Ucancam Post Processor

The Post Processor is a programmer which converts the tool path in some standard neutral format into the format required by a specific machine control system. For example the G code format supported worldwide by many control systems and PLT3D supported by Roland machine.

Because the wide range of control system on the market, the majority of controls have simple formatting requirements. And therefore UCancam supply a configurable post processor which can be used by customers or agents to create a post processor file to support their controls. This configurable post processor use a Unicode ASCII configuration file to specify the output format required.

An example of a configuration file is shown on the below:

```
/////////////////////////
FORMAT <X|X%1.3f |1.0>
FORMAT <Y|Y%1.3f |1.0>
FORMAT <Z|Z%1.3f |1.0>
FORMAT <S|S%d |1>
FORMAT <F|F%d |1>
UNITS <MM>
///////
FILE_EXTENSION <nc>
/////////////////////////
PROG_HEAD <G90G17G21>
TOOLCHANGE <M06 T[TN]>
PROG_TAIL <M30>
```

Briefly, the entries in configuration file fall into four main categories which can be described as below

1. Global Statements

These determine the file extensions, whether the output is in mm or inches.

Line numbering information and formatting for numeric fields

2. Head of Pogramme

This section deals with line that must be output at the head of every programme. This information usually has the programme name, command for switching on the spindle etc.

for example：

PROG_HEAD <%:[DATE]：[TIME]>

PROG_HEAD <G90G17G21>

The word suffix "[ ]" is variable.

3. Tail of Pogramme

This section deals with line that must be output at the tail of every programme. This information usually has the programme name, command for switching off the spindle etc, moving the tool back to the home position.

 For example:

PROG_TAIL <M30>

PROG_TAIL <%>

4. TOOLCHANGE

If the machine tool is equipped with an automatic toolchanger or user wants to allow manual tool changes through an output file. This statement can be used to output the appropriate command.

For example：

TOOLCHANGE <M05>

TOOLCHANGE <M06 T [TN]>

(TN: current tool number)

The schema of configuration file is: KEY WORD < description/value>

First word in the line is key word that is defined by Ucancam like as UNITS.

These in the brackets contain the description for command or values. For example: UNITS <MM>. To define the output is in millimeter.

The key word in Ucancam includes two types: the one is to define the commands.

The other is variable that is referenced in post processor file with prefix "[ ]"

The following is the key word for commands

KEY WORD	Specification
FORMAT	To define the formatting for numeric fields
PROG_HEAD	Head of programme
PROG_TAIL	Tail of programme
TOOLCHANGE	Tool change command
G00_DEF	Command name for rapid moving
G01_DEF	Command name for line cutting
G02_DEF	Command name for CW arc cutting
G03_DEF	Command name for CCW arc cutting
G04_DEF	Command name for pause
DWELL_DEF	Commands for pause statement
FIRST_ G00_MOVE_DEF	Commands for the first rapid move
G00_MOVE_DEF	Commands for rapid moves
FIRST_ G01_MOVE_DEF	Commands for the first feed rate move
G01_MOVE_DEF	Commands for feed rate moves
FIRST_ G02_MOVE_DEF	Commands for the first clockwise arc move
G02_MOVE_DEF	Commands for clockwise arc moves
FIRST_ G03_MOVE_DEF	Commands for the first counter-clockwise arc move
G03_MOVE_DEF	Commands for counter-clockwise arc moves
G20_DEF	command name for inch unit
G21_DEF	command name for mm unit
SPN_CW	command name for spindle CW rotation
FILE_EXTENSION	File extension name
UNITS	Unit for length
XYZ_SEQ	Sequence for XYZ

LINE_NUM_START	The start line number
LINE_NUM_INCREMENT	Line number increment
LINE_NUM_MAXIMUM	Maximum value for line number
OMIT_SAME_GCODE	Omit the same G code
OMIT_SAME_XYZ	Omit the same XYZ value
RAPID_ XY_Z	Sequence for rapid moving
ARC_TO_LINES	Convert arc to lines
END_OF_LINE	The string at the end of line

The following is the key word for variable

KEY WORD	Specification
DATE	Date of create file
TIME	Time of create file
FILENAME	File name
TOOLPATHNAME	Toolpath type name
XSIZE	Toolpath size for x axis
YSIZE	Toolpath size for y axis
ZSIZE	Toolpath size for z axis
XMIN	Toolpath minimum value for x axis
YMIN	Toolpath minimum value for y axis
ZMIN	Toolpath minimum value for z axis
XMAX	Toolpath maximum value for x axis
YMAX	Toolpath maximum value for y axis
ZMAX	Toolpath maximum value for z axis
WK_XSIZE	Length of material in X.
WK_YSIZE	Length of material in Y.
WK_XMIN	Minimum value of material in X.
WK_YMIN	Minimum value of material in Y.
WK_XMAX	Maximum value of material in X.
WK_YMAX	Maximum value of material in Y.
X	Current x position
Y	Current y position
Z	Current z position
I	Arc centre in X Axis (relative to start X,Y position).
J	Arc centre in Y Axis (relative to start X,Y position).
K	Arc centre in Z Axis (relative to start X,Y position).
IA	Arc centre in X Axis (absolute coordinates).
JA	Arc centre in Y Axis (absolute coordinates).
KA	Arc centre in Z Axis (absolute coordinates).
IE	Arc centre in X Axis (relative to end X,Y position).
JE	Arc centre in Y Axis (relative to end X,Y position).
KE	Arc centre in Z Axis (relative to end X,Y position).
LN	Line number

TN	Tool number
TOOL_DESC	Tool description
FC	Federate for cutting
FP	Federate for plunge
FR	Federate for rapid moving
SPN_SPEED	Spindle rotation speed
SAFE_ZPOS	Safe height

FORMAT

Output format for Variable in UCancam include:

FORMAT <N|N%d >

FORMAT <X|X%1.3f |1.0>

FORMAT <Y|Y%1.3f |1.0>

FORMAT <Z|Z%1.3f |1.0>

FORMAT <S|S%d |1>

FORMAT <F|F%d |1>

FORMAT <I|I%1.3f |1.0>

FORMAT <J|J%1.3f |1.0>

FORMAT <K|K%1.3f |1.0>

FORMAT <R|R%1.3f |1.0>

FORMAT <A|A%1.3f |1.0>

The field in brackets is separated as three parts by character "|" .eg:

FORMAT <X|X%1.3f |1.0>, the first part is Key character of Ucancam, "X" mean the current format is for x coordinate. Ucancam key characters of format include : N X Y Z S F I J K R A.

N: line number.

X: x coordinate

Y: y coordinate

Z: z coordinate

S: spindle rotation speed

F: spindle federate

I: arc x increment value

J: arc y increment value

K: arc z increment value

R: arc radius

A; angle for rotation axis

The second part is the string to print before value when output. %**1.3f** is format string to control the number of decimal places leading zero etc. "1" is number that specifies minimum number of characters output. "3" is the precision specification value that specifies maximum number of characters printed for all or part of the output field

5. G00_DEF, G01_DEF, G02_DEF, G03_DEF, G04_DEF, G20_DEF, G21_DEF

Define the command string name that replace for ISO G Code G00, G01, G02, G03, G04, G20, G21.

Eg: **G00_DEF <G172>**

6. Arc command
1）ARC_TO_LINES <1>
Possible value: 1 or 0
Convert the arc to lines.
Default: 0
2）The format of arc output, Expressed as R.
FORMAT <R|R%1.3f |1.0>
3）The format of arc output, Expressed as I, J, K(Arc centre in X Axis, relative to start X,Y position).
FORMAT <I|I%1.3f |1.0>
FORMAT <J|J%1.3f |1.0>
FORMAT <K|K%1.3f |1.0>
4）The format of arc output, Expressed as IA, JA, KA(absolute coordinates)
5）The format of arc output, Expressed as IE, JE, KE(Arc centre in X Axis, relative to end X,Y position).
Default: R format

7. FIRST_ G00_MOVE_DEF
Commands output for first rapid move.
Commands that are output when the very first rapid move is made. A Section not used for most posts, but useful if the very first rapid move, needs to output different information to subsequent rapid moves. This section is sometimes required for HPGL variants

G00_MOVE_DEF
Commands output for rapid moves.
Commands that are output when rapid moves are required.

8. FIRST_G01_MOVE_DEF
Commands output for first feed rate moves.
This section is commonly used where controllers require that the Feed Rate is set at the first feed move, this rate would then be used for subsequent cut moves.

G01_MOVE_DEF
Commands output for feed rate moves
Used to output information required at every move, or all feed moves except for the First Feed Move, if a FIRST_FEED_MOVE section is present within the post processor

9. FIRST_G02_MOVE_DEF
Commands output for the first clockwise arc move
Similar to the FIRST_G01_MOVE_DEF section, but for clockwise arc segments. This section is commonly used where controllers require that the Feed Rate is set for the first arc segment, this rate would then be used for subsequent arc moves in the same direction.

G02_MOVE_DEF

Commands output for clockwise arc moves.

Similar to the G01_MOVE_DEF section, but for clockwise arc segments.

10. FIRST_G03_MOVE_DEF

Commands output for the first counter-clockwise arc move.

Similar to the FIRST_G01_MOVE_DEF section, but for counter-clockwise arc segments. This section is commonly used where controllers require that the Feed Rate is set for the first arc segment, this rate would then be used for subsequent arc moves in the same direction.

G03_MOVE_DEF

Commands output for counter-clockwise arc moves.

Similar to the G01_MOVE_DEF section, but for counter-clockwise arc segments.

11. DWELL_DEF

Commands for pause statement.

If not set this statement, Default：G04 Xtime

Eg: G04 X2.000 the pause time when drilling at the bottom is 2 seconds.

12. Line numbering

FORMAT <N|N%d >

There are two meanings:

(1) Output the line number. if not set this statement, ucancam do not output line number.

(2) Set the format of line number

LINE_NUM_START <1>

Start line number

Default: 1

LINE_NUM_INCREMENT <1>

Increment line number

Default: 1

13. UNITS

Possible value: MM or INCH

MM: All position in mm, feed in mm/min

INCH: All position in inches, feed in inches/min

14. FILE_EXTENSION

Defines the file extension that is used for files created with toolpath output.

15. Rotary_AXIS

This is used only in post processor which is used to drive a machine using rotary axis.

Possible value: X or Y

Either the X or Y coordinate is mapped to rotary axis.

If this statement is present, Ucancam will display the dialog which show the
Diameter of rotary axis, the default value for diameter is assume that complete the length of toolpath
along the axis being wrapped is the circumference of the cylinder.

16. OMIT_SAME_GCODE
Possible value: 1 or 0
Omit the following same G code in output file.
Default: 0.

Eg: G01 x010.000 Y 20.000 Z0.000
     G01 x010.000 Y 20.000 Z-5.000

If set the statement: OMIT_SAME_GCODE <1>
The output is:
G01 x010.000 Y 20.000 Z0.000
 X010.000 Y 20.000 Z-5.000

17. OMIT_SAME_XYZ
OMIT_SAME_XYZ <1>
Possible value: 1 or 0.
Omit the following same xyz coordinate.
Default: 0.

Eg: G01 x010.000 Y 20.000 Z0.000
     G01 x010.000 Y 20.000 Z-5.000

If set the statement: OMIT_SAME_XYZ <1>
The output is:
G01 x010.000 Y 20.000 Z0.000
G01 Z-5.000

18. RAPID_XY_Z
Possible value: 1 or 0
If set the statement: RAPID_XY_Z <1>, the rapid move of tool from
 PointA(0,0,10) to point pointB (100,50,0) is seperated I n two part, firstly from pointA(0,0,10) to
midpoint(100,50,10), second ly from midpoint(100,50,10) to pointB(100,50,0).

19. XYZ_SEQ
Possible value: XYZ, XZY, YXZ, YZX, ZXY, ZYX.
This statement specifies the sequence of point coordinate is printed out .

20. END_OF_LINE
    This statement specifies the character output at the end of line.

Default: none.

21. XSIZE, YSIZE, ZSIZE
The size of the toolpath in x axis, y axis, z axis.

22. XMIN, YMIN, ZMIN, XMAX, YMAX, ZMAX
The minimum and maximum value of the toolpath

23. X, Y, Z
Current tool point coordinate

24. SPN_SPEED
Spindle rotation speed.

25. FC
Tool federate for cutting

26. FR
Tool federates for rapid moving.

27. SAFE_ZPOS
Safe height.

The following is example of pots processor file:
Eg1：General CNC
//line number
//FORMAT <N|N%d >
/////////////////
FORMAT <X|X%1.3f >
FORMAT <Y|Y%1.3f |1.0>
FORMAT <Z|Z%1.3f |1.0>
FORMAT <S|S%d |1>
FORMAT <F|F%d |1>
///////////////////////////
UNITS <MM>
/////////////////////////////
FILE_EXTENSION <nc>
/////////////////////////////
LINE_NUM_START <1>
LINE_NUM_INCREMENT <1>
/////////////////////////////
PROG_HEAD <G90G17G21>

TOOLCHANGE <M05>

TOOLCHANGE <M06 T[TN]>

PROG_TAIL <M30>

Eg2：HP_PLT3D
 //precision = 0.025,   1/0.025=40
FORMAT <X|%1.0f, |40.0>
FORMAT <Y|%1.0f, |40.0>
FORMAT <Z|%1.0f |40.0>
/////////////////////////////////
UNITS <MM>
//convert arc into lines
ARC_TO_LINES <1>
RAPID_XY_Z <0>
END_OF_LINE   <;>
/////////////////////////////////
FILE_EXTENSION <plt>
/////////////////////////////////
 PROG_HEAD <IN;>
 PROG_HEAD <SP1>

G00_DEF <PU>
G01_DEF <PD>

TOOLCHANGE <SP [TN]>

PROG_TAIL <SP0>