

Minute! Powered By C3CAM Common Operation Manual

2017.Mar.17

Revision 4

Division Engineering

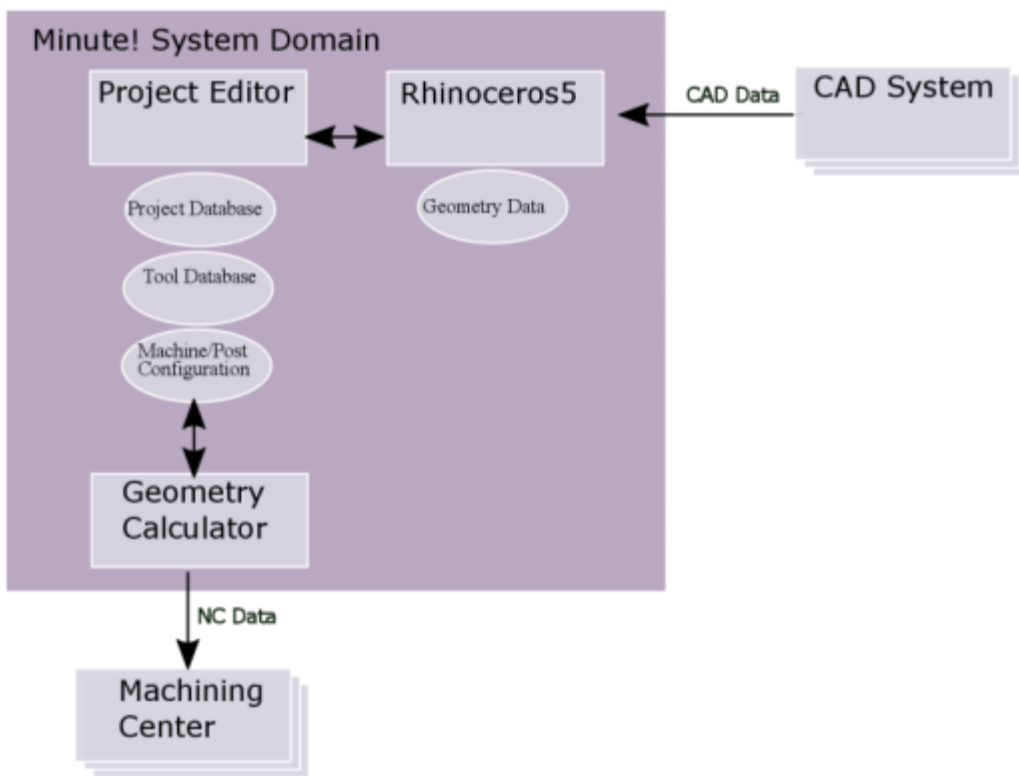
目次

Introduction.....	2
Common.....	2
User Interface.....	2
Project.....	5
Edit Project.....	7
Tool Configuratoin.....	10
Calculation Configuration.....	14
Configuration Files.....	14
Project Configuration Node.....	16
CAM Configuration Node.....	17
System Configuration File.....	19
Calculation.....	20
Remarks.....	22
Place Holders.....	22
Contact.....	23

Introduction

- Minute! Powered By C3CAM is CAM. Processes NURBS Surface and NURBS Curve directly.
- Function Structure as follows:

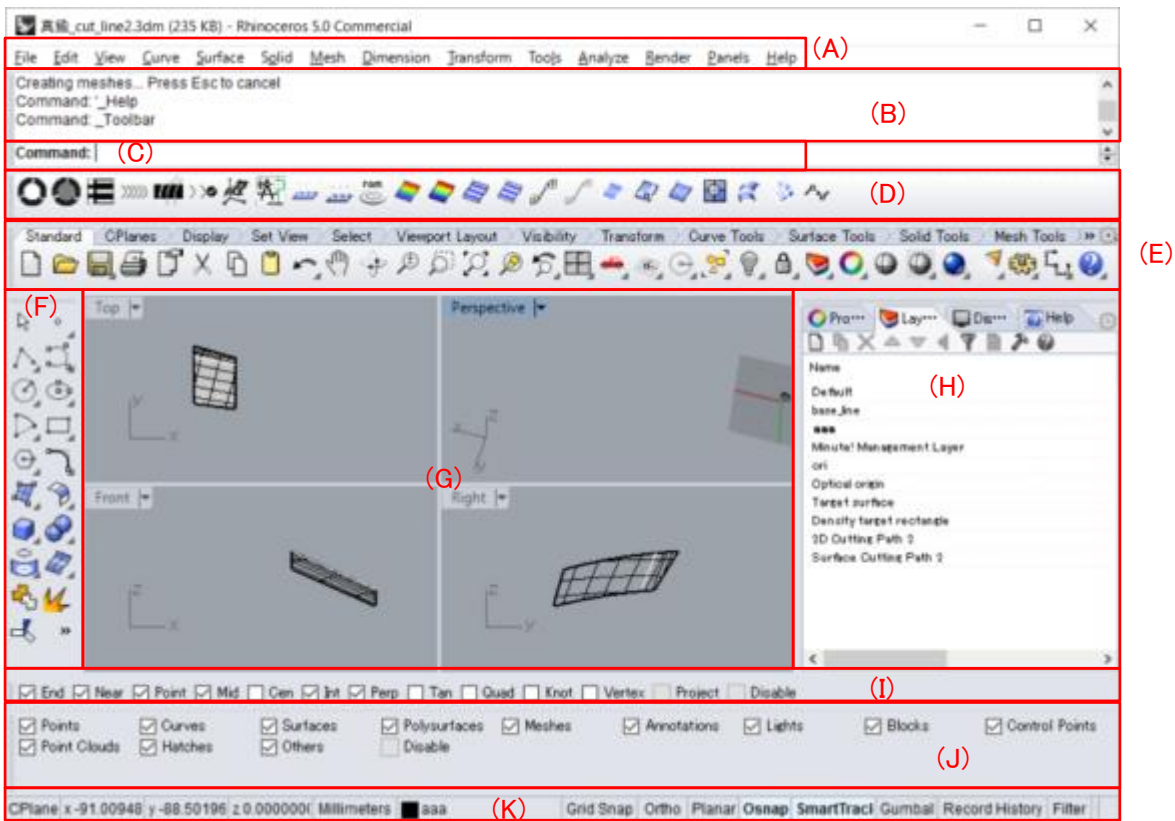
Item	Description
CAD System	This system can import various CAD Format.
CAD Data	Please refer to “Acceptable CAD Format”.
Rhino	All Geometry Data from CAD System is stored into Rhino. Rhino is a frontend.
Project Editor	Project Editor is a plug in for Rhinoceros. It has Project Database, Tool Database and Machine/Post Configuration.
Geometry Calculator	Backend engine for calculation.
NC Data	GCode Files
Machining Center	Supports FANUC and Meldas controller.



Common

USER INTERFACE

Rhino Window



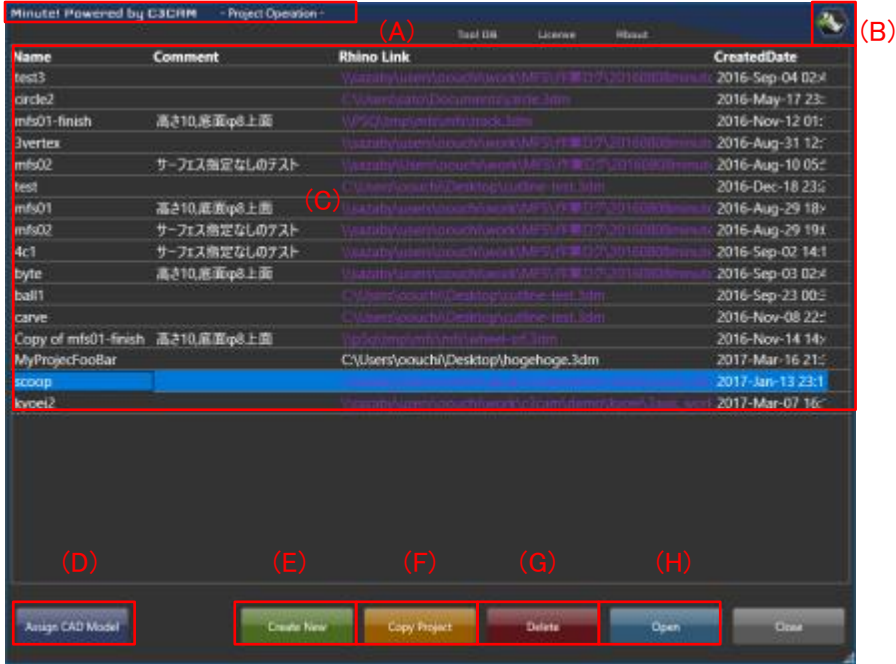
Rhino is a Direct Modeler which has precise NURBS engine. GUI components of Rhino are as follows:

#	Description	Function
(A)	Menu	
(B) (F) (G)	Command History Window	Displays the previous commands and prompts. Text from this area can be copied and pasted into the command prompt, macro editor, button command, or any application that accepts text.
(C)	Command Prompt	Displays prompts for command actions, allows typing command names and options.
(D)	Minute! Powered By C3CAM ToolBar	Control the cam and launch some useful command.
(E)(F)	Rhino Standard Toolbar	Contain graphical icons for initiating commands.
(G)	Viewports	Displays the Rhino working environment including object display, viewport title, background, construction plane grid, world axis icon.
(H)	Layer Panel	
(I)	Osnap Toolbar	The Osnap control lets you select which object snaps are currently in effect.
(J)	Selection Filter	The selection filter restricts any selection

	mode (SelWindow, SelCrossing, SelAll, etc.) to specified object types.
(K) Status Bar Pane	Click the Info pane to display information about the current Rhino session. The Info pane cycles through the list of specified categories.

Project Management Window

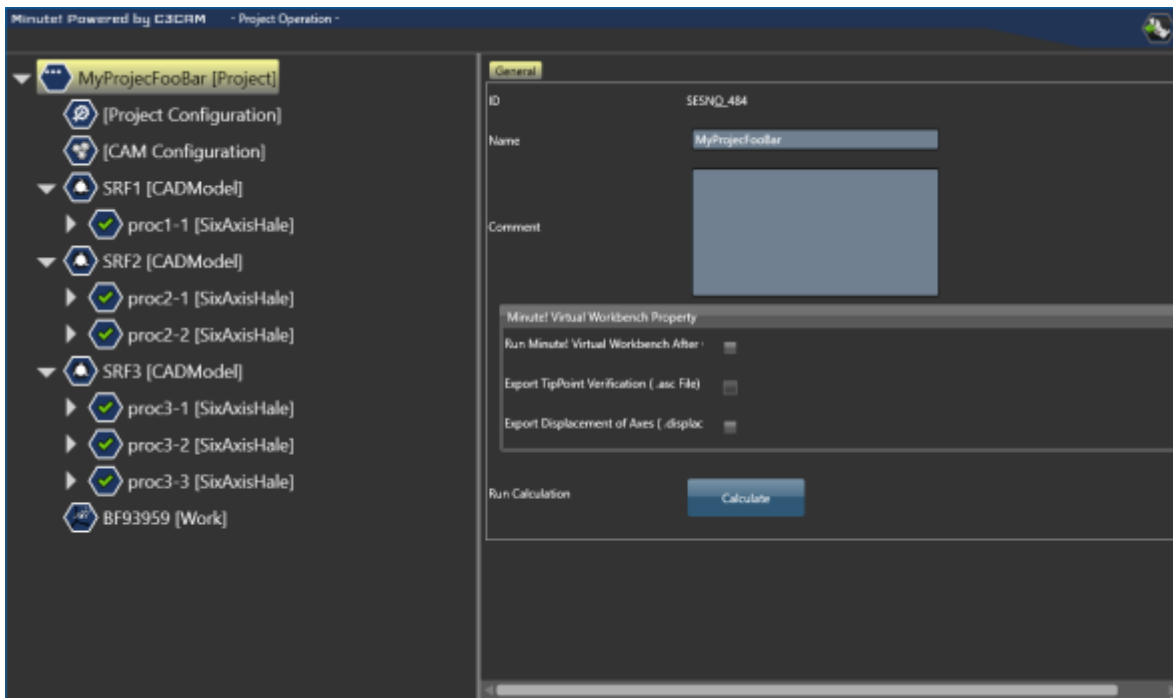
Shows all projects.



#	Description	Function
(A)	Title Bar	
(B)	Back To Rhino Button	Hide this panel and activate Rhino.
(C)	Project List	
(D)	Assign CAD Model	Link selected project and Rhino Model.
(E)	Create New	Creates new Project
(F)	Copy Project	Copy selected Project
(G)	Delete	Delete selected Project
(H)	Open	Open selected Project.

Project Editor

Edit a Project.



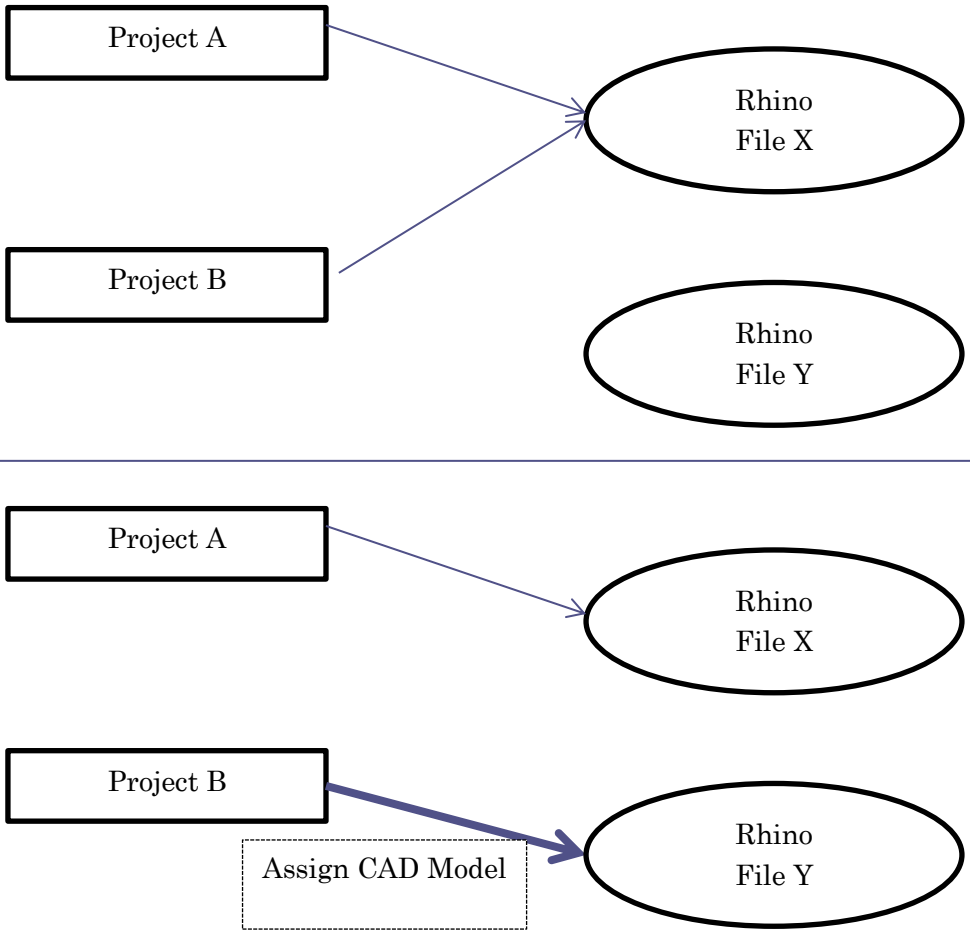
#	Description	Function
(A)	TitleBar	
(B)	BackToRhino	Hide Project Editor and activate Rhino.
(C)	Project Tree	View hierarchal node structure and Edit it
(D)	Project Panel View	Show and Edit selected node

PROJECT

Project can have Surfaces and processes.

Relationship between Project and Rhino

One Project can hold one relation with Rhino File. Rhino File means *.3dm file. You can change the relationship anytime. This Relationship is called “Rhino Link”.



Assign CAD Model to build “Rhino Link”

In Project Management Window you can view the relationships. Select Project and Click “Assign CAD Model” to build the Relationship.

Name	Comment	Rhino Link	CreatedDate
test3		Y:\zaty\user\youchi\work\Misc\作業07\20160808\test3	2016-Sep-04 02:4
circle2		C:\Users\youchi\Documents\circle2.rdm	2016-May-17 23:3
mfs01-finish	高さ10,底面p8上面	W:\500\mfs01\mfs01\sheet-of-3dm	2016-Nov-12 01:3
3vertex		Y:\zaty\user\youchi\work\Misc\作業07\20160808\test3	2016-Aug-31 12:3
mfs02	サーフェス指定なしのアスト	Y:\zaty\user\youchi\work\Misc\作業07\20160808\test3	2016-Aug-10 05:2
test		C:\Users\youchi\Desktop\outline-test_3dm	2016-Dec-18 23:0
mfs01	高さ10,底面p8上面	U:\zaty\user\youchi\work\Misc\作業07\20160808\test3	2016-Aug-29 18:4
mfs02	サーフェス指定なしのアスト	Y:\zaty\user\youchi\work\Misc\作業07\20160808\test3	2016-Aug-29 19:1
4c1	サーフェス指定なしのアスト	Y:\zaty\user\youchi\work\Misc\作業07\20160808\test3	2016-Sep-02 14:1
byte	高さ10,底面p8上面	U:\zaty\user\youchi\work\Misc\作業07\20160808\test3	2016-Sep-03 02:4
ball1		C:\Users\youchi\Desktop\outline-test_3dm	2016-Sep-23 00:0
carve		C:\Users\youchi\Desktop\outline-test_3dm	2016-Nov-08 22:2
Copy of mfs01-finish	高さ10,底面p8上面	U:\500\mfs01\mfs01\sheet-of-3dm	2016-Nov-14 14:4
MyProjectFooBar		C:\Users\youchi\Desktop\hoge.hoge.3dm	2017-Mar-16 21:3
scoop			2017-Jan-13 23:1
kyoet2		Y:\zaty\user\youchi\work\2017\demo\kyoet2\kyoet2_3dm	2017-Mar-07 16:3

Buttons at the bottom: Assign CAD Model, Create New, Copy Project, Delete, Open, Close.


Status of “Rhino Link”

Color of Rhino Link	Status	Description
Empty	No relationship	
White	Valid relationship and Valid File.	If the rhino file is already opened, Project cannot be opened.
Magenta	Valid relationship but not found Rhino File.	

Manage Project

Show Project Management Window



Click  Button in Rhino Window to show Project Management Window.

Create New Project

Click “Create” Button in Project Management Window.

Delete Project

Click “Delete” Button in Project Management Window.

Open Project

- Prerequisite:

Project has Valid Rhino Link. And Rhino opens Linked Rhino file.


- Click “Open” Button in Project Management Window.

- Or Click dedicated button,  in Rhino Window.

Note:

If Rhino Link is invalid, Project Management is shown.

Close Project

Click “Back To Rhino” Button. Or Click dedicated button,  in Rhino Window.

EDIT PROJECT

Essential Nodes are as follows:

- Project Configuration : Information about whole project.
- CAM : Information about POST.
- Work : Information about Start Point of Process.

Edit Surface

Project has some surfaces. One CADModel node can have one surface. CADModel node can have some Process Node.

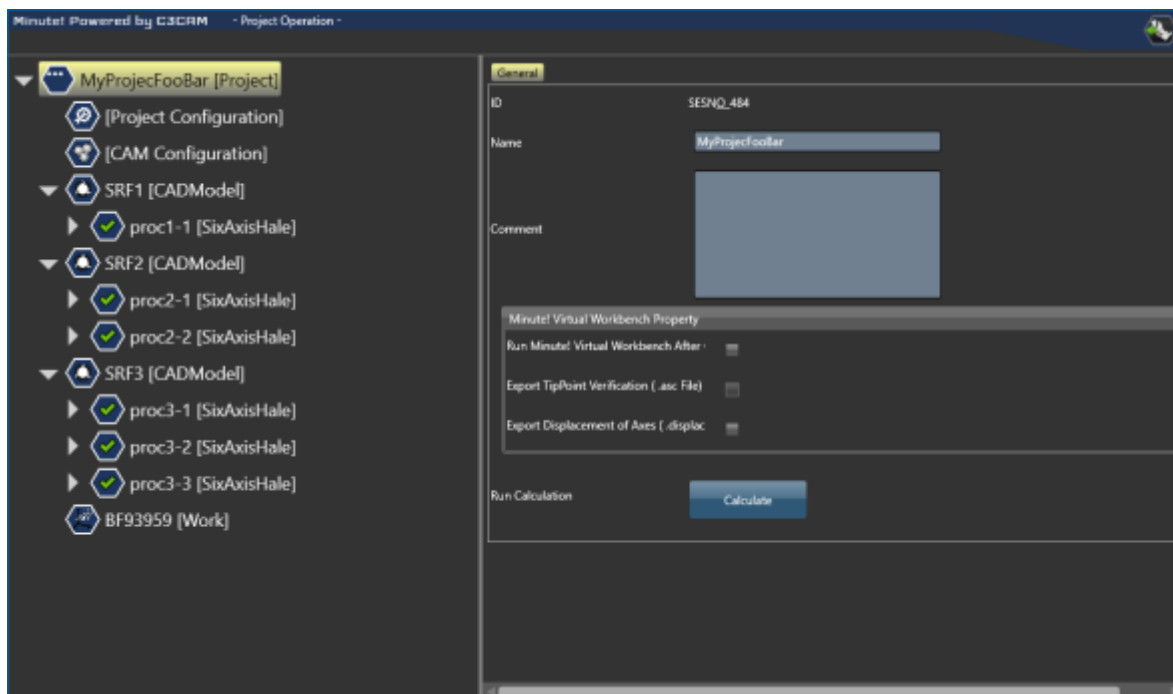
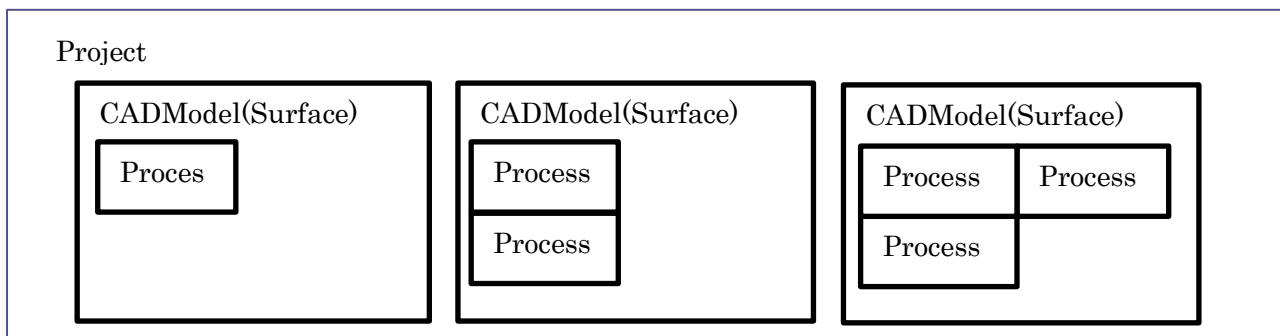
Note:

Surface or PolySurface, Rhinoceros Geometry can be added CADModel Node. To register Surface or PolySurface CADModel node requires Rhinoceros Layer.

Note:

Be sure to check Normal Vector of Surface. The direction of the vector should be toward same as Tool. In the case of 3-Axis Milling that is +Z direction.

Below figures indicate that 3 CADModel Node have some Processes.



Edit Process

Available Process Node:

- SixAxisHale : Synchronized 6axis Mirror Finishing or Groove using Bite(Planar Tool)
- SixAxisYamanokoshi : Synchronized 6axis Yamanokoshi using Bite(Planar Tool)
- ThreeAxisCutlineMilling : Synchronized 3axis Finishing(Endmill Tool)

Edit Work

Work Node can specify Start point and Coordinate System. The aim of This Node is:

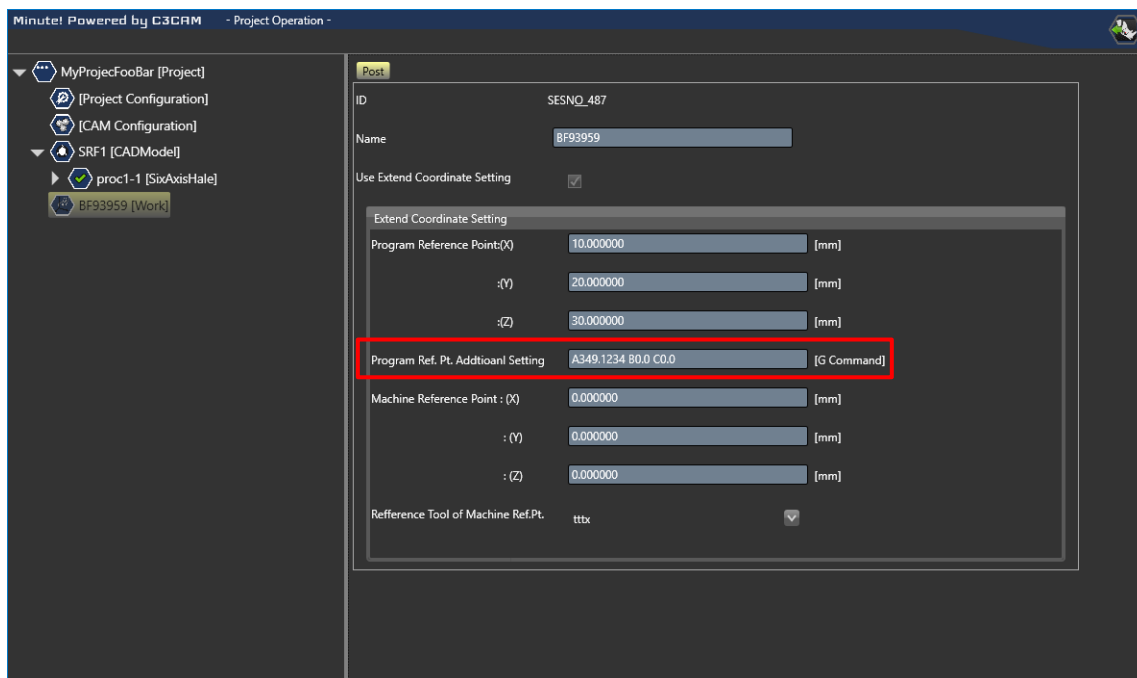
- Specify "Reference Tool".
- System output Coordinate System Command from:
 - A. Information of Tip Point from Reference Tool
 - B. Program Reference Point
 - C. Machine Reference Point

• Parameters

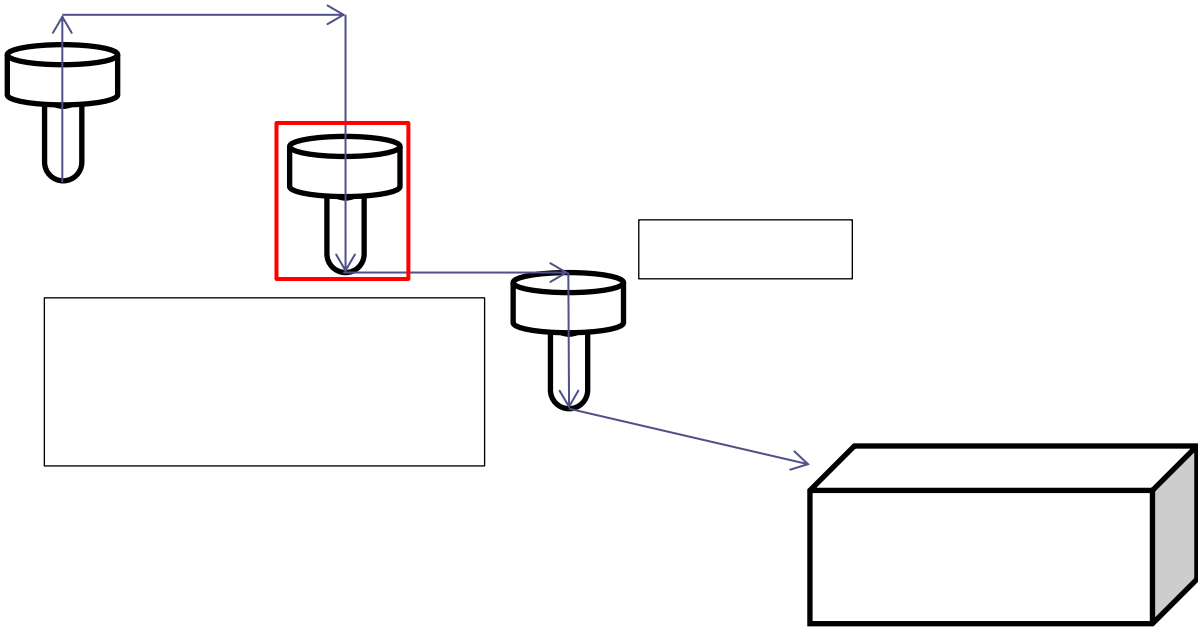
- Program Ref. Pt Additional Setting

This value is referenced while setting Coordinate System. Sets Rotation Axis value.

Ex. : A349.1234 B0.0 C0.0

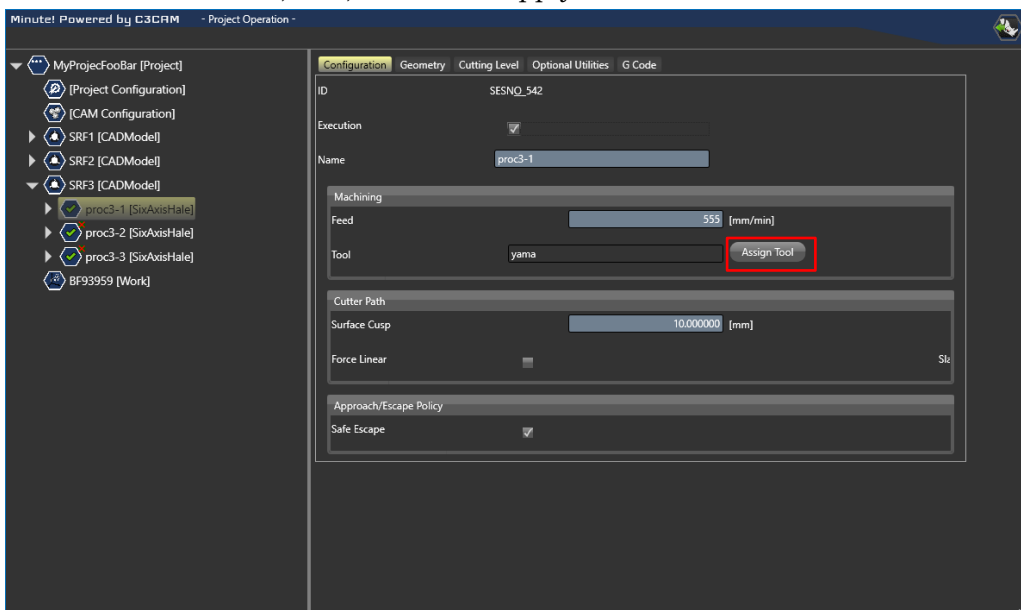


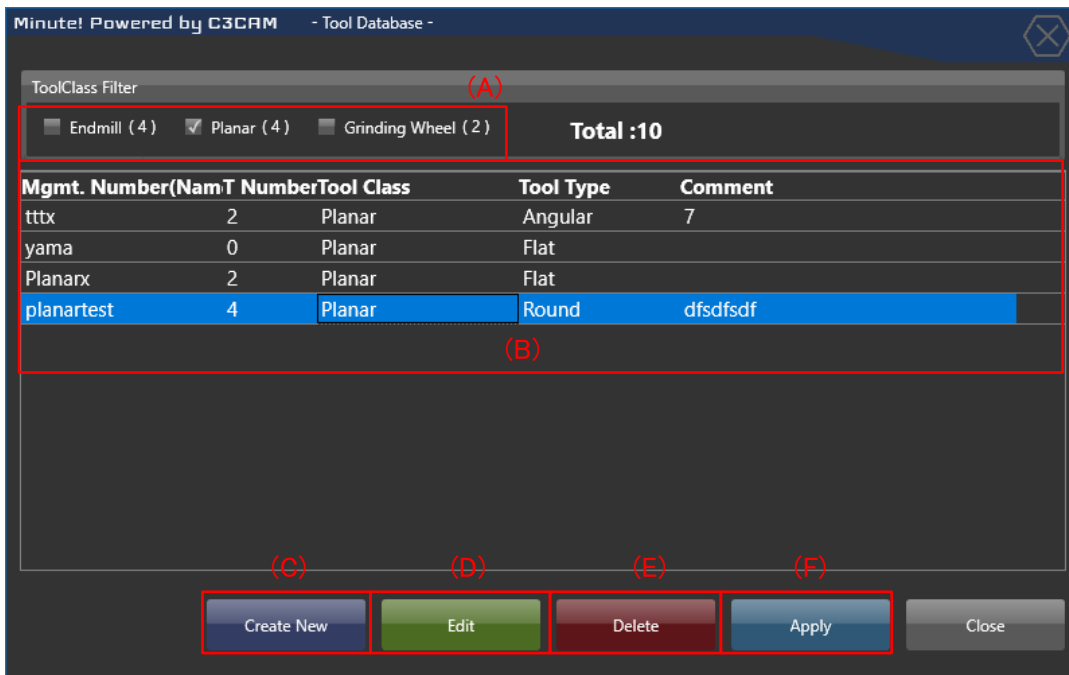
Below figure indicates the function of Work Node. Red Box : information of Work Node. It is defined in Tool Header File that A series of move of Changing Tool and Setting up Coordinate System.



Tool Configuratin

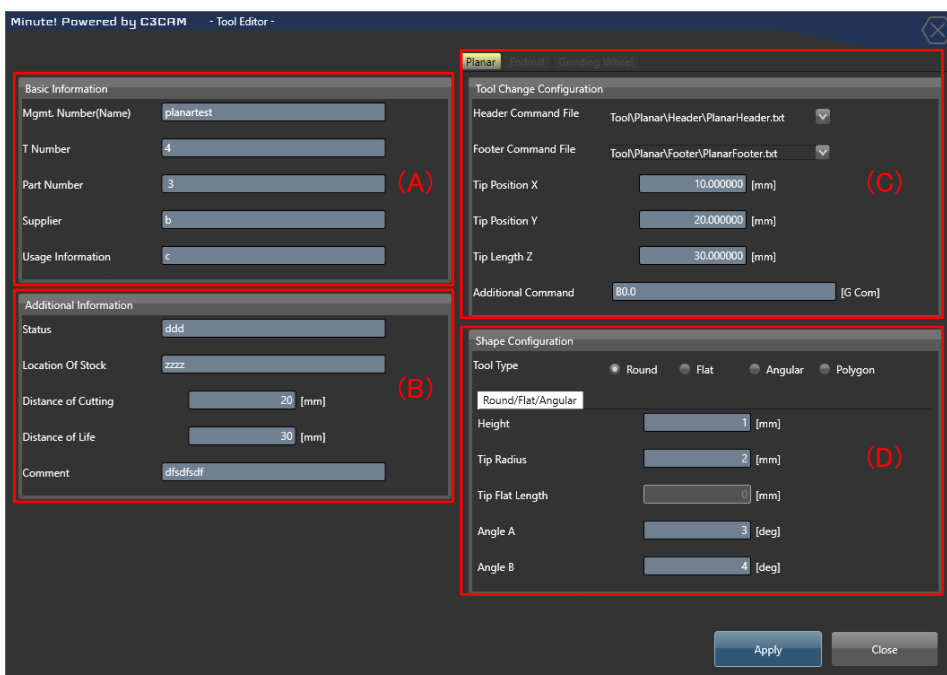
Process Panel has “Assign Tool” Button. Click “Assign Tool”, below panel is shown. This panel lists created Tools. You can create, edit, delete and apply tool.





#	Description	Function
(A)	Filters	You can select “Endmill”, “Planar” and “Grinding Wheel”
(B)	Tool List	
(C)	Create New	Create new tool
(D)	Edit	Show Editor about selected tool
(E)	Delete	Delete selected tool
(F)	Apply	Apply selected tool

ToolEditWindow has 4 group of information:



#	Description	Function
(A)	Basic Information	Name is required.
(B)	Shape Information	
(C)	Tool Change Information	
(D)	Additional Information	Comment

- Mgmt.Name

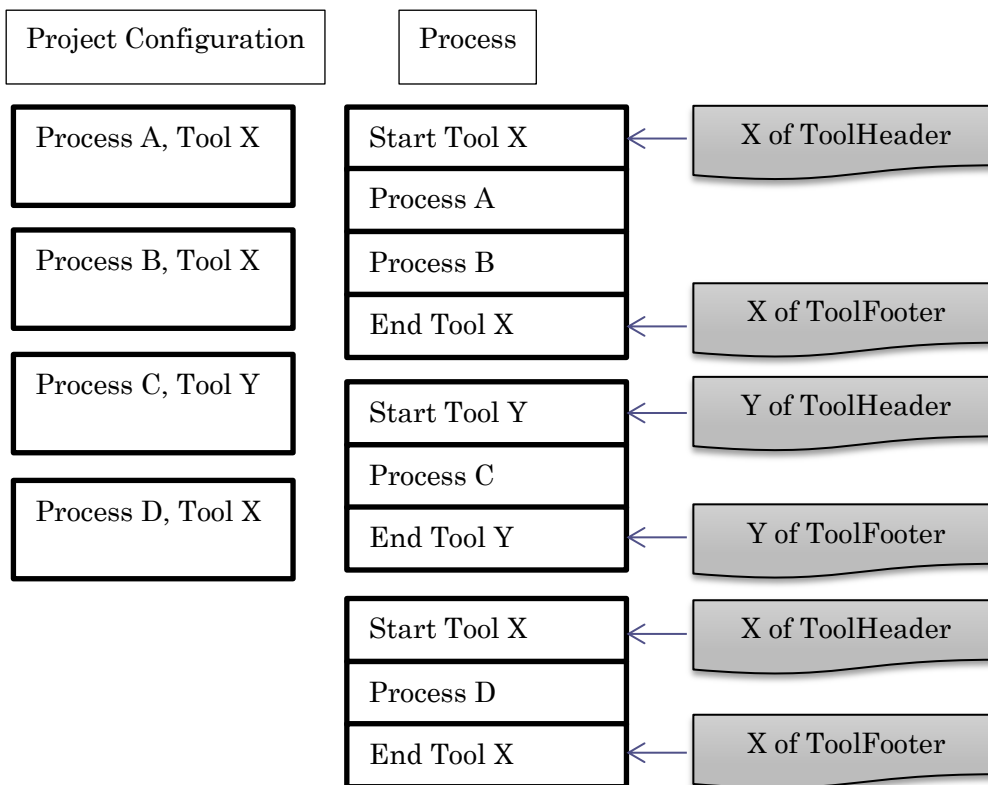
A Key value.

- T Number

Tool Number. This value is used in tool change.

- Header Command File/Footer Command File

Assign Tool Header File and Tool Footer File. Below figure indicates concept of Tool Header and Tool Footer.



- Generally Commands in Tool Header are Tool Change, Setup Coordinate and Coolant Configuration.
- Generally Commands in Tool Footer are Teardown Coolant.
- These files can be completely modified.
- End User can create Tool Header and Tool Footer. Their files should be stored in below folders:

.....
%USERPROFILE%\Documents\Minute!\Tool\[工具区分]\Header

%USERPROFILE%\Documents\Minute!\Tool\[工具区分]\Footer
.....

- Sample Tool Header

Note:

File can include Place Holders. Place Holder is described later.

```
1  (--- Tool Header : start ---)
2
3  (MOVE TO ESCAPE BEFORE TOOL CHANGE)
4  G90
5  G53 G0 Z0.
6
7
8  T${TNumber} (TOOL CHANGE)
9  M06
10
11 (MOVE TO MACHINE REFERENCE POINT)
12 G90
13 G53 G0 Z0.
14 G53 G0 ${Tool_TipCompensation_Additional_Setting}
15 G53 G0 X${Machine_Reference_X} Y${Machine_Reference_Y}
16 G53 G0 Z${Machine_Reference_Z}
17
18 (DEFAULT W AXIS)
19 G92 W0.0
20
21 (RELATIVE MOVE TO TOOL TIP COMPENSATION)
22 G91
23 G0 X${Tool_TipCompensation_X} Y${Tool_TipCompensation_Y}
24
25 (WORK OFFSET)
26 G90
27 G92 X${PG_Reference_X} Y${PG_Reference_Y} Z${PG_Reference_Z} ${PG_Additional_Setting}
28
29 (--- Tool Header : end ---)
30
```

- Sample Tool Footer

```
1  (--- Tool Footer : start ---)
2  (--- Tool Footer : end ---)
```

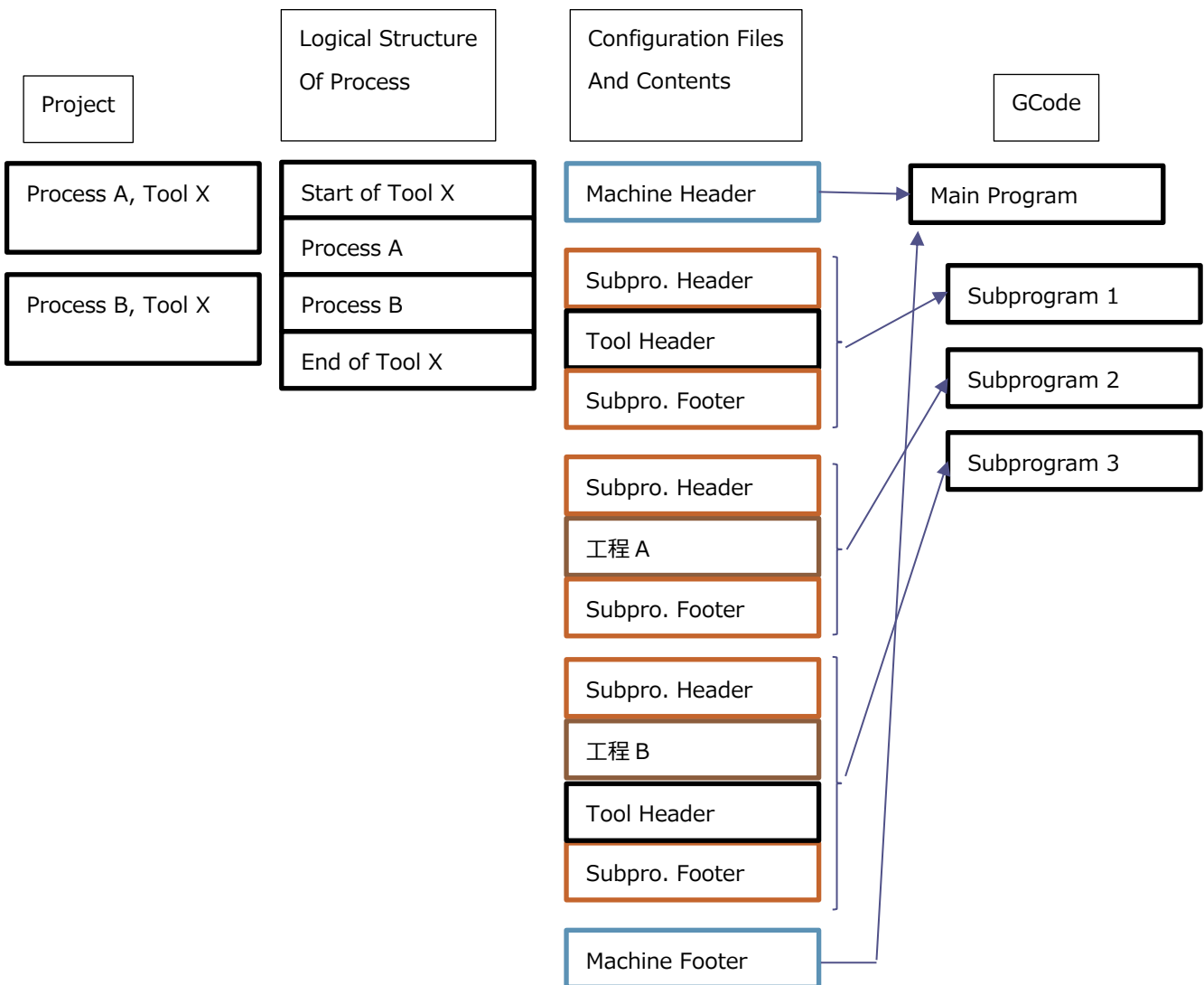
Calculation Configuration

CONFIGURATION FILES

Configuration files consists 3 kinds data:

#	Description	Function
(A)	Machine Header File, Machine Footer File	
(B)	Subprogram Header File, Subprogram Footer File	
(C)	Tool Header File, Tool Footer File	The files are described before.

Below figure indicates an example of the situation : 2 processes and 1 tool.



Note:

Sample Files are stored in the folder:

Note:

File can include Place Holders. Place Holder is described later.

- Sample Machine Header

```
1
2
3 (--- header 6axis carving : start ---)
4
5 G90 (Absolute)
6 G49 (Use no tool length offset)
7 G40 (Cutter radius compensation off)
8 G80 (No axis motion)
9 G17 (XY Plane)
10 G05P0 (Cancel P1000)
11 G64 (Cancel Exact Stop)
12
13 (--- header 6axis carving : end ---)
```

- Sample Machine Footer

```
1 (--- footer 6axis carving : start ---)
2 G05P0 (Cancel P1000)
3 (--- footer 6axis carving : end ---)
4
5 G53 G0 Z0.0
6 G53 G0 X-100.0 Y100.0
7
8 M30
9 %
10
```

- Sample Subprogram Header

```
1
2
3 (--- Sub Program header : start ---)
4
5 ( O${ProgramNumber} )
6 ( ${CurrentNumber} / ${TotalNumber} )
```

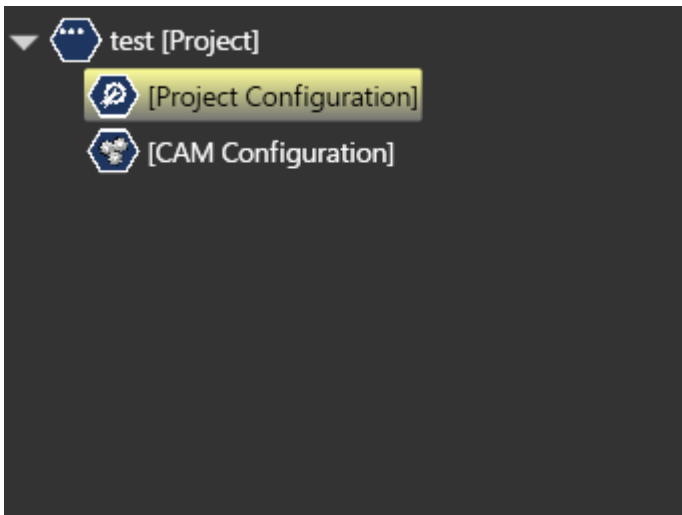
```
7 ( Process Name = ${ProcessName} )
8 ( TNumber = ${TNumber} )
9 ( Tool Name = ${ToolName} )
10
11 G90 (ABSOLUTE)
12 (--- Sub Program header : end ---)
```

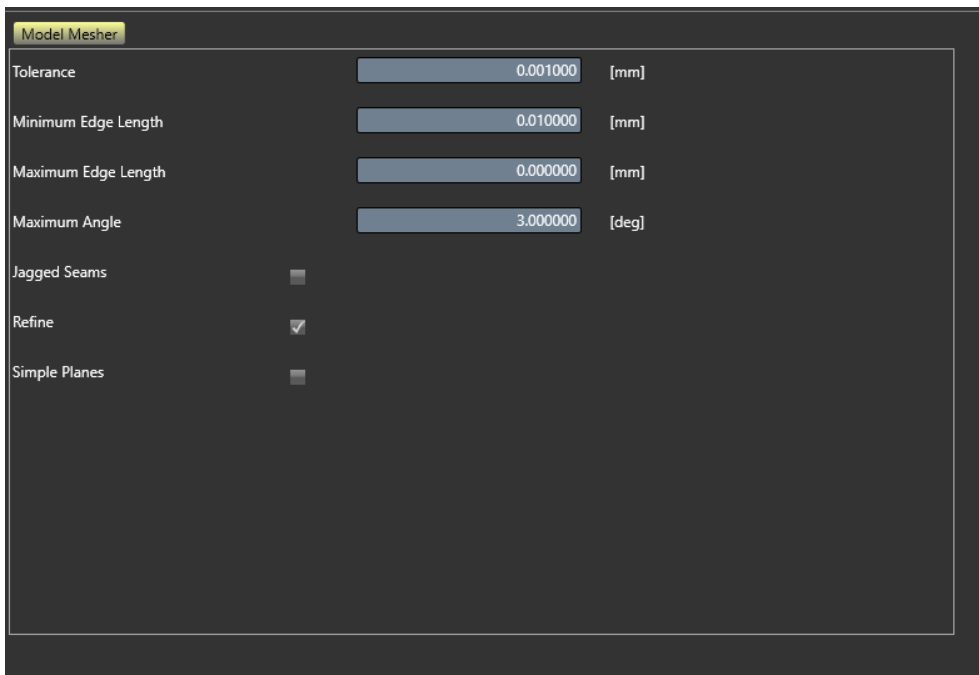
- Sample Subprogram Footer

```
1 (--- Sub Program Footer : start ---)
2 M99 (END SUB PROGRAM)
3 (--- Sub Program Footer : end ---)
4 %
```

PROJECT CONFIGURATION NODE

- Select “Project Configuration” Node in Tree View.

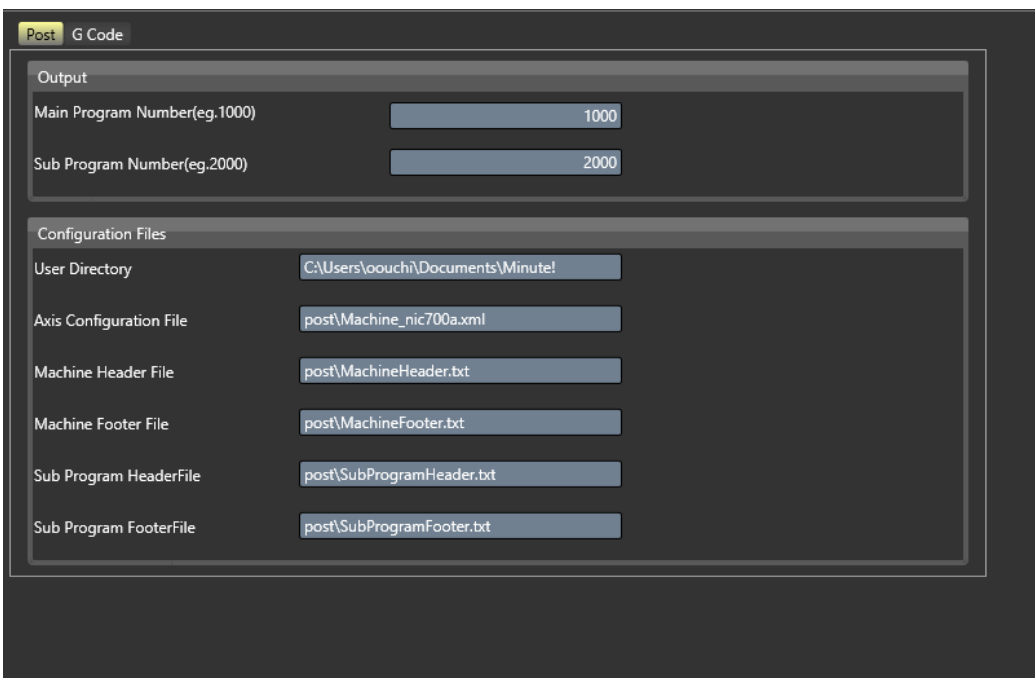
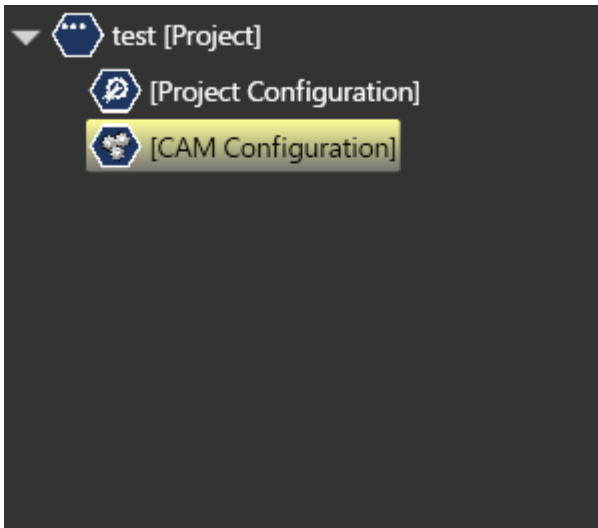




- “Model Mesher” Tab
 - Tolerance
 - Reference value : Sets 1/1~1/1000 of target tolerance.
 - Minimum Edge Length
 - Reference value : Sets 10 times~100 times of target tolerance.
 - Maximum Edge Length
 - Maximum Angle
 - Reference value : Sets 3.0
 - Jagged Seams
 - Reference value : False
 - Refine
 - Reference value : True
 - Simple Planes
 - Reference value : False

CAM CONFIGURATION NODE

- Select “Cam Configuration” Node in Tree View.



- “Post” Tab

- Main Program Number

Sets Top Level Program Number. The value should be lower than “Subprogram Number”.

- Subprogram Number

Sets Start Number of Subprogram.

- User Directory

Basically you don’t have to change this value. This value is set while installing.

Note:

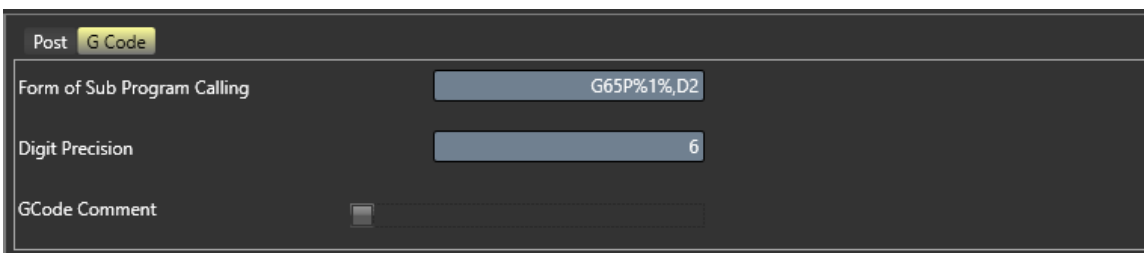
Structure of User Directory

User Directory is copied while installing from “Template” in Program Directory.

Directory	Description
Database	Project and Tool data.
Log	System Directory.
Post	There are Axis Configuration Files, Machine Header/Footer Files and Subprogram Header/Footer Files.
Sessions	One calculation is called a Session. There are some Session directories. End User has better delete useless Session Directory.
Tool	There are Tool Header Files and Tool Footer Files.
Tmp	Some Utilities write data file into this directory.
Etc	System Directory.

➤ Axis Configuration File

Refer to “Minute! Axis Configuration File Configuration Manual”.



- “G Code” Tab
 - Form of Sub Program Calling
“%1%” is replaced with Subprogram Number. Ex. Replaces “G65P%1%,D2” to G65P1051,D2.
 - Digit Precision
The Number of decimal places.
 - GCode Comment
Add Comment to GCode.

SYSTEM CONFIGURATION FILE

You can modify system configuration. It needs Restart Application to apply values.

.....
%USERPROFILE%\Documents\Minute!\Etc\Minute!.config
.....

Item

Description

Default Value

CAM.digit_precision		6
CAM.program_call_form		G65P%1%
RhinoUtilities.check_surface_vector	Error if direction of surface normal vector is downward(Z < 0).	False

- Sample System Configuration File

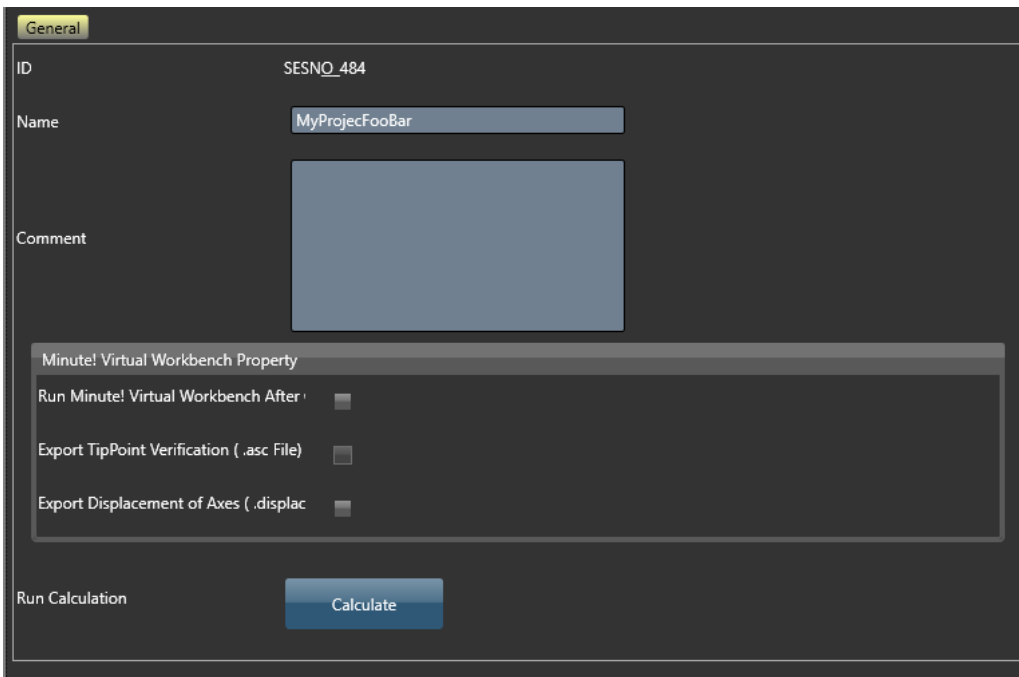
```

1 <?xml version="1.0" encoding="utf-8"?>
2 <configuration>
3   <appSettings>
4     <add key="LogWindow" value="False"/><!-- True:show False:noshow-->
5     <add key="Language" value=""/><!-- "ja":Japanese "en":English otherwise auto -->
6
7     <!-- Default System Parameters -->
8     <add key="Format.Double" value="{0:0.000000}"></add>
9
10    <!-- Default Values -->
11    <add key="Work.extend_coordinate_setting" value="true"></add>
12    <add key="CAM.digit_precision" value="6"/>
13    <add key="CAM.auto_g05p10000" value="true"></add>
14    <add key="CAM.program_call_form" value="G65P%1%"></add>
15    <add key="RhinoUtilities.check_surface_vector" value="false"></add>
16
17    <add key="Carve.SurfaceCusp" value="10.0"></add>
18    <add key="ThreeAxisCutlineMilling.SurfaceCusp" value="10.0"></add>
19  </appSettings>
20 <startup><supportedRuntime version="v4.0"
21 sku=".NETFramework,Version=v4.6.2"/></startup></configuration>

```

Calculation

Click “Calculate” button in the Panel of Project Node to start calculation.



After Calculation, the outputs are create in new Session Directory.

Session Directory

Item	Description
Where to create	%USERPROFILE%\Minute!\Sessions\ YYYY_MM_DD_HH_mm_ss
When to create	Just after calculation
“In” Directory	Stores Inputs
“Out Directory	Stores Outputs. Includes “Response.xml”. This file is system file. G Code is stored in this directory.

PLACE HOLDERS

To access Place Holder write below format:

$\{$ PlaceholderID $\}$

Target	PlaceholderID	Conversion Result Sample
Machine Header and Footer	PostDateTime	
Machine Header and Footer	ProgramPrefix	0
Machine Header and Footer	ProgramNumber	1000
Machine Header and Footer	FileExtension	""(Empty String)
SubProgram Header and Footer	PostDateTime	
SubProgram Header and Footer	TNumber	3
SubProgram Header and Footer	ToolName	R0.2Endmill
SubProgram Header and Footer	ProgramPrefix	0
SubProgram Header and Footer	ProgramNumber	1000
SubProgram Header and Footer	FileExtension	""(Empty String)
SubProgram Header and Footer	RetractPoint_X	
SubProgram Header and Footer	RetractPoint_Y	
SubProgram Header and Footer	RetractPoint_Z	
SubProgram Header and Footer	CurrentNumber	3
SubProgram Header and Footer	TotalNumber	5
SubProgram Header and Footer	ProcessName	
Tool Header and Footer	PostDateTime	
Tool Header and Footer	TNumber	
Tool Header and Footer	ToolName	
Tool Header and Footer	CurrentNumber	
Tool Header and Footer	TotalNumber	
Tool Header and Footer	ProcessName	
Tool Header and Footer	Tool_TipCompensation_X	

Tool Header and Footer	Tool_TipCompensation_Y
Tool Header and Footer	Tool_TipCompensation_Z
Tool Header and Footer	Tool_TipCompensation_Additional_Setting
Tool Header and Footer	RetractPoint_X
Tool Header and Footer	RetractPoint_Y
Tool Header and Footer	RetractPoint_Z
Tool Header and Footer	Machine_Reference_X
Tool Header and Footer	Machine_Reference_Y
Tool Header and Footer	Machine_Reference_Z
Tool Header and Footer	Tool_TipCompensation_X
Tool Header and Footer	Tool_TipCompensation_Y
Tool Header and Footer	Tool_TipCompensation_Z

Contact

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