in the following columns as required.
 - **Asserted CoM X (m)**
 - **Asserted CoM Y (m)**
 - **Asserted CoM Z (m)**
 - **Asserted MOI XX (kg m²)**
 - **Asserted MOI YY (kg m²)**
 - **Asserted MOI ZZ (kg m²)**
 - **Asserted POI XY (kg m²)**
 - **Asserted POI XZ (kg m²)**
 - **Asserted POI YZ (kg m²)**

9. Specify asserted values for center of mass, moment of inertia, and product of inertia



The screenshot shows the Teamcenter software interface with a table for asserting center of mass (CoM) values. The table has four columns: 'Element', 'Asserted CoM X [m]', 'Asserted CoM Y [m]', and 'Asserted CoM Z [m]'. The 'Element' column lists various assembly components, and the other three columns are empty input fields for specifying the CoM values.

Element	Asserted CoM X [m]	Asserted CoM Y [m]	Asserted CoM Z [m]
PL_lever_rocker_assembly			
PL_bolt_lever_rocker			
PL_bolt_lever_rocker			
PL_piston_rocker_assy			
PL_piston_rocker_assy			
PL_handle_lever_rocker...			
PL_bolt_lever_rocker			
PL_bolt_lever_rocker			
PL_bolt_lever_rocker			
PL_plate_lever_rocker			


4. Click **Save Edits**  to save your changes. To cancel your edits, click **Cancel Edits** .

10. Using Excel to edit weight and balance rollup data










You can export the weight and balance rollup data to Excel. You can then modify the data in Excel and import it back into Teamcenter. The weight properties sourced from the CAD integration are read-only and cannot be modified. Similarly, all balance properties are read-only, and you cannot import any modified values from Excel.

You can export the weight and balance data for any configuration.

A template for exporting the data to Excel is available this. It has nine columns for asserted type values for balance properties.










To export or import any structure data to or from Excel, use the **Excel Round-trip**  feature.

11. Create a payload and add its mass and CG values

1. From the **Home** page, navigate to your **Home** folder.
2. Choose **More Commands**  > **New**  > **Add** .
3. In the **Add** panel, in the **Type** box, scroll and select **Payload**.
4. Enter a name and description for the payload and click **Add**.
5. Select the payload in the **Home** folder, and then click **Edit** .
6. In the **Payload** section, click **Add** .
7. In the table, enter the **Name**, **Description**, **Mass** (kg), and **CoM** (m) values.
8. (Optional) click **Add**  to add more rows as required.
9. (Optional) select a row and click **Duplicate**  to create a new row with the same values (a duplicate row). The duplicate function is useful when you want to create many payloads with similar specifications, for example, 12 passenger seats.
10. To save the changes, click **Save** . To discard them, click **Cancel** .

11. Create a payload and add its mass and CG values

12. Create a CG Envelope object

1. From the **Home** page, navigate to your **Home** folder.
2. Choose **More Commands**  > **New**  > **Add** .
3. In the **Add** panel, in the **Type** box, scroll and select **CG Envelope**.
4. Enter a name and description for the CG envelope and click **Add**.
5. Select the CG envelope in the **Home** folder, and then click **Edit** .
6. In the **CG Envelope** section, click **Add** .
7. In the table, enter the **Name**, **X-Axis (%MAC)**, and **Y-Axis (Mass)**.
8. (Optional) click **Add**  to add more rows as required.
9. (Optional) select a row and click **Duplicate**  to create a new row with the same values (a duplicate row).
10. To save the changes, click **Save** . To discard them, click **Cancel** .

13. Calculating weight rollup

Rollup calculations are used to find the total mass based on the individual masses of all the parts in the structure (or the selected assembly). However, you can perform these calculations only when the weight and balance solution is set up in your Teamcenter environment.

You can use the following templates to perform rollup calculations:

- **Mass Properties** – Rolls up the mass of the components in the structure.
- **Mass and Balance Properties** – Rolls up the mass as well as the balance values of the structure components such as Center of Mass, Moment of Inertia, or Product of Inertia.

Your administrator manages the column configuration in a rollup report. However, you can have your own column configuration by overriding the **WNB0_MassPropsColConfiguration** and **WNB0_MassAndBalancePropsColConfiguration** preferences.

Your administrator specifies the rollup unit of measure (UOM) for your site. The rollup action always generates the rolled up value in this specified UOM. The rolled up value is listed in the **Computed** column in the rollup report.

You can use the following weight types for rollup calculations:

- **Actual**
- **Asserted**
- **Evaluated**
- **Budgeted**
- **From Design**

Your administrator can add custom weight types for your site. As an authorized user, you can add values for the **Actual**, **Asserted**, and **Evaluated** weight types. However, you can enter or edit the value for the **Budgeted** weight type only if you are a privileged user. Your site administrator assigns the user privileges using Access Control.

The value for the **From Design** weight type is retrieved from the CAD tool, and it cannot be edited in Active Workspace.

Each weight type can have a different value. This implies that structure components can have multiple mass values. In such cases, the mass value for a rollup calculation is selected based on the maturity assigned to the associated weight types.

14. Calculate mass and balance rollup for a structure



You can calculate and view the mass and balance rollup for structures to manage your mass and balance targets. For the structure in which you have created partitions, you can manage your mass and balance targets at the partition level.

Also, you can calculate and view the mass and balance rollup for the aligned engineering BOM. If the mass and balance values are available for both the design structure and engineering BOM, the mass and balance values from the engineering BOM are given more precedence and are considered for rollup. If a value is not available in the engineering BOM, only then does Teamcenter consider a value from the aligned design structure. A rollup report is generated based on the precedence order set by your system administrator.

1. To calculate the rollup value for a structure, open the structure.

To calculate the rollup value for a partition, from **Partition Scheme**, select the required scheme.


By default, the structure opens in the partition scheme that is set as the primary scheme.

2. Click **Rollup**  > **Create Report** .
3. In the **Create Rollup Report** panel, edit the name of the rollup report if required.
4. In the **Template** list:
 - a. Select the **Mass Properties** template to calculate the mass rollup.
 - b. Select the **Mass and Balance Properties** template to calculate the rollup with mass and balance properties such as Center of Mass (CoM), Moment of Inertia (Mol), or Product of Inertia (Pol).

If you select the **Mass and Balance Properties** template, the rollup report shows the rollup charts for the visual analysis of CoM.

5. Perform the action listed in the following table depending on your intended task:

Task	Action
To create the report synchronously	<ol style="list-style-type: none">a. Clear the Run in Background check box. (By default, the Run in Background check box is selected.)b. Click Create Report.

Task	Action
	When the calculation is complete, the report opens in a new browser tab.
<p>To create the report in the background</p> <div data-bbox="233 401 547 848" style="border: 1px solid black; padding: 5px;"> <p>Note:</p> <p>For creating a report for large assemblies, it is recommended that you run the rollup calculation process in the background. If you are unable to do so, contact your system administrator.</p> </div>	<p>a. Click Create Report.</p> <p>When the calculation is complete and the rollup report is generated, a notification appears in the Alerts panel.</p> <p>b. Click the Alerts  icon. The rollup report is available with its timestamp.</p> <p>c. Click the rollup report to view it.</p> <p>The report opens in a new browser tab.</p>

The topmost element of the structure shows the rollup calculation for the entire product, that is, it considers the structure elements in partitions as well as the unassigned structure elements (the elements that are not assigned to any partition). However, an individual partition shows the rollup calculation considering the structure elements only from that partition.

15. How rollup is calculated for subassemblies

Your site administrator sets the following two preferences to control how mass rollup is calculated for subassemblies:

- The **WNBO_MassMaturitySequence** preference defines the maturity for different weight types. It decides which weight type is considered for rollup calculation when multiple weight types are available.
- The **WNBO_AssemblyMaturedMassTypes** preference specifies the weight types for which the mass of the parent subassembly is considered and the masses of its child parts are ignored.

For example, if the preference defines **Actual** and **Asserted** as *matured* weight types, then these values of the parent subassembly are considered (if available) and the values of the child parts are ignored for rollup calculations.

The rollup mass for a subassembly is the sum of the masses of all its components. If the mass of a sub-assembly and the masses of its individual components are both available, then only one is counted. However, some business cases require that both the assembly mass and the sum of the components' masses be included in the rollup calculation. You can set preferences to achieve the required behavior.

Example:

Consider the following values for the preferences:

The **WNBO_AssemblyMaturedMassTypes** preference specifies **Actual** and **Asserted** as *matured* weight types.

The **WNBO_MassMaturitySequence** preference defines the maturity for different weight types in the following order:

1. **Actual** (maturity 1)
2. **Asserted** (maturity 2)
3. **From Design** (maturity 3)
4. **Estimated** (maturity 4)
5. **Budgeted** (maturity 5)

Based on the given preference values, the rollup for different scenarios is calculated as follows:

If the **From Design** assembly mass has the highest maturity among the available masses, or if the **From Design** assembly mass is available and a lower precedence mass (**Estimated** or **Budgeted**) is available as well, then both the assembly mass and its component masses are included in the calculation. Component mass is selected based on the assigned precedence.


If the **From Design** assembly mass is available but the other higher precedence masses (**Actual** or **Asserted**) are also available, then the higher precedence mass (between **Actual** or **Asserted**) is considered and the components mass values are ignored.

If the available subassembly mass has a lower precedence (**Estimated** or **Budgeted**), then the rollup of the components is considered, and the mass of the parent subassembly is ignored.

If the subassembly mass is not available, then the sum of the components is considered.

16. View existing rollup reports

Whenever a rollup calculation is completed and the report is generated, a notification is displayed in the **Alerts** panel. From this panel, you can access all the latest reports created by you. All rollup reports for a structure are available for viewing, unless you delete them. To view an existing rollup report for a structure:

1. Search for and open the structure for which you want to view the rollup reports.
2. Click **Rollup** Σ > **View Report** .


The **View Rollup Report** panel is displayed with the list of existing rollup reports. These are sorted from new to old with the newest on the top.

3. Select the report you want to view and click **View Report**.

The report opens in a new browser tab.



Rollup reports always show packed lines, whereas downloaded reports are always in the unpacked form. The mass of a packed line is the rolled up mass of all the lines that are packed. The mass is calculated as follows:

Mass of a packed line = No of packed lines * mass per line * quantity


4. Rollup charts are available for **Mass and Balance Properties** reports. To view the rollup chart and excursion plot, choose **Layout Choice** > **Charts at Side** .

17. Delete a rollup report



You can access the rollup reports for a structure in the **View Rollup Report** panel. You can also search for them.

1. To view the rollup reports for a structure, search and open the structure.
2. Click **Rollup**  > **View Report** .

The **View Rollup Report** panel is displayed with the list of existing rollup reports. These are sorted from new to old with the newest on the top.


3. Select the report you want to delete, and click **Delete** .

18. Generate the excursion diagram for the selected payload collection


1. Open the structure for which you want to generate the excursion diagram.
2. Click **Rollup**  > **Create Report** .
3. In the **Create Rollup Report** panel, edit the name of the rollup report if required.
4. In the **Template** list, select **Mass and Balance Properties**.
5. Select the **Generate Excursion Plot** check box.
6. Select the **Payload Collection** for which you want to generate the excursion plot.
7. Click **Create Report**.

The rollup value is calculated. When the calculation is complete and the rollup report is generated, a notification is displayed in the **Alerts** panel.

Teamcenter Dispatcher Server must be installed to run the rollup calculation process in the background. Your system administrator can find information about configuring asynchronous services in *Installing and Configuring Dispatcher* in the Teamcenter help.

8. Click the **Alerts**  button. The rollup report is available with its timestamp.
9. Select the report you want to view and click **View Report**.

The report opens in a new browser tab.

10. Rollup charts are available for **Mass and Balance Properties** reports. To view the rollup chart and excursion plot, choose **Layout Choice** > **Charts at Side** .

18. Generate the excursion diagram for the selected payload collection

19. Download rollup reports

1. Click **Rollup**  > **View Report** .

The **View Rollup Report** panel is displayed with the list of existing rollup reports. The reports are sorted from new to old with the newest on the top.

2. Select the report you want to view, and click **View Report**.

The report opens in a new browser tab.

3. Click **Download File** .

The report is downloaded as a CSV file.

Troubleshooting the Excel errors in a localized report

If the report is generated in Japanese (language), it may show garbled characters when it is opened in Excel. To open the CSV correctly in Excel, you must perform the following steps:

1. Open a blank workbook in Excel.
2. Select the **Data** tab.
3. Select the **From Text/CSV** option.
4. Navigate to the *<filename>.CSV* file on your computer and click **Import**.

A new dialog box with header *<filename>.CSV* is displayed.

5. In the **File Origin** list, select **65001 unicode (utf-8)**.

massrollup_report.csv

Column1	Column2	Column3
Level	Category	Message
Deprecated	Deprecated	defaultResolution is deprecated.
Deprecated	Deprecated	fileGranularity is deprecated.
Information	Broken References	Cannot resolve href: D:\perforce\workdocs\lmdcontent...
Information	Broken References	Cannot resolve href: D:\perforce\workdocs\lmdcontent...
Information	Broken References	Cannot resolve href: D:\perforce\workdocs\lmdcontent...
Information	linkURL	./resources/tdoc/en_US/pdf/whats_new.pdf
Information	linkURL	./resources/tdoc/en_US/pdf/managing_xpedition_or_p...
Information	linkURL	./resources/tdoc/en_US/pdf/managing_xpedition_or_P...
Information	linkURL	./resources/tdoc/en_US/pdf/managing_altium_cadenc...

6. Click **Load** or **Transform Data**.
7. Save the file.