

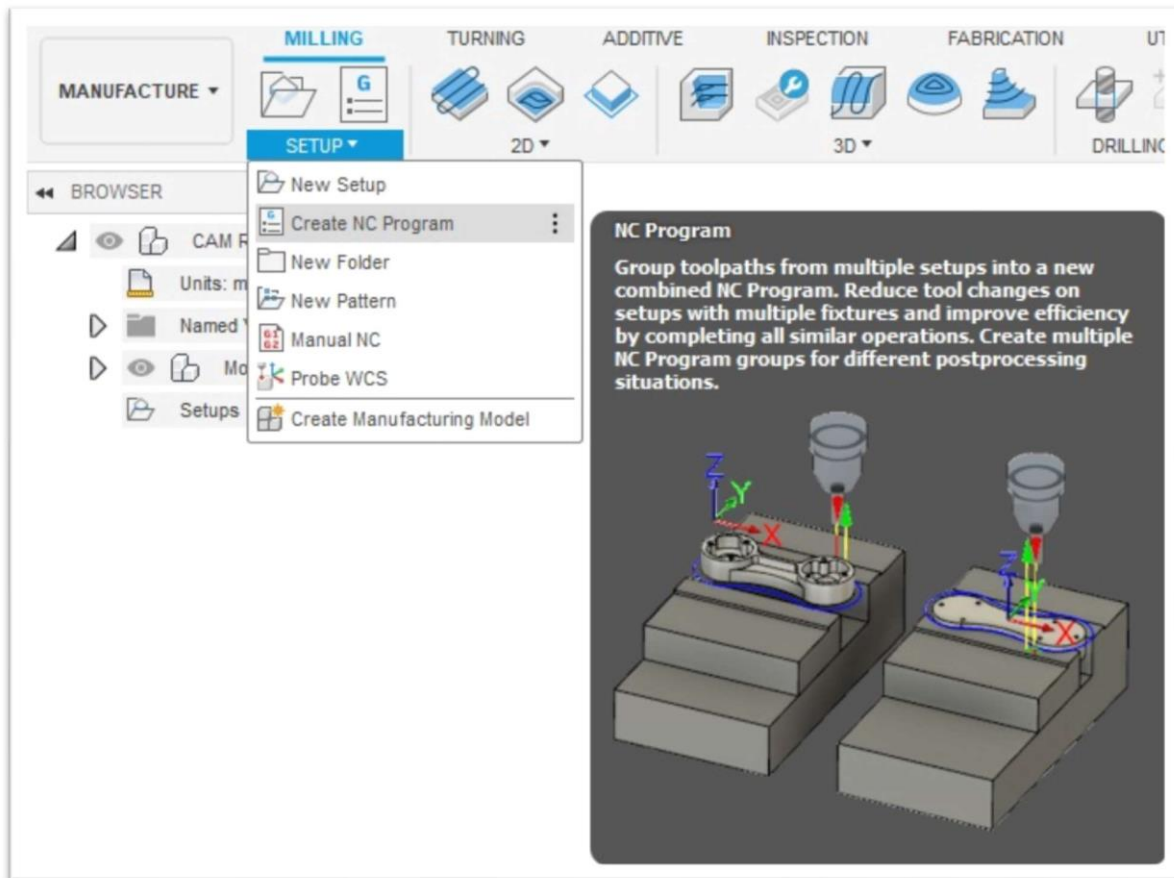


**ROBOT**  
**POSTPROCESSOR MANUAL**



## 1. Create NC Program

NC Program can organize several Setups into a single NC program output, writing multiple toolpaths when needed:



It's important to use NC Program for writing your nc codes.

The NC Program dialog has an ordered tab to manage all the properties you need for the ABB nc code.

## 2. NC Program Settings properties

This is an overview of all the properties available for ABB output:

### Post properties

▼ Process

End-effector state

Head angle

Welding mode ☐

▼ Configuration

First point move type

Robot configuration

Robot joint 1

Robot joint 2

Robot joint 3

Robot joint 4

Robot joint 5

Robot joint 6

▼ Parameters

Flip tool frame ☒

Robot tool name (prefix)

Robot workobject data name (prefix)

Robot smoothing value (Zone)

▶ ☐ Welding Settings

▶ ☐ FFF Settings

▶ ☐ General

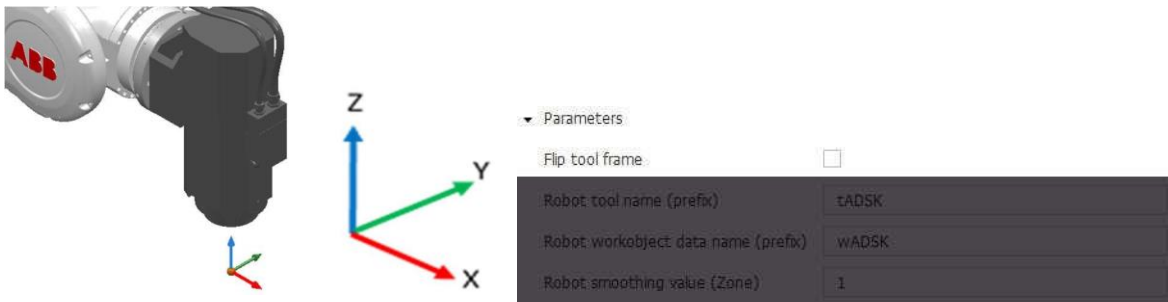
▶ ☐ Built-in

### 3. Confirm the tool orientation on the robot

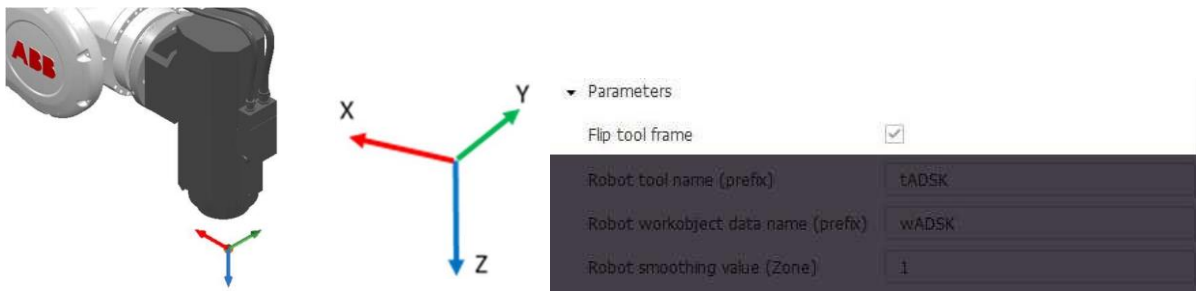
The robot can be driven manually along the tool coordinate system, this is one option to check the orientation of the tool workplane.

- Select the tool coordinate system
- Select the appropriate tool number to jog
- Use the teach pendant/enabling device to drive the robot along each axis individually
- This is a good way to check the orientation of X, Y and Z axis of the tool workplane.

If Z+ is pointing up along the tool axis and the X+ is pointing in front, **use No Flip** option:



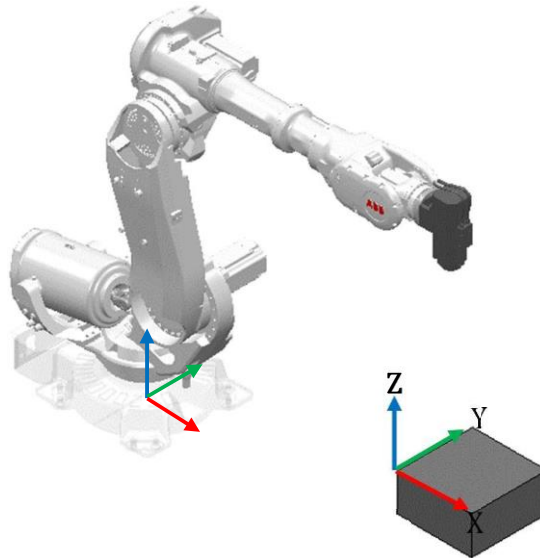
If Z+ is pointing down along the tool axis and X+ is pointing backwards, **use Flip** option:



**Note:** if the tool orientation is not one of the above, Autodesk CAM post will not support the application correctly.

#### 4. WCS setup (workplane)

On the ABB robot it is possible to define a coordinate system on the part which is known as a **Work Object Coordinate System (WOCS)**. The **WOCS**, located on the part/block, will be referenced from the zero of the robot, which is located at its base.

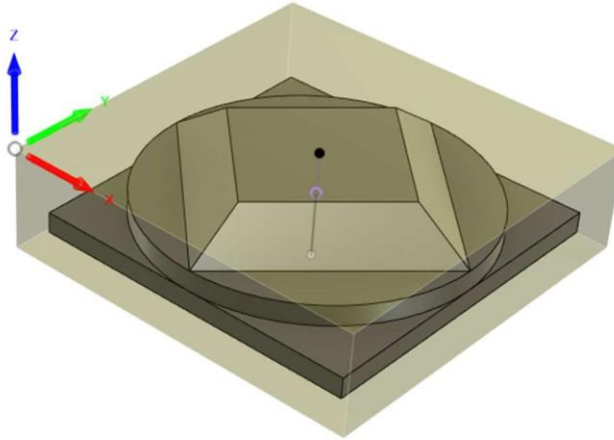
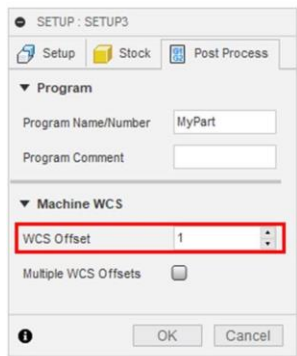


When a **WOCS** is defined on the part, the robot will have defined a:

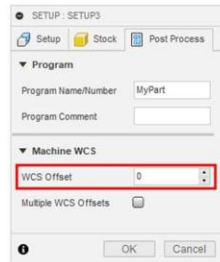
- Number
- Name
- Position & Orientation

To run a toolpath successfully on the robot, users must ensure the robot **WOCS** and the WCS in Autodesk CAM are in the same relationship and orientation.

The WCS Offset number in Autodesk CAM defines the **WOCS** number, select the number defined on the robot.



Note: If zero is selected an error will be raised while post processing and no output will be written.



```
[Information: Configuration: ABB Robotics - Rapid
Information: Vendor: ABB
Information: Posting intermediate data to 'C:\Users\t_pintoa\
\AppData\Local\Fusion 360 CAM\nc\MyPart.pgf'
Error: Failed to post process. See below for details.
...
Code page changed to '1252 (ANSI - Latin I)'
Start time: Thursday, April 9, 2020 1:35:33 PM
Code page changed to '20127 (US-ASCII)'
Post processor engine: 4.5633.2
Configuration path: C:\Users\t_pintoa\Documents\5_FUSION_360\0
_Fusion_Post\Custom Posts\200804ABB.cps
Security level: 1000
Include paths: C:\Users\t_pintoa\Documents\5_FUSION_360\0
_Fusion_Post\Custom Posts
Configuration modification date: Wednesday, April 8, 2020 3:34:05
PM
Output path: C:\Users\t_pintoa\AppData\Local\Fusion 360 CAM\nc
\MyPart.pgf
Checksum of intermediate NC data:
f454e1778ca5080837373ecd3f86dc8d
Checksum of configuration: e8dcb3f49f779a8c131fece4c8010e1e
Vendor url: http://www.abb.com
Legal: Copyright (C) 2012-2020 by Autodesk, Inc.
Generated by: Fusion 360 CAM 2.0.7830
...
#####
#####
Error: Workobject data has not been specified. Define it as WCS
value, editing current Setup.
Error at line: 257
Error in operation: 'Adaptive3'
Failed while processing onSection() for record 427.
#####
#####
Error: Failed to invoke function 'onSection'.
Error: Failed to invoke 'onSection' in the post configuration.
Error: Failed to execute configuration.
Stop time: Thursday, April 9, 2020 1:35:33 PM
Post processing failed.
```

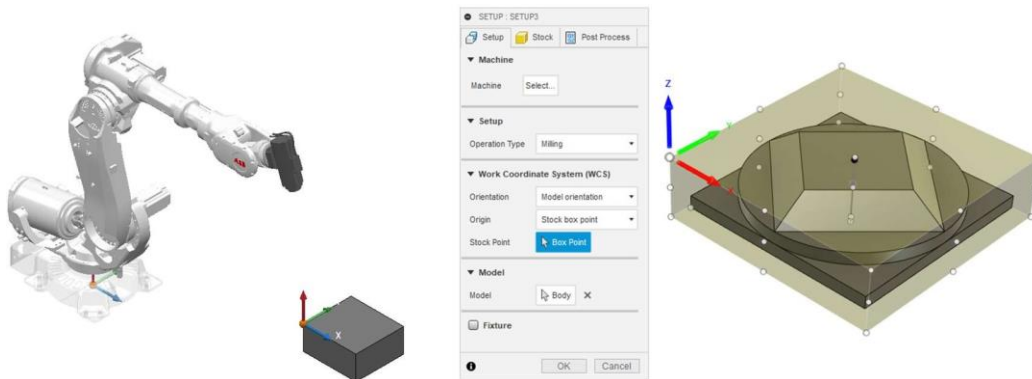
The name of the **WOCS** (prefix) is defined in the post-processor properties like below:



The **WOCS** is defined with *prefix* and *WCS Offset* number: wADSK and 1.

```
MoveL [[8.432,-62.821,5],[0,-0.25881905,0.96592583,0],[0,0,0],[9E9,9E9,9E9,9E9,9E9,9E9]],v17,z1,tADSK9[Wobj:=wADSK1;
```

Use the WCS setup menu to replicate the position and orientation of the **WOCS** on the part.

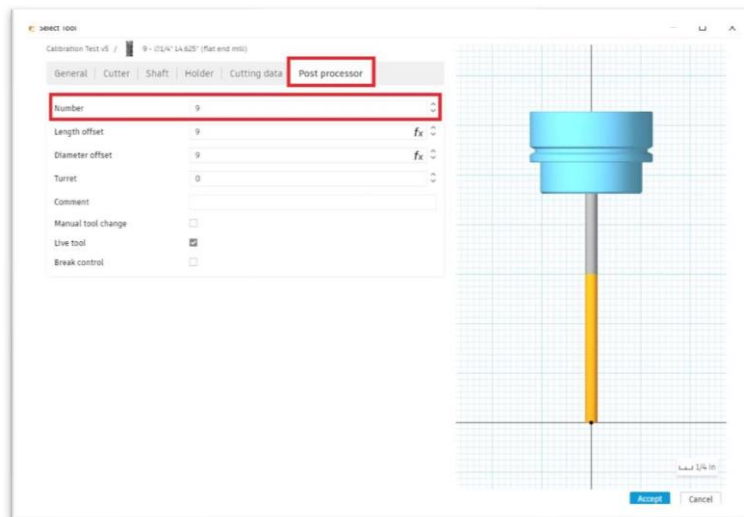


The robot can be jogged along the **WOCS**, this is one option to check the orientation of the **WOCS**.

- Select the **WOCS**
- Select the appropriate **WOCS** to jog
- Use the teach pendant/enabling device to drive the robot along each axis individually
- This is a good way to check the orientation of X, Y and Z axis of the **WOCS**
- You can also jog the robot to the location of the origin and visualize the coordinates of the **WOCS**

## 5. Define Tool Number & Prefix/Tool Name (replicate settings on the Robot)

The tool number is defined via the Tool Post Processor menu.



Autodesk CAM defines the tool with a number and a name, so these two sets of data must be replicated. Set the tool name by typing the name in the available post processor property field.

Parameters

Flip tool frame

☒

Robot tool name (prefix)

tADSK

Robot workobject data name (prefix)

wADSK

Robot smoothing value (Zone)

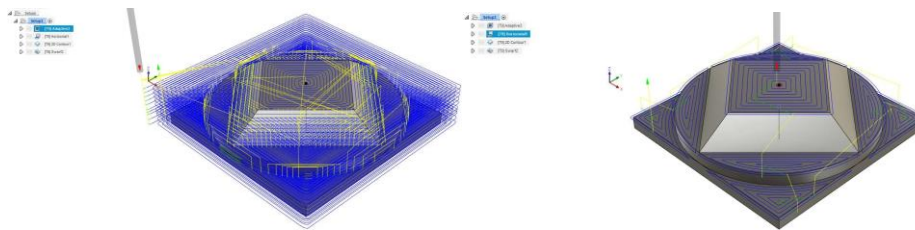
1

The tool will be declared at the end of the line in the MOD file for each move.

```
MoveL [[-0.599,-7.303,-4.814],[0.96592583,0,0,0.25881905],[0,0,0,0],[9E9,9E9,9E9,9E9,9E9,9E9]],v17,z1,tADSK,WObj:=wADSK1;
```

## 6. Create a toolpath

Follow the normal steps inside Autodesk CAM in order to generate one or more toolpaths in your setup.



## 7. Post processing

Autodesk CAM post-processor generates a few files.

- **.mod** file (module file) per toolpath
- **.mod** file that manages the call of the toolpaths, called the main.
- **.pgf** (program file) that is used on the controller to load all **.mod** files.

The **mToolpath.mod** file will use the toolpath file name (file name should **NOT** start with a number and should not contain any special characters).

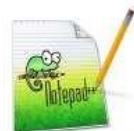
The main file is named **mAutodesk.mod** by default (this can be changed in the post).

**T1.pgf** file uses the name defined in the post processor menu or in the setup.

Program

Name/number

T1



mAutodesk.mod



mToolpath.mod

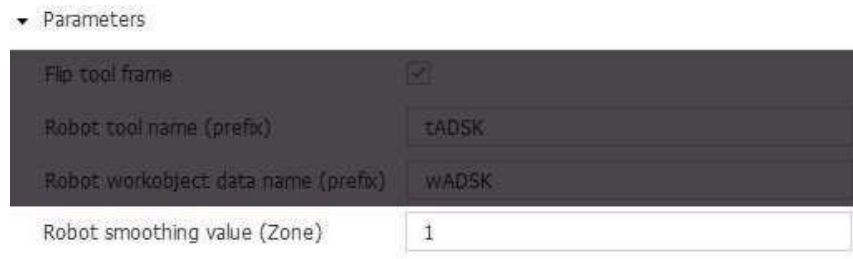


T1.pgf



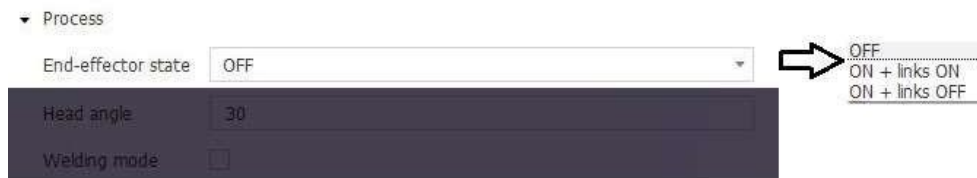
Once ready to post process, some post-postprocessor properties need to be defined output files can be generated:

- Robot smoothing value: This refers to ABB Zones (refer to ABB official documentation).



### Process properties

- End-effector state: This option is for all the non-subtractive operations when the end-effector needs to be turned on/off.



Codes to use end-effectors are non-standard and they must be customized according to the robot integration. The postprocessor simply writes these 2 lines as a comment:

*==> END EFFECTOR ON: DEFINE YOUR CODE HERE IN THE POST*

and

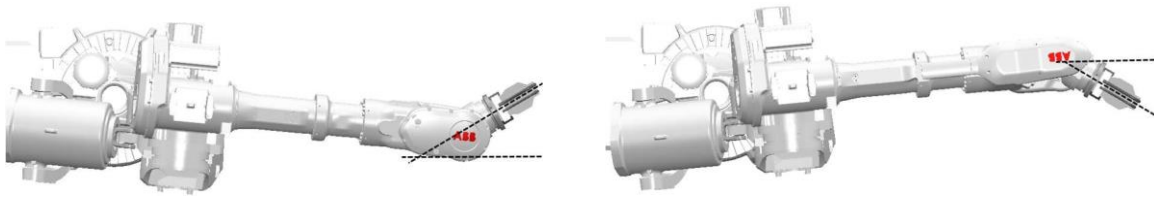
*==> END EFFECTOR ON: DEFINE YOUR CODE HERE IN THE POST*

You can define your proper codes inside the postprocessor editing these lines.

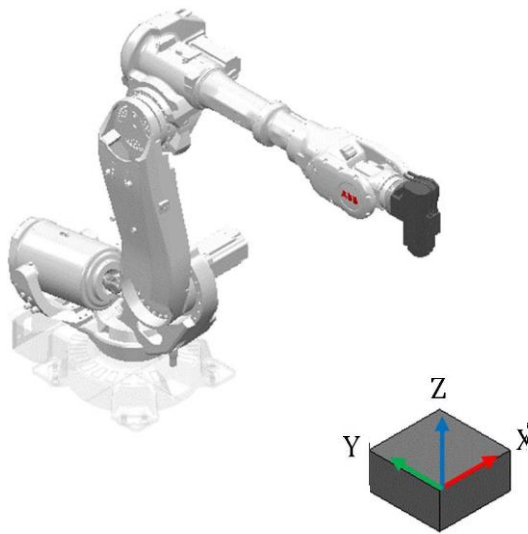
- Head angle: This allows the user to enter an angle of rotation around the tool axis, this will effectively rotate the spindle, the angle will be kept throughout the entire toolpath. This angle is relative to the X axis of the WCS defined on the part.



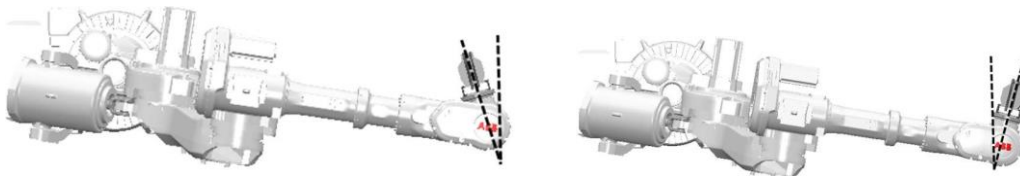
Below you can see an example of a 15 (left) and -15 degree (right) relative to the X axis, for a tool defined with Z+ going up a spindle.



If the X axis is defined on another orientation the spindle angle will be relative to this orientation.



15 degree (left) and -15 degree (right)



- Welding mode: This allows to activate welding mode

Process

End-effector state

OFF

Head angle

30

Welding mode

☒

Toolpaths work with ArcL commands instead of standard MoveL:

```
! Welding Move Starts (Arc is about to be established)
ArcLStart [[37.5,25,-82.001],[0.1830127,0.1830127,-0.6830127,0.6830127],[0,0,0,0],[9E9,9E9,9E9,9E9,9E9,9E9]],v17,seam1,weld1\Weave:=weave1,fine,tADSK900\Wobj:=wADSK54;
ArcL [[39.354,25,-81.708],[0.1830127,0.1830127,-0.6830127,0.6830127],[0,0,0,0],[9E9,9E9,9E9,9E9,9E9,9E9]],v17,seam1,weld1\Weave:=weave1,z1,tADSK900\Wobj:=wADSK54;
ArcL [[43.5,25,-76.001],[0.1830127,0.1830127,-0.6830127,0.6830127],[0,0,0,0],[9E9,9E9,9E9,9E9,9E9,9E9]],v17,seam1,weld1\Weave:=weave1,z1,tADSK900\Wobj:=wADSK54;
ArcL [[43.5,25,-58.953],[0.1830127,0.1830127,-0.6830127,0.6830127],[0,0,0,0],[9E9,9E9,9E9,9E9,9E9,9E9]],v17,seam1,weld1\Weave:=weave1,z1,tADSK900\Wobj:=wADSK54;
! Lead Out Move Starts
ArcL [[43.851,25,-58.104],[0.1830127,0.1830127,-0.6830127,0.6830127],[0,0,0,0],[9E9,9E9,9E9,9E9,9E9,9E9]],v17,seam1,weld1\Weave:=weave1,z1,tADSK900\Wobj:=wADSK54;
! Welding Move Ends (Arc is about to be stopped)
ArcLEnd [[43.851,25,-58.104],[0.1830127,0.1830127,-0.6830127,0.6830127],[0,0,0,0],[9E9,9E9,9E9,9E9,9E9,9E9]],v17,seam1,weld1\Weave:=weave1,z1,tADSK900\Wobj:=wADSK54;
WaitTime 0;
```

☒ Welding Settings

Welding seamdata

seam1

Welding wait time

0

Welding weavedata

weave1

Welding welddata

weld1

ABB *Seam data*, *weld data* and *weave data* must be defined according to your controller settings in the post-processor. It's also possible to define the Welding wait time.

### Configuration properties

Configuration

First point move type

Joints

Robot configuration

0,-1,0,1

Robot joint 1

0

Robot joint 2

0

Robot joint 3

5

Robot joint 4

-70

Robot joint 5

-40

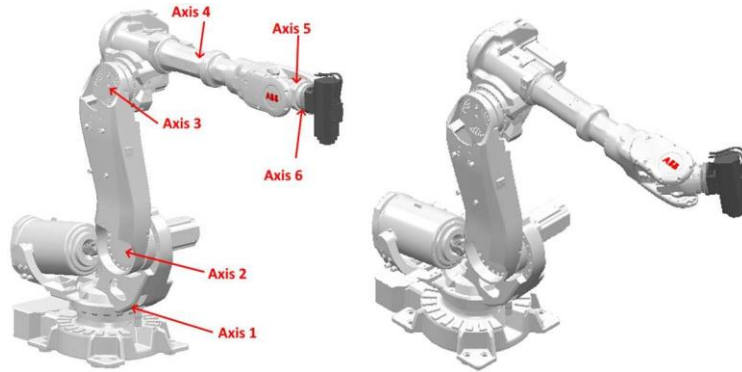
Robot joint 6

70

- **First point move type:** Allows the user to choose from a first move using robot joints or a cartesian position. Default is joint move.  
Below the axis position defined by joint angles using **MoveAbsJ** command where joint 1=0, joint 2=0, joint 3=5, joint 4=-70, joint 5=-40, joint 6=70:

```
MoveAbsJ [0, 0, 5, -70, -40, 70], [9E9, 9E9, 9E9, 9E9, 9E9, 9E9] \NoEOffs, v17, fine, tADSK9;
```

The joint values are defined in the Configuration properties dialog.



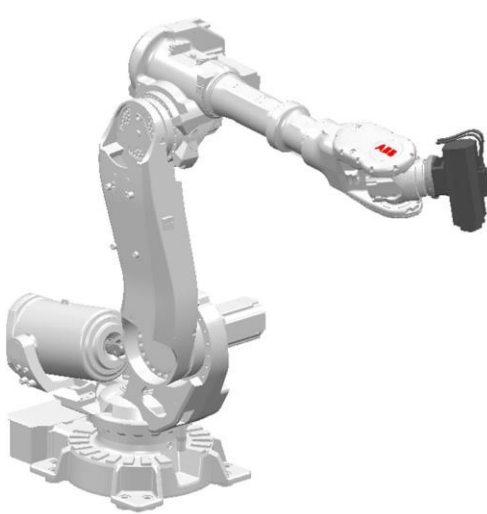
If cartesian position is defined, the robot will move to the first toolpath point using a **MoveJ** relative to the WCS/Work Object defined on the part, this will require reading the robot configuration from the teach pendant and updating field below.

```
MoveJ [115.031, 110.671, 15.24], [0, -0.25881905, 0.96592583, 0], [0, -1, 0, 1], [9E9, 9E9, 9E9, 9E9, 9E9, 9E9], v17, z1, tADSK9\Wobj:=wADSK1;
```

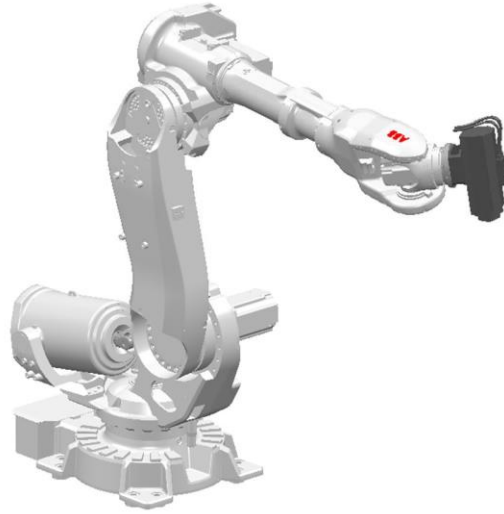
- **Robot configuration:** This allows the user to define the specific robot configuration, this should be used when using cartesian position Option above, the robot configuration must be defined in order to have a unique solution.

```
MoveJ [115.031, 110.671, 15.24], [0, -0.25881905, 0.96592583, 0], [0, -1, 0, 1], [9E9, 9E9, 9E9, 9E9, 9E9, 9E9], v17, z1, tADSK9\Wobj:=wADSK1;
```

An example of the same tool tip position & orientation but with 2 different robot configurations. Notice that robot axis 4, 5 and 6 are reversed (robot wrist with ABB logo is flipped 180 degrees)

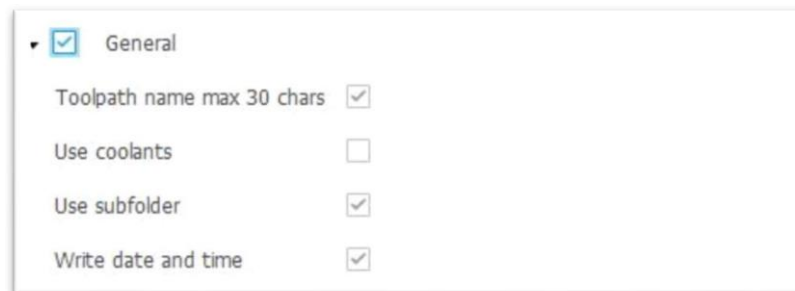


Robot Configuration [0, -1, 0, 1]



Robot Configuration [0, 1, -2, 0]

### General properties



- Use coolants: When this option set as No (default) post-processor will ignore Coolant definition set in Autodesk CAM.
- Use subfolder: Default is to write out all data in a sub folder.

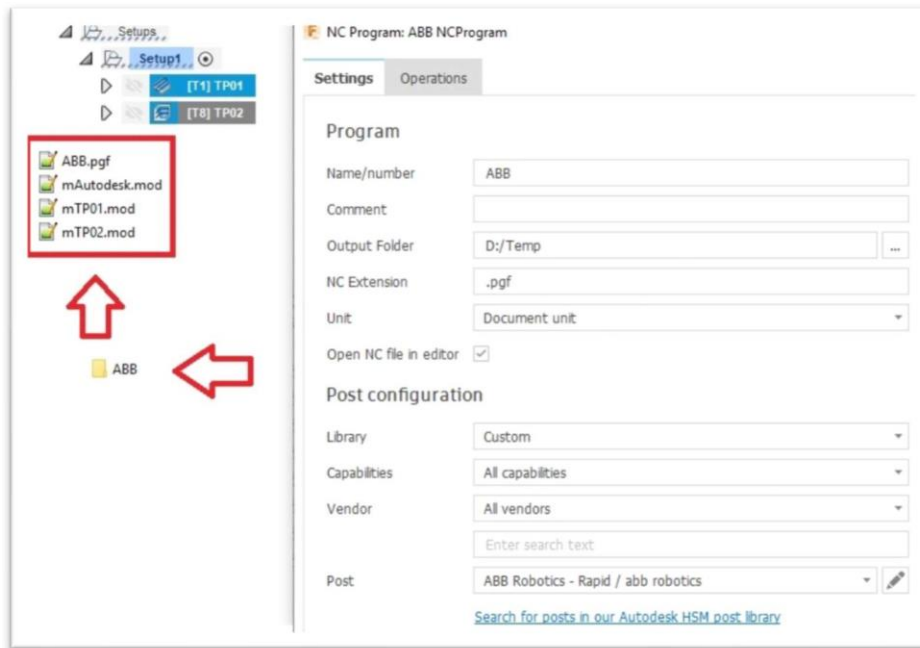
A dummy file with standard information is created after posting if you chose to Use subfolder. It contains the name of the directory where you can find your nc files. It is called as the Program Name in NC Program form. This is a dummy file example:

This is a dummy file.  
Your program files are located here: C:\Users\xyz\AppData\Local\Fusion 360 CAM\nc\1001

- Toolpath name max 30 chars: Default is to check each toolpath name length. An error will be raised when length is more than 30 char.
- Write date and time: Writes date & time of file creation in the main .MOD file:

! Creation date: Wednesday, April 15, 2020 16:12:18

Below an example setup with two toolpaths, ABB is the name of the folder and the program file. Main file is mAutodesk.mod and the toolpath .MOD files have the toolpath names.



## 8. General information

For more information get help or post your questions on the forum:

<https://forums.autodesk.com> Select "Fusion 360" and then "Fusion 360 Manufacturing"

In ABB Rapid language (MOD files), the default unit of speed is millimeters per second: **mm/s**.  
MoveL [...],v17,z0,t1\WObj:=w1; means robot TCP speed = 17 mm/s (≈1000 mm/min)

If the Autodesk CAM session is running in inches, the output file will still be written in mm as this is the unit system used on robots.

**IMPORTANT:** Please remember that program and toolpath names should not contain any symbol or special character.

## 9. Program sample

Autodesk CAM post-processor generates a few files, as described above on point 7.

This is an example of ABB postprocessor output. The example has one only toolpath.

```
--- PGF file Start ---
<?xml version="1.0" encoding="ISO-8859-1"?>
<Program>
  <Module>mAutodesk.mod</Module>
  <Module>mTP01_T9.mod</Module>
  <Module>mTP02_T7.mod</Module>
</Program>
--- PGF file End ---

--- mAutodesk.mod file Start ---
%%%
VERSION:1
LANGUAGE:ENGLISH
%%%

MODULE mAUTODESK

  PERS speeddata v106:=[106,500,5000,1000];
  PERS speeddata v17:=[17,500,5000,1000];
  PERS speeddata v64:=[64,500,5000,1000];

  PROC main()
    ! Generated by AUTODESK Fusion 360 CAM 2.0.8111
    ! Creation date: Thursday, April 16, 2020 18:27:01

    ! Acceleration and jerk/ramp (percentage)
    AccSet 20,20;

    ! Configurations
    Confj\On;
    Confl\Off;

    ! Load Tool
    !Tool_Change tADSK9;

    ! Spindle On/Speed
    !Spindle_ON 15000;

    pTP01_T9;

    ! Load Tool
    !Tool_Change tADSK7;

    ! Spindle On/Speed
    !Spindle_ON 1000;

    pTP02_T7;

    ! Spindle Off
    !Spindle_OFF;

    Confj\On;
    Confl\On;
    Stop;
  ENDPROC
ENDMODULE
--- mAutodesk.mod file End ---
```

--- mToolpath.mod file Start ---

%%%

VERSION:1

LANGUAGE:ENGLISH

%%%

MODULE mTP01\_T9

PROC pTP01\_T9()

MoveAbsJ [[0,0,5,-70,-40,70],[9E9,9E9,9E9,9E9,9E9,9E9]]\NoEOffs,v17,fine,tADSK9;

MoveL [[8.432,-62.821,5],[0,-0.25881905,0.96592583,0],[0,0,0,0],[9E9,9E9,9E9,9E9,9E9,9E9]],v17,z1,tADSK9\WObj:=wADSK3;

MoveL [[8.432,-62.821,-0.365],[0,-0.25881905,0.96592583,0],[0,0,0,0],[9E9,9E9,9E9,9E9,9E9,9E9]],v64,z1,tADSK9\WObj:=wADSK3;

MoveL [[8.246,-62.821,-0.814],[0,-0.25881905,0.96592583,0],[0,0,0,0],[9E9,9E9,9E9,9E9,9E9,9E9]],v64,z1,tADSK9\WObj:=wADSK3;

MoveL [[7.797,-62.821,-1],[0,-0.25881905,0.96592583,0],[0,0,0,0],[9E9,9E9,9E9,9E9,9E9,9E9]],v64,z1,tADSK9\WObj:=wADSK3;

MoveL [[6.033,-62.821,-1],[0,-0.25881905,0.96592583,0],[0,0,0,0],[9E9,9E9,9E9,9E9,9E9,9E9]],v64,z1,tADSK9\WObj:=wADSK3;

MoveL [[-6.033,-62.821,-1],[0,-0.25881905,0.96592583,0],[0,0,0,0],[9E9,9E9,9E9,9E9,9E9,9E9]],v64,z1,tADSK9\WObj:=wADSK3;

MoveL [[-12.005,-62.821,-1],[0,-0.25881905,0.96592583,0],[0,0,0,0],[9E9,9E9,9E9,9E9,9E9,9E9]],v64,z1,tADSK9\WObj:=wADSK3;

MoveL [[-13.301,-62.525,-1],[0,-0.25881905,0.96592583,0],[0,0,0,0],[9E9,9E9,9E9,9E9,9E9,9E9]],v64,z1,tADSK9\WObj:=wADSK3;

MoveL [[-14.34,-61.697,-1],[0,-0.25881905,0.96592583,0],[0,0,0,0],[9E9,9E9,9E9,9E9,9E9,9E9]],v64,z1,tADSK9\WObj:=wADSK3;

MoveL [[-14.917,-60.499,-1],[0,-0.25881905,0.96592583,0],[0,0,0,0],[9E9,9E9,9E9,9E9,9E9,9E9]],v64,z1,tADSK9\WObj:=wADSK3;

MoveL [[-14.917,-59.17,-1],[0,-0.25881905,0.96592583,0],[0,0,0,0],[9E9,9E9,9E9,9E9,9E9,9E9]],v64,z1,tADSK9\WObj:=wADSK3;

MoveL [[-14.34,-57.973,-1],[0,-0.25881905,0.96592583,0],[0,0,0,0],[9E9,9E9,9E9,9E9,9E9,9E9]],v64,z1,tADSK9\WObj:=wADSK3;

ENDPROC

ENDMODULE

--- mToolpath.mod file End ---