

AZpost

User Guide

to

Vertical Machining Centers

prepared by

NCDATA Services
Manufacturing Solutions
www.NCDataServices.com

NCData@frontiernet.net
928-242-8389

January 17, 2005

**Postprocessor vocabulary and syntax is based on and complies with the
ANSI X3.37-199X Standard (June 30, 1992) for APT programming Language.
Working draft published as X3J7/55-323-06-92**

UPDATE	DATE	AUTHOR	REASON
A0000	12/15/2004	LJones	Initial delivery

Table of Contents

Table of Contents	4
AUXFUN syntax.	6
CIRCLE & CYLNDR syntax.	7
CLEARP syntax.	9
COOLNT syntax.	10
CUTCOM syntax.	11
CUTTER syntax.	12
CYCLE syntax.	13
DISPLY syntax.	15
DELAY syntax.	16
DELAY syntax.	16
END syntax.	17
FEDRAT syntax.	18
FINI syntax.	19
FROM syntax.	20
GODLTA syntax.	21
GOHOME syntax.	22
GOTO syntax.	23
INDIRV syntax.	24
INSERT syntax.	25
INTOL Syntax.	26
LIMITS syntax.	27
LOAD or LOADTL syntax.	28
MACHIN syntax.	29
MODE syntax.	30
NOCYCL syntax.	31
OPSKIP syntax.	32
OPSTOP syntax.	33
ORIGIN syntax.	34
OUTTOL Syntax.	35
PARTNO syntax.	36
PIVOTZ syntax.	37
PPRINT syntax.	38
PPLIST syntax.	39
PREFUN syntax.	40
RAPID syntax.	41
RETRCT syntax.	42
REWIND syntax.	43
ROTATE syntax.	44
SEQNO syntax.	45
SPINDL syntax.	46
STOP syntax.	47
TLAXIS syntax.	48
TPRINT syntax.	49

TPRINT syntax	49
TRANS syntax	50
Example APT source Part Program file	51
MAJOR vocabulary words used (without parameters)	56
MAJOR vocabulary words used (with text)	57
MAJOR vocabulary words used (with parameters)	58
MINOR vocabulary words used	59

AUXFUN syntax.

Output an auxiliary machine function using the M0 register. This code is usually output with an "M" letter and a two digit integer code, but depends on the word address and format specification of the predefined M0 register.

Effect of configuration file on AUXFUN output:

Word address and format of M0 register

AUXFUN effect on configuration file:

None

APT Syntax

AUXFUN / m

APT example

AUXFUN / 5

Example machine code

==> M05

CIRCLE & CYLNDR syntax.

Defines the circular interpolation information for output to the machine code file.

Effect of configuration file on CIRCULAR output:

Word address and format of G1,I,J,K,R registers
Values for CLW & CCLW set with G1 register

CIRCULAR effect on configuration file:

None

APT Syntax

INDIRV/ x-value, y-value, z-value

TLON,GOFWD/ (CIRCLE/ x-center,y-center,z-center,radius),\$
ON, (LINE/ x-center,y-center,z-center, \$
x-endpnt,y-endpnt,z-endpnt)

---- or ----

TLON,GOFWD/ (CIRCLE/ x-center,y-center,z-center,radius),\$
ON, 2,INTOF, (LINE/ x-center,y-center,z-center, \$
x-endpnt,y-endpnt,z-endpnt)

---- or ----

TLON, GOFWD/ (CYLNDR/ x-center, y-center, z-center,\$
i-value, j-value, k-value, radius),\$
ON,2,INTOF, (PLANE/ (POINT/ x-center,y-center,z-center),\$
(POINT/ x-endpnt, y-endpnt, z-endpnt), \$
(POINT/ x-center, y-center, z-center))

---- or ----

TLON, GOFWD/ (CYLNDR/ x-center, y-center, z-center,\$
i-value, j-value, k-value, radius),TANTO,\$
(PLANE / (POINT/ x-endpnt, y-endpnt, z-endpnt),\$
,PERPTO, (VECTOR/ i-value, j-value, k-value))

where: x-center, y-center, z-center = arc center point coordinates

x-endpnt, y-endpnt, z-endpnt = arc end point coordinates

x-value, y-value, z-value = direction vector values

Example:

INDIRV/ .00000, 1.00000, .00000

TLON,GOFWD/ (CIRCLE/ 16.00000, 11.00000, .00000, 4.00000), \$
ON, (LINE/ 16.00000, 11.00000, .00000, \$
16.00000, 15.00000, .00000)

Example machine code

G03 X16. Y15. I-4. J0.

CLEARP syntax.

Used to define a clearance plane parallel to the part origin XY Plane for reference by other postprocessor functions such as RETRACT, LOADTL and CYCLE. This statement also sets the the value of the macro variable "CLEARP" used in the configuration file.

Effect of configuration file on CLEARP output:

None

CLEARP effect on configuration file:

Sets value of CLEARP variable for use in Macro section

Syntax:		NCdata:
-----		-----
CLEARP / d	==>	No output
ON		
OFF		

where:

d = distance from the origin of the XY plane

used by RETRACT and CYCLE

Example:		NCdata
-----		-----
CLEARP / 5.5	==>	No output
CYCLE/ DRILL, DEPTH, 1.5, CLEAR, .06	==>	No output
GOTO/ 4.0, 6.0, 3.0	==>	G00 X4. Y6. Z5.5
	==>	G81 X4. Y6. Z.5 R3.06

COOLNT syntax.

APT syntax used to specify for output the desired coolant feature to the machine code file. If syntax is specified after LOAD and before GOTO syntax the output will be held for output by RESTAR macro.

Effect of configuration file on COOLNT output:

Word address and format of M2 register
Values for minor words set with M2 register

COOLNT effect on configuration file:

Sets value of COOLNT variable for use in Macro section

APT Syntax		Example machine code
-----		-----
COOLNT / ON	==>	M08
FLOOD	==>	M08
MIST	==>	M07
THRU	==>	M20
TAP	==>	M21
AIR	==>	M22
OFF	==>	M09

CUTCOM syntax.

APT syntax used to specify the desired Cutter Radius Compensation function to the machine code file. Syntax should be used before a linear motion (GOTO) is programmed.

Effect of configuration file on CUTCOM output:

Word address and format of G7 register
Values for minor words set with G7 register

CUTCOM effect on configuration file:

None

Syntax:	NCDData:
-----	-----
CUTCOM / RIGHT [,n] ==>	applies to next
LEFT	motion
OFF	

Where n = register number
Register number = tool unless specified

APT Example		Example machine code
-----		-----
LOAD/TOOL,2	==>	M6 T3
CUTCOM / RIGHT	==>	No output
GOTO / 1, 2, 3	==>	G42 X1. Y2. Z3. D3
CUTCOM / OFF	==>	No output
GOTO / 2, 3, 3	==>	G40 X2. Y3.

Note: applies only to the next motion

CUTTER syntax.

APT syntax used to specify the desired cutting tool dimensions.

Effect of configuration file on CUTTER output:

None.

CUTTER effect on configuration file:

None.

APT syntax

CUTTER / dia, radius, e, f, alpha, beta, height

where: dia = diameter of cutting tool at the tool end.
radius = corner radius at the tool end.
e = radius center distance from tool center line.
f = radius center distance from end of tool.
alpha = angle at tool end.
beta = angle along tool side.

APT example:

CUTTER /.5,.0625,.1875,.0625,.0,.0,5.0 ==>

Example machine code

No output

CYCLE syntax.

APT syntax used to specify for output the desired CYCLE type to the machine code file.

Effect of configuration file on CYCLE output:

Word address and format of G9,Z1,RR & QQ register
Values for CYCLE type set with G9 register

CYCLE effect on configuration file:

None

Syntax:

```
CYCLE/ ON                      - Turns last cycle
      OFF                      - Turns cycle mode

CYCLE/ DRILL, CLEAR, c, DEPTH, d, UPM, f
      RAPTO                      UPR

CYCLE/ CSINK, CLEAR, c, DIAMTR, d UPM, f [,TLANGL,a]
      RAPTO                      UPR

CYCLE/ TAP, CLEAR, c, DEPTH, d, LEAD, f
      RAPTO                      TPI

CYCLE/ CBORE, CLEAR, c, DEPTH, d, UPM, f [,DWELL,p]
      RAPTO                      UPR      REV, p

CYCLE/ DEEP, STEP, q, CLEAR, c, DEPTH, d, UPM, f
      DECR      RAPTO                      UPR

CYCLE/ BRKCHP, STEP, q, CLEAR, c, DEPTH, d, UPM, f
      DECR      RAPTO                      UPR

CYCLE/ FBORE, CLEAR, c, DEPTH, d, UPM, f , OFFSET,q
      RAPTO                      UPR      NODRAG

CYCLE/ BORE, CLEAR, c, DEPTH, d, UPM, f [,DWELL,p]
      REAM RAPTO                      UPR      REV, p

CYCLE/ BORE6, CLEAR, c, DEPTH, d, UPM, f , DRAG
      BORE RAPTO                      UPR

CYCLE/ BORE7, CLEAR, c, DEPTH, d, OFFSET,q, UPM,f, MANOP
      PULBOR RAPTO                      NODRAG      UPR

CYCLE/ BORE8, CLEAR, c, DEPTH, d, UPM, f ,DWELL,p , MANOP
      BORE RAPTO                      UPR      REV
```

```

CYCLE/ BORE9, CLEAR, c, DEPTH, d, UPM, f ,DWELL,p
      BORE   RAPTO           UPR      REV

```

```

CYCLE/ MILL, DIAMTR, c, DEPTH, d, PITCH, k, UPM, f
                                UPR
      [NPASS, n, STEP, s]

```

```

CYCLE/ THREAD, DIAMTR, c, DEPTH, d, PITCH, k, UPM, f
                                UPR

```

where: c = Clearance from part surface
 d = Depth from part surface
 f = Feed rate in either IPM,IPR,MMPM,MMPR
 (thread LEAD or Threads Per Inch for TAP)
 p = Dwell at bottom of operation in either
 seconds or REVolutions
 q = Delta step depth for DEEP or BRKCHP drill
 k = Pitch value for helical milling cycle
 s = Radial pass depth of cut

Note: TAP or Counter TAP cycle is selected based on
 programmed spindle direction G84 for (CLW) or
 G74 for (CCLW)

RTRCTO modifier can be added to all cycle types
 to output G98 vs G99 on cycle activation

APT Syntax

```

CYCLE / DRILL, DEPTH, 1.0, CLEAR,.06, IPM, 10,

```

Example machine code

```

GOTO / 5.0, 7.5, 0.0      ==>      G81 G99 X5. y7.5 Z-1. R.06 F10

```

DISPLY syntax.

APT syntax used to specify comments in the output listing file and the machine code file.

Effect of configuration file on DISPLY output:

None.

DISPLY effect on configuration file:

None.

APT Syntax

DISPLY character text

Where: character_text = alpha-numeric character string will be
included in machine code file.

APT Example

Example machine code

DISPLY THIS IS A MESSAGE ==> (THIS IS A MESSAGE)

DELAY syntax.

APT syntax used to specify the desired program dwell to the machine code file.

Effect of configuration file on DELAY output:

Word address and format of PP register

DELAY effect on configuration file:

None

APT Syntax

DELAY / REV, r
s

where: s = Dwell in (SEConds or REVolutions)

APT Example:

DELAY / 2, SEC

==>

Example machine code

G04 P2.0

END syntax.

APT syntax used to specify the end of the program. Mostly used for continuous loop to the program start type of programs.

Effect of configuration file on END output:

Word address and format of M5 register.
Values set with M5 register in configuration file.
Contents of the PRGEND macro.

END effect on configuration file:

None

Syntax

END

APT Example

END

==>

Example machine code

M09
G0 G53 H0 Z0.
X0. Y0.
M2

FEDRAT syntax.

APT syntax used to specify the desired feed rate to the machine code file.
If syntax is specified after LOAD and before GOTO syntax the output will
be held for output by RESTAR macro.

Effect of configuration file on FEDRAT output:

Word address and format of FF register

FEDRAT effect on configuration file:

Sets value of FEED variable for use in Macro section

Syntax:

FEDRAT / (UPM), f
UPR
IPM
IPR
MMPM
MMPR

where: f = feed rate value in the specified units

APT Example:

FEDRAT / 8, IPM
GOTO / 5.0, 6.0, 0.0

==>

==>

Example machine code

G01 X5. Y6. Z0. F8.

FINI syntax.

APT syntax used to specify the end of the program input. This syntax causes the postprocessor to produce reports in specific output files and close all input and output files.

Effect of configuration file on FINI output:

SET/ FOOTER in section one of configuration file.

FINI effect on configuration file:

None

APT Syntax

FINI

FROM syntax.

APT syntax used to specify the initial machine position at program start. The values of X,Y & Z axis specified set the postprocessor HOME positions. This syntax must be specified prior to first LOAD and GOTO syntax. This syntax output the initial machine code block.

Effect of configuration file on FROM output:

Contents of the FROM macro in section three of configuration file.

FROM effect on configuration file:

None.

APT Syntax:

FROM / x, y, z [,i ,j ,k]

APT Example

FROM / 0, 0, 0

Example machine code

==> G90 G20 G80 G40

GODLTA syntax.

APT syntax used to specify an incremental machine position relative to the previous motion. The values of X,Y & Z axis specified are the incremental values. The I J & K values are the vector components of the unit tool axis.

Effect of configuration file on GODLTA output:

None.

FROM effect on configuration file:

None.

APT Syntax:

GODLTA / x, y, z [,i ,j ,k]

APT Example

Example machine code

GOTO / 1.0, 2.0, 3.0, 0.0, 0.0, 1.0

GODLTA / 0.0, 0.0, .50, 0.0, 0.0, 1.0 ==> X1.0 Y2.0, Z3.5

GOHOME syntax.

APT syntax used to specify machine motion to the machine home position.

Effect of configuration file on GOHOME output:

Contents of GOHOME macro in section three of configuration file.

GOHOME effect on configuration file:

Sets value of HOMEX, HOMEY and HOMEZ variables for use in Macro section.

APT Syntax:

GOHOME [/ XAXIS][, YAXIS][,ZAXIS]

Example:

FROM / 0, 0, 0

GOHOME/ ZAXIS

==>

==>

Example machine code

G90 G20 G80 G40

G91 G28 Z0.

GOTO syntax.

APT syntax used to specify the desired linear machine motion. The first GOTO syntax after LOAD/TOOL syntax causes the RESTAR macro activation.

Effect of configuration file on GOTO output:

SET/ CLIPZ, value is used to ignore GOTO if Z-axis is over value.
Word address and format of G1, XX, YY, & ZZ registers.
First GOTO after LOAD/TOOL syntax activates RESTAR macro.

GOTO effect on configuration file:

None.

Syntax:

GOTO / x, y, z [,i ,j ,k]

where: x, y, z = coordinate position
i, j, k = tool axis vector components

if RAPID and x = 0 and y = 0 and z > CLIPZ value then motion is ignored

APT Example:

GOTO / 1, 2, 3

==>

Example machine code

G01 X1. Y2. Z3.

INDIRV syntax.

APT syntax used before a CIRCLE or CYLNDR syntax to indicate the direction of travel on the circle by using unit vector components as a direction vector from the current position.

Effect of configuration file on INDIRV output:

None.

INDIRV effect on configuration file:

None.

APT Syntax:

INDIRV/ X-Component, Y-Component, Z-Component

Example:

INDIRV / 1, 0, 0 direction in plus X-axis

INSERT syntax.

APT syntax used to specify a literal output machine block. This syntax is not checked for correctness or completeness. This syntax is mostly used to output blocks of special characters. Use of '/' immediately following INSERT causes sequence numbers to be added immediately before character text.

Effect of configuration file on INSERT output:

None.

INSERT effect on configuration file:

None.

APT Syntax:

INSERTcharacter text

or

INSERT/character text

APT Example:

INSERTG80G49

===>

Example machine code

G80G49

INSERT/G80G49

===>

N12G80G49

INTOL Syntax.

This APT syntax specifies the tolerance used when creating linear tool path points inside the part drive surface CIRCLE or CYLNDR.

```
APT Syntax
-----
INTOL /  value
```

Where value is the distance from the circle allowed.

LIMITS syntax.

APT syntax used to specify the axis limits for the machining envelope of the part to be machined.

Effect of configuration file on LIMITS output:

None.

LIMITS effect on configuration file:

Limits (XAXIS,YAXIS,ZAXIS,AAXIS & BAXIS) can be specified in the program using the LIMITS syntax overriding limit values in the configuration file and MACHIN syntax.

Syntax:

```
LIMITS/  [XAXIS,min,max] [,YAXIS,min,max] [,ZAXIS,min,max] [,AAXIS,min,max] $
                                                [,BAXIS,min,max]
          OFF
          ON
```

Example:

```
LIMITS/ XAXIS,-20,20, YAXIS,-10,10, ZAXIZ,0,20
```

LOAD or LOADTL syntax.

APT syntax used to specify the desired TOOL change to the machine code file. If syntax is used in conjunction with the CUTTER syntax to completely define the tool.

Effect of configuration file on LOAD output:

- Use of SELECT/TOOL,AUTO in section one
- Use of SET/TOOL,MAX,value in section one
- Use of SET/TOOL,LIST,ON in section one
- Word address and format of TT & M1 register
- Contents of RETRCT, TLCHG, TLCHG1 & RESTAR macros

LOAD effect on configuration file:

Sets value of CURTL, NEXTL & GAGEZ variables for use in Macro section

Syntax:

LOAD/ type, t [, LENGTH, z][, ADJUST, h][, MANUAL]
LOADTL/

where: type = tool type (Tool, MILL or DRILL)
t = tool number
z = set length of tool
h = length compensation register

Example:

LOAD/ TOOL, 1 ==> T01 M06

MACHIN syntax.

APT syntax used to specify the desired postprocessor, configuration file, UNITS, and Axis limits. The MACHIN syntax should be programmed in the beginning of the program.

Effect of configuration file on MACHIN output:

None.

MACHIN effect on configuration file:

Specifies the name of the configuration file (.cfg) for the required machine tool. If configuration file name is not specified or file is not found the postprocessor will prompt the user for the configuration file name.

UNITS and limits (XAXIS, YAXIS & ZAXIS) can be specified in the program using the MACHIN syntax overriding UNITS and LIMITS in the configuration file.

Syntax:

```
-----  
MACHIN/ vmc4x, mchtool [,UNITS,INCHES,OUT,MM]      [,ON ]  
                                     MM              INCHES  OFF  
                                     [,XAXIS,min,max] [,YAXIS,min,max]  
                                     [,ZAXIS,min,max]
```

vmc4x - specifies the postprocessor executable (example)
mchtool - specifies the machine tool configuration (example)

Example:

```
-----  
MACHIN / VMC4X, VF10, UNITS,INCHES, OUT,INCHES, OFF
```

MODE syntax.

APT syntax used to specify the desired machining mode to the machine code file.

Effect of configuration file on MODE output:

None.

MODE effect on configuration file:

None.

Syntax:

```
-----  
MODE/  INCHES  
      MM  
      XYPLAN  
      YZPLAN  
      ZXPLAN
```

APT Example:

```
-----  
MODE / INCH    ===>  
MODE / MM      ===>
```

Example machine code

```
-----  
G20  
G21
```

NOCYCL syntax.

APT syntax used to specify no output of CYCLE on next motion (GOTO syntax)..
..

Effect of configuration file on FEDRAT output:

None.

FEDRAT effect on configuration file:

None.

APT Syntax

NOCYCL

APT Example

NOCYCL

GOTO/ 1.0, 2.0, 0.0

==>

Example machine code

X1. Y2. L0

OPSKIP syntax.

APT syntax used to specify a block delete code to the machine code file.

Effect of configuration file on OPSKIP output:

None.

OPSKIP effect on configuration file:

None.

AP Syntax:

```
-----  
OPSKIP [/ ON ]  
      / OFF
```

APT Example:

```
-----  
OPSKIP      ==>  
GOTO/ 1,2,3  ==>
```

Example machine code

```
-----  
No output  
/N1234 G01 X1. Y2. Z3.
```

OPSTOP syntax.

APT syntax used to specify an optional stop code to the machine code file.

Effect of configuration file on OPSTOP output:

Word address and format of M5 register.
Values specified with M5 register.

OPSTOP effect on configuration file:

None.

APT Syntax:

OPSTOP

APT Example:

OPSTOP

==>

Example machine code

M01

ORIGIN syntax.

APT syntax used to specify the desired coordinate system origin. If syntax is specified after LOAD and before GOTO syntax the output will be held for output by RESTAR macro.

Effect of configuration file on ORIGIN output:

Word address and format of G10 register.
Values defined for G10 register.

ORIGIN effect on configuration file:

Sets value of FIXTUR variable for use in Macro section

Syntax:

ORIGIN / FIXTUR, m
ORIGIN / DATUM, x, y, z
ORIGIN / x, y, z

where: m = work coordinate system select (FIXTUR)

0 = 1st value (G53)
1 = 2nd value (G54)
2 = 3rd value (G55)
3 = 4th value (G56)
4 = 5th value (G57)
5 = 6th value (G58)
6 = 7th value (G59)

ORIGIN/ DATUM x, y & z = values output with 7th value of G10 (G92)

ORIGIN/ x, y & z = values are subtracted from following GOTO x, y, z
(translation)

APT Example

ORIGIN / FIXTUR, 2 ==>
ORIGIN / DATUM, 1, 2, 3 ==>
ORIGIN / 10, 5, 2 ==>
GOTO/ 1, 2, 3 ==>

Example machine code

G55
G92 X1, Y2. Z3.
No output
G00 X-9. Y-3. Z1.

OUTTOL Syntax.

This APT syntax specifies the tolerance used when creating linear tool path points outside the part drive surface CIRCLE or CYLNDR.

```
APT Syntax
-----
OUTTOL / value
```

Where value is the distance from the circle allowed.

Example:

```
OUTTOL/ .010
```

PARTNO syntax.

APT syntax used to specify the desired Program ID and part information to the machine code file. The PARTNO syntax should be programmed in the beginning of the part program.

Effect of configuration file on PARTNO output:

Contents of START macro in configuration file

PARTNO effect on configuration file:

Sets value of PROGID variable for use in Macro section.
Sets value of PARTNO variable for use in Macro section.

APT Syntax

PARTNO numeric_id character_text

Where: numeric_id = numeric value specifying Program ID (PROGID).
character_text = text string specifying the Part
Information (PARTNO).

APT Example

PARTNO 1234 OPERATION A

====>

Example machine code

%
O1234 (OPERATION A)

PIVOTZ syntax.

APT syntax used to specify the distance from part zero to center of rotation of A-axis. The PIVOTZ syntax should be programmed before any tool motion resulting in A-axis rotation. This syntax is not required for 3-axis programs

Effect of configuration file on PIVOTZ output:

PIVOTZ/ n can be used in section one to set default value.

PIVOTZ effect on configuration file:

Sets value of PIVOTZ variable for use in Macro section

Syntax:

PIVOTZ/ n

where: n = distance from part zero to center-line of a-axis

APT Example

PIVOTZ / 6.75

==>

Example machine code

None

PPRINT syntax.

APT syntax used to specify comments in the output listing file and conditionally to the machine code file. If the PPRINT syntax is specified before the first CUTTER syntax and SET/PPRINT,LIST,ON is used in the configuration file the output will be displayed in the machine code file as comments.

Effect of configuration file on PPRINT output:

SET/PPRINT,LIST,ON in section one of the configuration file

PPRINT effect on configuration file:

None.

APT Syntax

PPRINT character text

PPRINT(character text)

Where: character_text = alpha-numeric character string and
(character_text) = character text enclosed in () will also be
included in machine code file.

APT Example

PPRINT(THIS IS A MESSAGE) ==> (THIS IS A MESSAGE)

Example machine code

PPLIST syntax.

APT syntax used to specify the format of the output for the NC listing (.NCL) file.

Effect of configuration file on PPLIST output:

None.

PPLIST effect on configuration file:

None.

APT Syntax

PPLIST/	OFF	-	Turns off output to listing file.
	MIXED	-	MIXED APT and Machine Code in listing.
	FORMAT	-	Classic column formatted listing.

PREFUN syntax.

Output an preparatory machine function using the G0 register. This code is usually output with a "G" letter and a two digit integer code, but depends on the word address and format specification of the predefined G0 register.

Effect of configuration file on PREFUN output:

Word address and format of G0 register

PREFUN effect on configuration file:

None

APT Syntax

PREFUN / g

where: g = G-code

APT example

PREFUN / 98

==>

Example machine code

G98

RAPID syntax.

APT syntax used to specify a rapid motion to the next cutter path point (GOTO syntax). This syntax is not modal and must be specified for each GOTO syntax

Effect of configuration file on RAPID output:

Defines the G1 register code used for RAPID motion G1(0).

RAPID effect on configuration file:

None.

APT Syntax

RAPID

APT example

RAPID

GOTO/ 1.0, 2.0, 3.0

Example machine code

GO X1. Y2. Z3.

RETRCT syntax.

APT syntax used to specify a retract Z-axis motion to the predefined clearance plane.

Effect of configuration file on RETRCT output:

Uses the value of CLEARP for clearance plane.

RETRCT effect on configuration file:

None.

APT Syntax

```
-----  
RETRCT [/ON ]  
        OFF
```

APT example

RETRCT/ON

GOTO/ 1.0, 2.0, 0.0

RETRCT/OFF

GOTO/ 4.0, 5.0, 0.0

CLEARP/ 6.0

RETRCT

Example machine code

==> G98 X1. Y2.

==> G99 X4. Y5.

==> G0 Z6.

REWIND syntax.

APT syntax used at the end of the program (before FINI) to output a program (tape) rewind code (M30 typically).

Effect of configuration file on REWIND output:

Uses the value of M2 register code M2(30).

REWIND effect on configuration file:

None.

APT Syntax

REWIND

APT example

REWIND

Example machine code

M30

ROTATE syntax.

APT syntax used to specify for output the desired coolant feature to the machine code file. If syntax is specified after LOAD and before GOTO syntax the output will be held for output by RESTAR macro.

Effect of configuration file on ROTATE output:

None.

ROTATE effect on configuration file:

None.

APT Syntax

```
-----  
ROTATE / BAXIS, ATANGL, a (,CLW )  
                INCR      CCLW  
where:  a      = angle of rotation  
        ATANGL = Absolute angle  
        INCR   = Incremental angle
```

APT example

RAPID

ROTATE / AAXIS, ATANGL, 30

ROTATE / AAXIS, INCR, -45, 10

Example machine code

==> G00 A30.

==> G01 A-15 F10.

SEQNO syntax.

APT syntax used to specify the sequence numbers (N) assigned to the machine code records (blocks).

Effect of configuration file on SEQNO output:

Uses the value of NN register.

SEQNO effect on configuration file:

None.

APT Syntax

SEQNO/ n, INCR, I	Specifies sequence start and increment values.
ON	Turns sequence numbering off.
OFF	Turns sequence numbering on.

Where:

n = Start number
I = Increment number

APT example

SEQNO/ 10, INCR, 5

Example machine code

N10...
N15...
N20...

SPINDL syntax.

APT syntax used to specify spindle speed for output to the machine code file. If syntax is specified after LOAD and before GOTO syntax the output will be held for output by RESTAR macro.

Effect of configuration file on SPINDL output:

Word address and format of SS & M3 register
Values for minor words set with M3 register

SPINDL effect on configuration file:

Sets value of RPM variable for use in Macro section

APT Syntax

SPINDL / (RPM) ,s (,CLW)
 SFM CCLW
 MAXRPM, s

SPINDL / s (,RPM) (,CLW)
 CCLW

where: s = Spindle speed in RPM or SFM

APT example

SPINDL / RPM, 600, CLW ==>

Example machine code

S600 M03

STOP syntax.

APT syntax used to specify a program machine stop to the machine code file. The first motion after STOP will be output by RESTAR macro.

Effect of configuration file on STOP output:

Word address and format of M5 register.
Values for minor words set with M5 register.
The first motion after STOP will be output by RESTAR macro.

STOP effect on configuration file:

None.

APT syntax

STOP

APT example

STOP

==>

Example machine code

M00

TLAXIS syntax.

APT syntax used to define the desired tool axis for 3-axis machining by specifying a 3D unit vector.

Effect of configuration file on TLAXIS output:

None.

TLAXIS effect on configuration file:

None.

APT syntax

TLAXIS / i, j, k

where: i, j, k = values of 3D unit vector components

APT example

TLAXIS / .00000, .00000, 1.00000

Example machine code

==> No output

TPRINT syntax.

APT syntax used to specify tool comments in the output listing file and to the machine code file. The TPRINT syntax must be used prior to each LOAD /TOOL syntax. The postprocessor will collect all the TPRINTs in the part program and output them as comments at the beginning of the machine code file if SET/TOOL,LIST,ON is specified in section one of the configuration file.

Effect of configuration file on PPRINT output:

SET/TOOL,LIST,ON in section one of the configuration file

PPRINT effect on configuration file:

None.

APT Syntax

TPRINT character text

Where: character_text = alpha-numeric character string and

APT Example

TPRINT 1/2-13 TAP 6.500 LGH ==> (1/2-13 TAP 6.500 LGH)
LOAD/TOOL,4,LENGTH,6.5

Example machine code

TRANS syntax.

APT syntax used to specify a desired translation on the part coordinate system.

Effect of configuration file on TRANS output:

None.

TRANS effect on configuration file:

None.

APT syntax

TRANS / x, y, z

where: x, y, z = values are added to all following motions

APT example:

TRANS / .5, .5, 0

GOTO / 1, 2, 3

Example machine code

==> No output

==> G00 X1.5 Y2.5 Z3.

Example APT source Part Program file.

```
$$ -----
$$      Generated on Wednesday, November 05, 2003 11:31:57 AM
$$      CATIA APT VERSION 1.0
$$ -----
$$ MANUFACTURING OPERATION A
PPRINT MANUFACTURING PROGRAM DESCRIPTION
$$ 12345 PART OPERATION A TEST
$$*CATIA0
$$ MANUFACTURING OPERATION A
$$      1.00000      0.00000      0.00000      0.00000
$$      0.00000      1.00000      0.00000      0.00000
$$      0.00000      0.00000      1.00000      0.00000
MACHIN/XCEL,KIT6M,UNITS,INCHES,OUT,INCHES,OFF
PARTNO 12345 PART OPERATION A TEST GENERIC FANUC VMC4X
$$ OPERATION NAME : DEFINE PART SETUP
$$ Start generation of : DEFINE PART SETUP
PPRINT MAKE FROM 8.5" X 4.5" X .5" ALUMINUM STOCK
PPRINT LOCATE PART ZERO AT:
PPRINT      X = IN FROM LEFT EDGE OF STOCK .5"
PPRINT      Y = IN FROM FRONT EDGE OF STOCK .5"
PPRINT      Z = BOTTOM OF STOCK
CLEARP/1.0
$$ End of generation of : DEFINE PART SETUP
$$ OPERATION NAME : Tool Change.2
$$ Start generation of : Tool Change.2
TLAXIS/ 0.000000, 0.000000, 1.000000
FROM /      0.00000,      0.00000,      6.00000
$$ TOOLCHANGEBEGINNING
CUTTER/ 1.000000, 0.000000, 0.500000, 0.000000, 45.000000,$
      0.000000, 1.500000
TPRINT/T2 - SPOT DRILL 90 DEG
LOAD/TOOL,2,LENGTH,      4.528000
$$ TOOLCHANGEEND
$$ End of generation of : Tool Change.2
$$ OPERATION NAME : SPOT DRILL 4 PLACES
$$ Start generation of : SPOT DRILL 4 PLACES
SPINDL/RPM, 1050.0000,CLW
RAPID
GOTO /      0.50000,      0.50000,      0.60000
CYCLE/DRILL,DEPTH,      0.125000,CLEAR,      0.100000,DWELL,      2.000000,$
IPM,      5.000000,RTRCTO,      0.000000
GOTO /      0.50000,      0.50000,      0.50000
GOTO /      0.50000,      3.50000,      0.50000
GOTO /      7.50000,      3.50000,      0.50000
GOTO /      7.50000,      0.50000,      0.50000
CYCLE/OFF
$$ End of generation of : SPOT DRILL 4 PLACES
$$ OPERATION NAME : Tool Change.7
$$ Start generation of : Tool Change.7
$$ TOOLCHANGEBEGINNING
CUTTER/ 0.500000, 0.005000, 0.245000, 0.005000, 0.000000,$
```

```

0.000000, 2.000000
TPRINT/T3 - END MILL .50 DIA
LOAD/TOOL,3,LENGTH, 4.000000
COOLNT/ON
$$ TOOLCHANGEEND
$$ End of generation of : Tool Change.7
$$ OPERATION NAME : DRILL 4 HOLES
$$ Start generation of : DRILL 4 HOLES
SPINDL/RPM, 1200.0000,CLW
RAPID
GOTO / 7.50000, 3.50000, 0.70000
CYCLE/DRILL,DEPTH, 0.500000,CLEAR, 0.200000,IPM, 12.000000,$
RTRCTO, 0.000000
GOTO / 7.50000, 3.50000, 0.50000
GOTO / 7.50000, 0.50000, 0.50000
GOTO / 0.50000, 3.50000, 0.50000
CYCLE/OFF
$$ End of generation of : DRILL 4 HOLES
$$ OPERATION NAME : Tool Change.3
$$ Start generation of : Tool Change.3
$$ TOOLCHANGEBEGINNING
CUTTER/ 0.375000, 0.000000, 0.187500, 0.108253, 30.000000,$
0.000000, 2.000000
TPRINT/T4 - TWIST DRILL .375 DIA
LOAD/TOOL,4,LENGTH, 4.000000
COOLNT/ON
$$ TOOLCHANGEEND
$$ End of generation of : Tool Change.3
$$ OPERATION NAME : DEEP DRILL 4 HOLES
$$ Start generation of : DEEP DRILL 4 HOLES
SPINDL/RPM, 1250.0000,CLW
RAPID
GOTO / 0.50000, 0.50000, 0.60000
CYCLE/DEEP,DEPTH, 0.500000,CLEAR, 0.100000,STEP, 0.250000,IPM,$
12.000000,RTRCTO, 0.000000
GOTO / 0.50000, 0.50000, 0.50000
GOTO / 0.50000, 3.50000, 0.50000
GOTO / 7.50000, 3.50000, 0.50000
GOTO / 7.50000, 0.50000, 0.50000
CYCLE/OFF
$$ End of generation of : DEEP DRILL 4 HOLES
$$ OPERATION NAME : Tool Change.5
$$ Start generation of : Tool Change.5
$$ TOOLCHANGEBEGINNING
CUTTER/ 0.500000, 0.000000, 0.250000, 0.000000, 0.000000,$
0.000000, 0.625000
TPRINT/T6 - COUNTER BORE DIA .50
LOAD/TOOL,6,LENGTH, 4.000000
COOLNT/ON
$$ TOOLCHANGEEND
$$ End of generation of : Tool Change.5
$$ OPERATION NAME : COUNTER BORE 4 HOLES
$$ Start generation of : COUNTER BORE 4 HOLES
SPINDL/RPM, 950.0000,CLW
RAPID
GOTO / 0.50000, 0.50000, 0.78750
CYCLE/CBORE,DEPTH, 0.100000,CLEAR, 0.100000,DWELL, 2.000000,$

```

```

IPM, 12.000000,RTRCTO, 0.000000
GOTO / 0.50000, 0.50000, 0.50000
GOTO / 0.50000, 3.50000, 0.50000
GOTO / 7.50000, 3.50000, 0.50000
GOTO / 7.50000, 0.50000, 0.50000
CYCLE/OFF
$$ End of generation of : COUNTER BORE 4 HOLES
$$ OPERATION NAME : Tool Change.4
$$ Start generation of : Tool Change.4
$$ TOOLCHANGEBEGINNING
CUTTER/ 0.50000, 0.005000, 0.245000, 0.005000, 0.000000,$
0.000000, 2.000000
TPRINT/T3 - END MILL .50 DIA
LOAD/TOOL,3,LENGTH, 4.000000
COOLNT/ON
$$ TOOLCHANGEEND
$$ End of generation of : Tool Change.4
$$ OPERATION NAME : PROFILE CONTOUR OUTSIDE
$$ Start generation of : PROFILE CONTOUR OUTSIDE
FEDRAT/IPM, 30.0000
SPINDL/RPM, 1050.0000,CLW
GOTO / 1.00000, -1.00000, 0.50000
GOTO / 1.00000, -1.00000, 0.00000
CUTCOM/LEFT
GOTO / 1.00000, -0.75000, 0.00000
INTOL / 0.00394
OUTTOL/ 0.00000
AUTOPS
INDIRV/ 0.00000, 1.00000, 0.00000
TLON,GOFWD/ (CIRCLE/ 0.50000, -0.75000, 0.00000,$
0.50000),ON,(LINE/ 0.50000, -0.75000, 0.00000,$
0.50000, -0.25000, 0.00000)

FEDRAT/IPM, 5.0000
INDIRV/ -1.00000, 0.00000, 0.00000
TLON,GOFWD/ (CIRCLE/ 0.50000, 0.50000, 0.00000,$
0.75000),ON,(LINE/ 0.50000, 0.50000, 0.00000,$
-0.25000, 0.50000, 0.00000)

GOTO / -0.25000, 3.50000, 0.00000
INDIRV/ 0.00000, 1.00000, 0.00000
TLON,GOFWD/ (CIRCLE/ 0.50000, 3.50000, 0.00000,$
0.75000),ON,(LINE/ 0.50000, 3.50000, 0.00000,$
0.50000, 4.25000, 0.00000)

GOTO / 7.50000, 4.25000, 0.00000
INDIRV/ 1.00000, 0.00000, 0.00000
TLON,GOFWD/ (CIRCLE/ 7.50000, 3.50000, 0.00000,$
0.75000),ON,(LINE/ 7.50000, 3.50000, 0.00000,$
8.25000, 3.50000, 0.00000)

GOTO / 8.25000, 0.50000, 0.00000
INDIRV/ 0.00000, -1.00000, 0.00000
TLON,GOFWD/ (CIRCLE/ 7.50000, 0.50000, 0.00000,$
0.75000),ON,(LINE/ 7.50000, 0.50000, 0.00000,$
7.50000, -0.25000, 0.00000)

GOTO / 0.50000, -0.25000, 0.00000
FEDRAT/IPM, 50.0000
INDIRV/ -1.00000, 0.00000, 0.00000
TLON,GOFWD/ (CIRCLE/ 0.50000, -0.75000, 0.00000,$
0.50000),ON,(LINE/ 0.50000, -0.75000, 0.00000,$

```

```

                                0.00000,      -0.75000,      0.00000)
CUTCOM/OFF
GOTO /      0.00000,      -1.00000,      0.00000
GOTO /      0.00000,      -1.00000,      0.50000
$$ End of generation of : PROFILE CONTOUR OUTSIDE
$$ OPERATION NAME : PROFILE CONTOUR INSIDE
$$ Start generation of : PROFILE CONTOUR INSIDE
FEDRAT/IPM,      30.0000
SPINDL/RPM, 1050.0000,CLW
GOTO /      4.99103,      1.03349,      0.75000
GOTO /      4.99103,      1.03349,      0.25000
CUTCOM/LEFT
GOTO /      5.20753,      1.15849,      0.25000
AUTOPS
INDIRV/      0.86603,      0.50000,      0.00000
TLON,GOFWD/      (CIRCLE/      5.08253,      1.37500,      0.25000,$
      0.25000),ON,(LINE/      5.08253,      1.37500,      0.25000,$
                                5.29904,      1.50000,      0.25000)

FEDRAT/IPM,      5.0000
GOTO /      4.43301,      3.00000,      0.25000
INDIRV/     -0.50000,      0.86603,      0.00000
TLON,GOFWD/      (CIRCLE/      4.00000,      2.75000,      0.25000,$
      0.50000),ON,(LINE/      4.00000,      2.75000,      0.25000,$
                                3.56699,      3.00000,      0.25000)

GOTO /      2.70096,      1.50000,      0.25000
INDIRV/     -0.50000,     -0.86603,      0.00000
TLON,GOFWD/      (CIRCLE/      3.13397,      1.25000,      0.25000,$
      0.50000),ON,(LINE/      3.13397,      1.25000,      0.25000,$
                                3.13397,      0.75000,      0.25000)

GOTO /      4.86603,      0.75000,      0.25000
INDIRV/      1.00000,      0.00000,      0.00000
TLON,GOFWD/      (CIRCLE/      4.86603,      1.25000,      0.25000,$
      0.50000),ON,(LINE/      4.86603,      1.25000,      0.25000,$
                                5.29904,      1.50000,      0.25000)

FEDRAT/IPM,      50.0000
INDIRV/     -0.50000,      0.86603,      0.00000
TLON,GOFWD/      (CIRCLE/      5.08253,      1.37500,      0.25000,$
      0.25000),ON,(LINE/      5.08253,      1.37500,      0.25000,$
                                4.95753,      1.59151,      0.25000)

CUTCOM/OFF
GOTO /      4.74103,      1.46651,      0.25000
GOTO /      4.74103,      1.46651,      0.75000
$$ End of generation of : PROFILE CONTOUR INSIDE
$$ OPERATION NAME : HELICAL MILL CENTER HOLE
$$ Start generation of : HELICAL MILL CENTER HOLE
SPINDL/RPM, 1200.0000,CLW
RAPID
GOTO /      4.00000,      1.75000,      0.35000
CYCLE/MILL,1,DIAMTR,      2.000000,PITCH,      0.125000,DEPTH,      0.350000,$
NPASS,2,STEP,      0.200000,IPM,      12.000000
GOTO /      4.00000,      1.75000,      0.25000
CYCLE/OFF
$$ End of generation of : HELICAL MILL CENTER HOLE
$$ OPERATION NAME : Tool Change.6
$$ Start generation of : Tool Change.6
$$ TOOLCHANGEBEGINNING
CUTTER/      0.921260,      0.000000,      0.460630,      0.000000,      0.000000,$

```

```

      0.000000,  1.969000
TPRINT/T11 - THREAD MILL 1.0 DIA
LOAD/TOOL,11,LENGTH,    3.937000
COOLNT/ON
$$ TOOLCHANGEEND
$$ End of generation of : Tool Change.6
$$ OPERATION NAME : THREAD MILL CENTER HOLE
$$ Start generation of : THREAD MILL CENTER HOLE
SPINDL/RPM, 1200.0000,CLW
RAPID
GOTO /    4.00000,    1.75000,    0.45000
CYCLE/THREAD,2,DIAMTR,    2.000000,PITCH,    0.083300,DEPTH,$
      0.450000,IPM,    12.000000
GOTO /    4.00000,    1.75000,    0.25000
CYCLE/OFF
$$ End of generation of : THREAD MILL CENTER HOLE
SPINDL/OFF
END
FINI

```

MAJOR vocabulary words used (without parameters)

WORD	ICODE
-----	-----
END	1201
OPSTOP	1203
RAPID	1205
REWIND	1006
STOP	1202
NOCYCL	1206

MAJOR vocabulary words used (with text)

WORD	ICODE
-----	-----
DISPLY	1021
INSERT	1046
PARTNO	1045
PPRINT	1044

MAJOR vocabulary words used (with parameters)

WORD	ICODE
-----	-----
AUXFUN	1022
CLAMP	1074
CLEARP	1004
COOLNT	1030
CUTCOM	1007
CYCLE	1054
DEBUG	1094
DELAY	1010
FEDRAT	1009
GOHOME	1217
LOAD	1075
LINTOL	1067
MACHIN	1015
MODE	1003
OPSKIP	1012
ORIGIN	1027
PREFUN	1048
PIVOTZ	1017
RETRCT	1207
ROTATE	1066
SEQNO	1019
SPINDL	1031
TRANS	1037

MINOR vocabulary words used

WORD	ICODE
-----	-----
AAXIS	0140
ABSOL	0296
ADJUST	0159
ATANGL	0001
BORE	0082
BORE6	0210
BORE7	0211
BORE8	0212
BORE9	0213
BRKCHP	0288
CBORE	0245
CCLW	0059
CLEAR	0204
CLW	0060
CSINK	0256
DATUM	0284
DEEP	0153
DEPTH	0229
DIAMTR	0205
DRILL	0163
DWELL	0279
FBORE	0402
FIXTUR	0209
FLOOD	0089
MIST	0090
LEFT	0008
MODE	1003
REV	0097
RIGHT	0024
RPM	0078
SFM	0115
STEP	0092
TLANGL	0294
TIP	0282
TPI	0143
INCHES	0303
INCR	0066
IPM	0073
IPR	0074
LEAD	0326
LENGTH	0009
MAXRPM	0079
MM	0301
ON	0071
OFF	0072
RTRCTO	0295
SEC4	0199
TAP	0168
TOOL	0170

XAXIS	0084
XYPLAN	0033
YAXIS	0085
YZPLAN	0037
ZAXIS	0086
ZXPLAN	0041