CamAlign User Manual

Overview

CamAlign is a Fusion 360 add-in designed to streamline the alignment of parts for CAM (Computer-Aided Manufacturing) setups. It allows users to align a selected planar face or circular edge to the XY plane with its normal pointing downward (negative Z-axis), position the centroid at the origin (0, 0, 0), and align a selected linear edge parallel to the X-axis. This ensures consistent part orientation for machining operations.

Key Features

- Aligns a planar face or circular edge to the XY plane with the normal downward.
- Positions the centroid of the selected face or edge at the origin.
- Aligns a linear edge to the X-axis for precise orientation.
- Logs detailed transformation data to a CSV file for tracking.
- Provides error handling and user feedback through Fusion 360's UI.

System Requirements

- **Fusion 360**: Latest version (cloud updates recommended).
- **Operating System**: Windows 10/11 or macOS (compatible with Fusion 360).
- **Permissions**: Write access to the add-in's directory for logging and CSV output.
- **Internet Connection**: Not required for operation, but recommended for initial add-in download and Fusion 360 updates.

Installation

1. **Download CamAlign**:
    - Obtain the CamAlignAddIn.py file and associated Resources folder from the Autodesk App Store or the developer's distribution channel.
    - Ensure the Resources folder contains the add-in's icon for proper display in Fusion 360.
2. **Install the Add-In**:
    - Open Fusion 360.

- Go to the **Tools** tab > **Scripts and Add-Ins** (under the **Add-Ins** section).
- In the **Add-Ins** tab, click **Add-Ins** > **Create Add-In**.
- Navigate to the folder containing CamAlignAddIn.py and select it.
- Ensure the **Run on Startup** checkbox is selected for automatic loading.
- Click **Run** to load the add-in.

3. **Verify Installation**:
   - Switch to the **Manufacture** workspace in Fusion 360.
   - Under the **Tools** tab, locate the **Align Part to XYZ 0** panel.
   - Confirm the **Align Part to XYZ 0** button is visible (see *Figure 1*).

Figure 1: CamAlign button in the Manufacture workspace Tools Tab.

Using CamAlign

CamAlign operates within the Manufacture workspace and requires an active design with a part to align. Follow these steps to use the add-in:

Step-by-Step Instructions

1. **Open a Design**:
   - Open or create a Fusion 360 design containing the part to align.
   - Ensure the part is in the root component of a design product (parametric or direct modeling).
2. **Switch to Manufacture Workspace**:
   - In Fusion 360, select the **Manufacture** workspace from the workspace dropdown.
3. **Launch CamAlign**:
   - Go to the **Tools** tab in the Manufacture workspace.

- In the **Align Part to XYZ 0** panel, click the **Align Part to XYZ 0** button.
- The command dialog appears (see *Figure 2*).

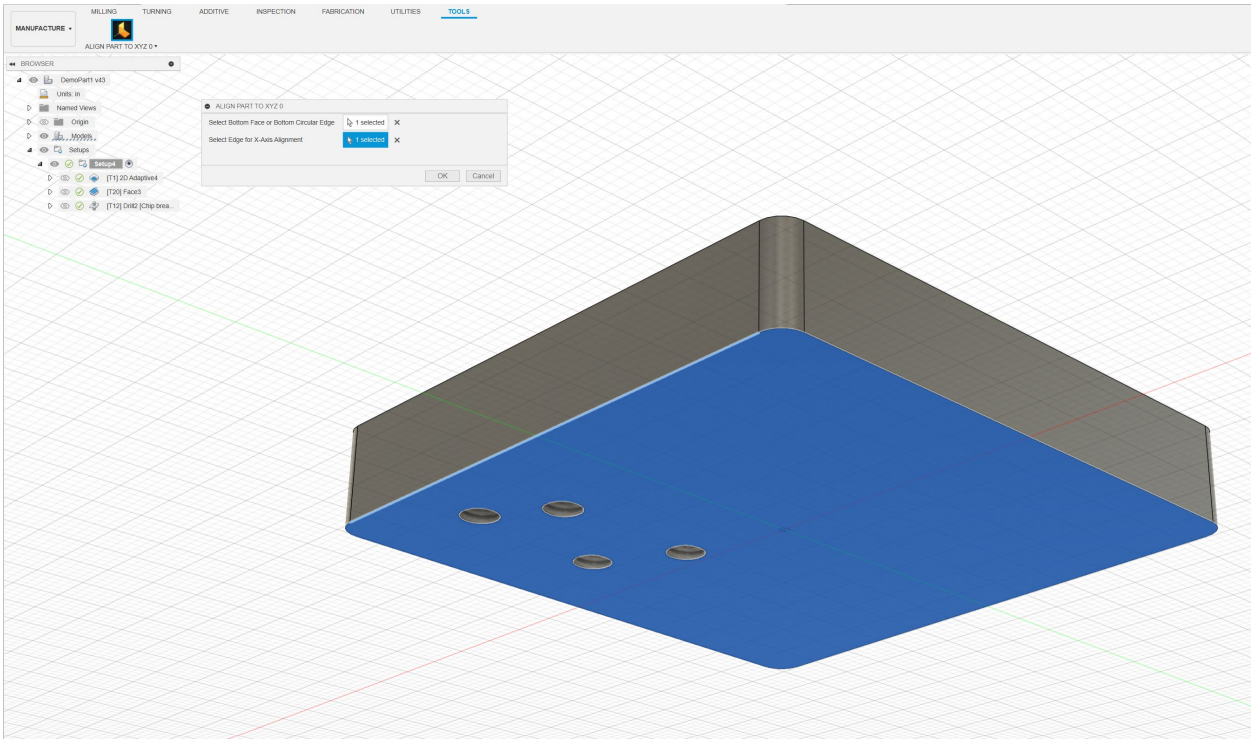


Figure 2: CamAlign command dialog showing selection inputs

4. **Select Bottom Face or Circular Edge**:
   - In the **Select Bottom Face or Bottom Circular Edge** input, select a planar face or a circular edge that represents the bottom of the part.
     - **Planar Face**: Choose a flat surface that should lie on the XY plane.
     - **Circular Edge**: Choose the bottom circular edge of a cylindrical feature (e.g., the base of a hole or boss).
   - Ensure the selection is valid (the dialog will highlight the selection).
   - After selection, the **Select Edge for X-Axis Alignment** input becomes active.
5. **Select Linear Edge**:
   - In the **Select Edge for X-Axis Alignment** input, select a linear edge on the part that should align parallel to the X-axis.
   - The edge must be a straight line (curved edges are not supported).

6. **Execute Alignment**:
    - Click **OK** in the command dialog.
    - CamAlign performs the following:
        - Rotates the part so the selected face or edge's normal points downward (negative Z-axis).
        - Translates the part so the centroid of the selected face or edge is at the origin (0, 0, 0).
        - Rotates the part around the Z-axis to align the selected linear edge with the X-axis.
    - The part updates in the canvas, and a confirmation message appears if successful.
7. **Review Results**:
    - If the alignment succeeds, the part is correctly oriented.
    - If an error occurs (e.g., invalid selection or geometry), an error message displays with details (see *Troubleshooting*).

Example Use Case

- **Scenario**: Align a cylindrical part for CNC milling.
- **Steps**:
    1. Open the part in Fusion 360 (e.g., a cylinder with a flat base and a reference edge).
    2. In the Manufacture workspace, launch CamAlign.
    3. Select the flat base (planar face) as the bottom face.
    4. Select a linear edge on the part's side to align with the X-axis.
    5. Click **OK**. The cylinder's base lies on the XY plane, its center is at (0, 0, 0), and the selected edge is parallel to the X-axis.

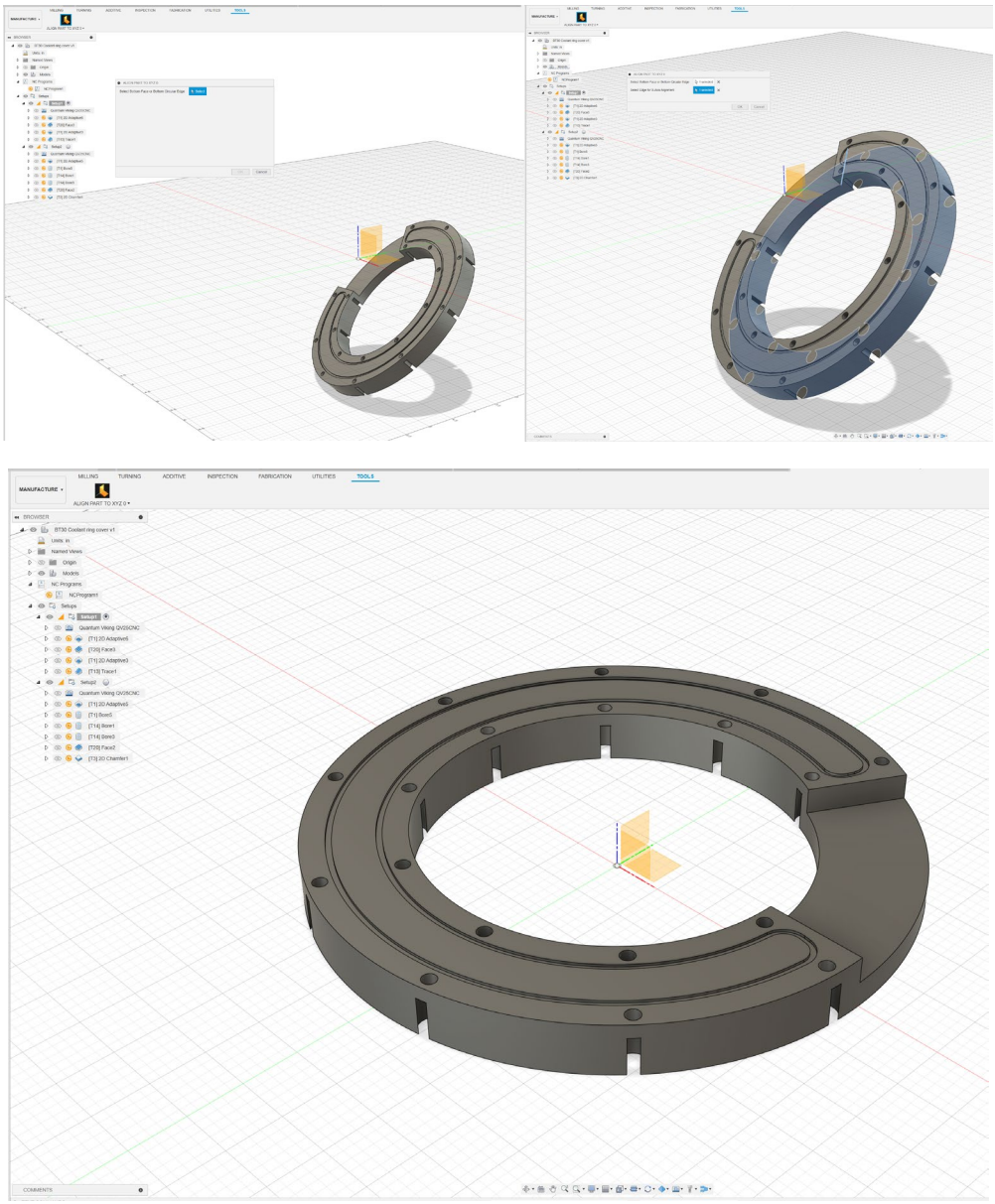


Figure 3: Before and after alignment of a cylindrical part

Logging and Output

CamAlign generates detailed logs and a CSV file for tracking alignment operations.

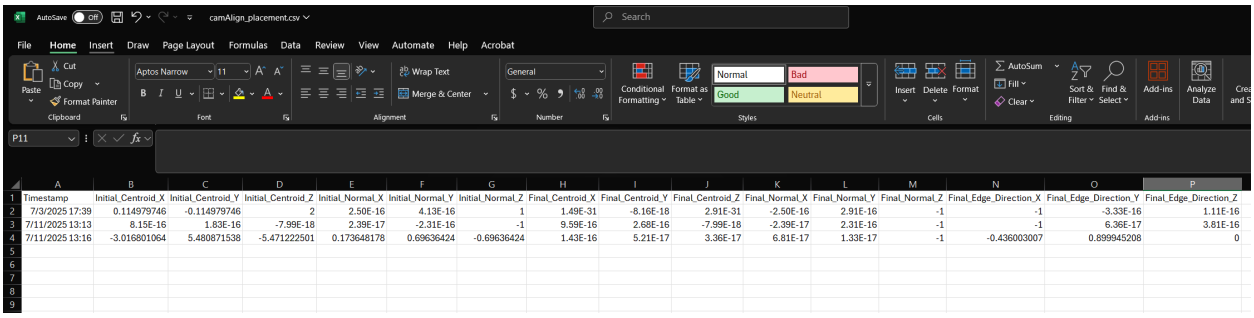
Log File

- **Location**: camAlign_events.log in the add-in's directory (e.g., where CamAlignAddIn.py is stored).

- **Fallback Location**: If the add-in directory is not writable, logs are saved to the system's temporary directory (e.g., %TEMP%\camAlign_log.log on Windows).
- **Content**: Includes timestamps, debug messages, errors, and transformation details (e.g., initial and final centroids, normals, and edge directions).
- **Accessing Logs**:
    - Navigate to the add-in directory or temporary directory.
    - Open camAlign_events.log in a text editor to review operations.

CSV Output

- **Location**: camAlign_placement.csv in the add-in's directory.
- **Content**: Records each alignment operation with:
    - Timestamp
    - Initial centroid (X, Y, Z)
    - Initial normal (X, Y, Z)
    - Final centroid (X, Y, Z)
    - Final normal (X, Y, Z)
    - Final edge direction (X, Y, Z)
- **Accessing CSV**:
    - Open camAlign_placement.csv in a spreadsheet application (e.g., Excel) or text editor.
    - The first row contains headers, followed by rows for each alignment operation.
- **Usage**: Use the CSV to verify alignments, track part orientations, or debug issues.



	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P
1	Timestamp	Initial_Centroid_X	Initial_Centroid_Y	Initial_Centroid_Z	Initial_Normal_X	Initial_Normal_Y	Initial_Normal_Z	Final_Centroid_X	Final_Centroid_Y	Final_Centroid_Z	Final_Normal_X	Final_Normal_Y	Final_Normal_Z	Final_Edge_Direction_X	Final_Edge_Direction_Y	Final_Edge_Direction_Z
2	7/3/2025 17:39	0.114979746	-0.114979746	2	2.50E-16	4.13E-16	1	1.49E-31	-8.16E-18	2.91E-31	-2.50E-16	2.91E-16	-1	-1	-3.33E-16	1.11E-16
3	7/11/2025 13:13	8.15E-16	1.83E-16	-7.99E-18	2.39E-17	-2.31E-16	-1	9.59E-16	2.68E-16	-7.99E-18	-2.39E-17	2.31E-16	-1	-1	6.36E-17	3.81E-16
4	7/11/2025 13:16	-3.016801064	5.480871538	-5.471222501	0.173648178	0.69636424	-0.69636424	1.43E-16	5.21E-17	3.36E-17	6.81E-17	1.33E-17	-1	-0.436003007	0.899945208	0
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Figure 4: Sample camAlign_placement.csv (Located in Add Ins folder or install folder)

Troubleshooting

Below are common issues and solutions:

Issue: “No bottom face or bottom circular edge selected”

- **Cause**: No valid planar face or circular edge was selected.
- **Solution**:
    - Ensure you select a flat face or a circular edge (e.g., the bottom edge of a cylinder).
    - Verify the selection highlights in the dialog before proceeding.

Issue: “No edge selected”

- **Cause**: The linear edge for X-axis alignment was not selected.
- **Solution**:
    - After selecting the bottom face/edge, ensure the **Select Edge for X-Axis Alignment** input is active.
    - Select a straight edge on the part.

Issue: “Edge direction lies along Z-axis”

- **Cause**: The selected linear edge is parallel to the Z-axis, which cannot be aligned to the X-axis.
- **Solution**:
    - Choose a different linear edge that lies in or projects to the XY plane.
    - Modify the part to include a suitable reference edge if needed.

Issue: “Permission denied writing to CSV file”

- **Cause**: The Excel file is already open.
- **Solution**:
    - Close the Excel file.
- **Cause**: The add-in lacks write permissions for the add-in directory.
- **Solution**:
    - Run Fusion 360 as an administrator.
    - Move the add-in to a writable directory (e.g., Documents\Fusion 360\AddIns).
    - Check the log file for the fallback CSV location (temporary directory).

Issue: Add-In Does Not Appear in Manufacture workspace

- **Cause**: The add-in failed to load or was not installed correctly.
- **Solution**:
    - Go to **Tools** > **Scripts and Add-Ins** and check for errors in the add-in list.
    - Verify the Resources folder is in the same directory as CamAlignAddIn.py.
    - Review the log file for initialization errors.

Issue: Misaligned Part After Execution

- **Cause**: Numerical precision or complex geometry may cause slight misalignments.
- **Solution**:
    - Check the log file for warnings about final centroid or normal misalignment.
    - Verify the selected face/edge and linear edge are appropriate for the desired orientation.
    - Contact support with the log file and camAlign_placement.csv for assistance.

Advanced Tips

- **Batch Processing**: To align multiple parts, repeat the CamAlign process for each component in the design. Consider scripting automation for bulk operations (requires API customization).
- **Custom Reference Edges**: Add construction geometry (e.g., a linear edge) to complex parts to ensure reliable X-axis alignment.
- **Log Analysis**: Use the CSV output to analyze alignment consistency across multiple parts or sessions.
- **Backup Logs**: Regularly back up camAlign_events.log and camAlign_placement.csv to prevent data loss, especially in the temporary directory.

Support

For issues not covered in this manual:

- **Log Files**: Share camAlign_events.log and camAlign_placement.csv with support for detailed diagnostics.
- **Developer Contact**: Check the Autodesk App Store page for support details or contact support@automatedviking.com .

License

CamAlign is distributed under the terms specified by its developer. If purchased or downloaded from the Autodesk App Store, refer to the store's licensing agreement. For custom distributions, contact the developer for licensing details.

Version History

- **Version 1.1** (June 2025): Initial release with face/edge alignment, X-axis alignment, logging, and CSV output.

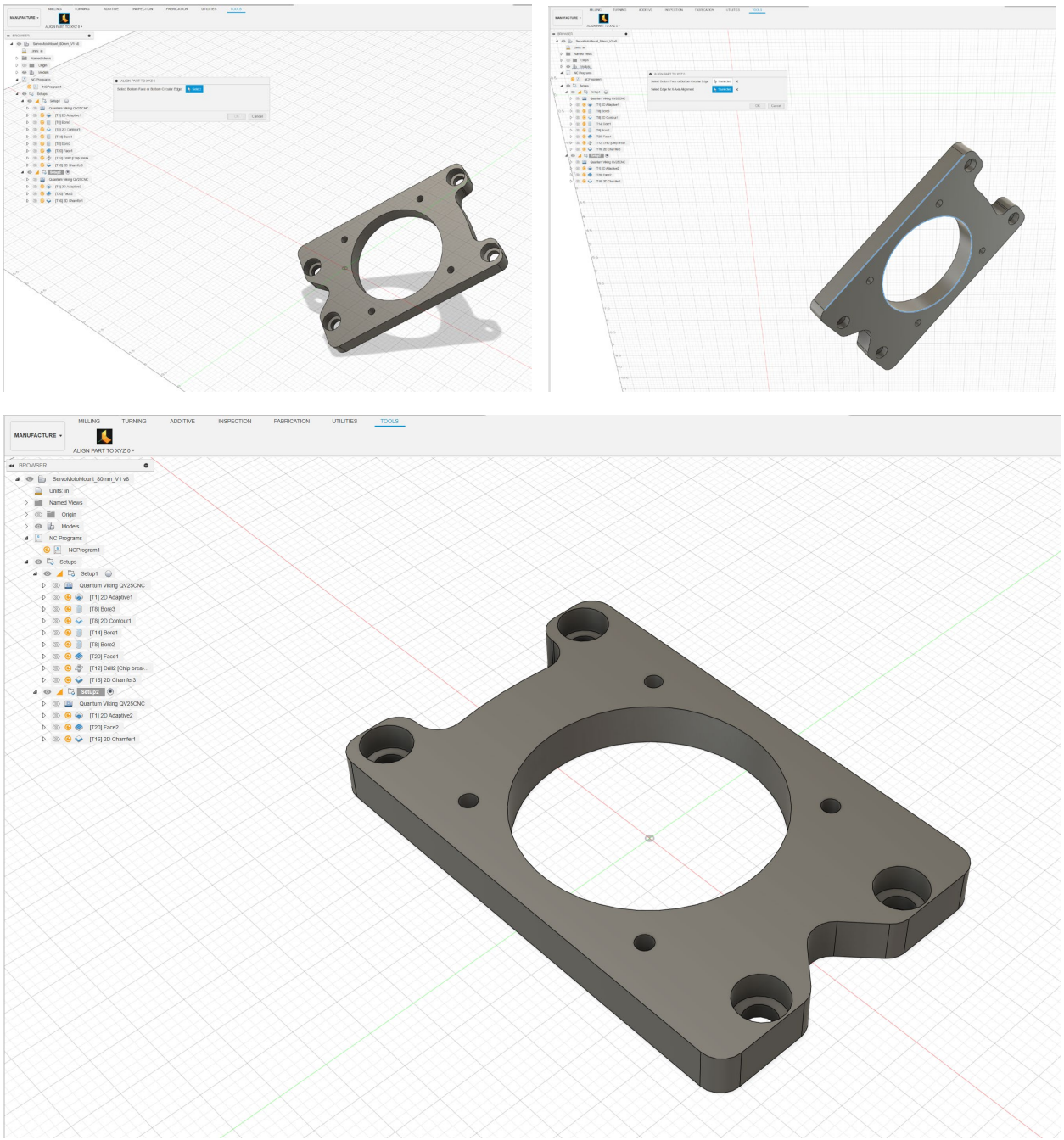

Figure 5: CamAlign in action aligning a complex part using circular edge

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This manual is provided as-is. Ensure you have the latest version of CamAlign and Fusion 360 for optimal performance.