NCI Reference

This volume lists all of the Gcodes that are output in the NCI file. It is divided into two main sections:

Changes for X9

Mastercam X9 includes the following NCI changes:

- Added Mill-Turn **tool_op$** codes for 230–236.
- Added new parameter to 1016 line for **nesting_op_id$**.
- New parameters 22–27 have been added to the 20004 line. In addition, two new tool types have been defined, for thread mills and barrel mills.
- New parameter 9 has been added to 20006 line.

Corrections

For NCI 100, the references to **drill_depth_x$**, **drill_depth_y$** and **drill_depthz$** have been corrected to **drl_depth_x$**, **drl_depth_y$** and **drl_depthz$**.

The documentation for the 20004–20007 lines has been generally revised and updated.

In addition, we have substantially improved the documentation in this volume for some of the lathe tool information lines: 20101, 20104, 20105 and 20111.

Note that for X9, the old *NCI & Parameter Reference* volume has been broken out into three separate books:

- *NCI Reference* (this book)
- *Operation Parameter Reference*
- *Working with Parameters* application guide.

The *Working with Parameters* application guide collects the "how-to" information on working with operation parameters and NCI data. It presents this content in an easier-to-use format that is better suited for learning or training purposes. The other two volumes only contain tables of reference information and should be easier to use by being smaller and more focused.

NCI Gcodes

This section lists all of the NCI Gcodes used by Mastercam.

- Each entry is preceded by a lettered code indicating which product(s) the entry applies to.
- The table following each entry lists the predefined post variables used to store each parameter.

Control Flags Parameters are detailed in a separate section on page 91.

M R 0 : Linear Move at rapid rate

Definition: `0`
`1 2 3 4 5 6`

1	Cutter compensation	**cc$**	0	Cutter compensation modal (no change)
			40	Cancel cutter compensation in the control
			41	Cutter compensation in the control = left
			42	Cutter compensation in the control = right
			140	Cancel cutter compensation last move in the contour
2	X position	**xnci$, x$**		
3	Y position	**ynci$, y$**		
4	Z position	**znci$, z$**		
5	Feed rate	**fr$**	Positive	Feed rate in units per minute
			-1	Unchanged
			-2	Rapid
6	Control flags	**cur_cflg$**		See **Control Flags Parameters** on page 91.

L 0 : Linear Move at rapid rate

Definition: `0`
`1 2 3 4 5 6`

1	Cutter compensation	**cc$**	0	Cutter compensation modal (no change)
			40	Cancel cutter compensation in the control
			41	Cutter compensation in the control = left
			42	Cutter compensation in the control = right
			140	Cancel cutter compensation last move in the contour
2	X position	**xnci$, x$**		
3	Y position	**ynci$, y$**		
4	Z position	**znci$, z$**		
5	Feed rate	**fr$**	Positive	Feed rate in units per minute
			Negative	Feed rate in units per revolution
6	Control flags	**cur_cflg$**		See **Control Flags Parameters** on page 91.

W 0 : Linear move at rapid rate

Definition: **0**
1 2 3 4 5 6 7 8 9

1	Wire compensation	**cc$**	0	Wire compensation modal (no change)
			40	Cancel wire compensation in the control
			41	Wire compensation in the control = left
			42	Wire compensation in the control = right
			140	Cancel wire compensation last move in the contour
2	X position	**xnci$, x$**		
3	Y position	**ynci$, y$**		
4	Z position	**znci$, z$**		
5	Feed rate	**fr$**	Positive	Feed rate in units per minute
			-1	Unchanged
6	Wire taper	**wt$**		
7	Corner type	**wc$**	0	Conical
			1	Sharp
			2	Constant
			3	Other
			4	Fixed
			5	Fishtail
8	Control flags	**cur_cflg$**		See **Control Flags Parameters** on page 91.
9	Corner type radius	**wc_rad$**		

M R 1 : Linear Move at feed rate

Definition: `1`
`1 2 3 4 5 6`

1	Cutter compensation	**cc$**	0	Cutter compensation modal (no change)
			40	Cancel cutter compensation in the control
			41	Cutter compensation in the control = left
			42	Cutter compensation in the control = right
			140	Cancel cutter compensation last move in the contour
2	X position	**xnci$, x$**		
3	Y position	**ynci$, y$**		
4	Z position	**znci$, z$**		
5	Feed rate	**fr$**	Positive	Feed rate in units per minute
			-1	Unchanged
			-2	Rapid
6	Control flags	**cur_cflg$**		See **Control Flags Parameters** on page 91.

L 1 : Linear Move at feed rate

Definition: `1`
`1 2 3 4 5 6`

1	Cutter compensation	**cc$**	0	Cutter compensation modal (no change)
			40	Cancel cutter compensation in the control
			41	Cutter compensation in the control = left
			42	Cutter compensation in the control = right
			140	Cancel cutter compensation last move in the contour
2	X position	**xnci$, x$**		
3	Y position	**ynci$, y$**		
4	Z position	**znci$, z$**		
5	Feed rate	**fr$**	Positive	Feed rate in units per minute
			Negative	Feed rate in units per revolution
6	Control flags	**cur_cflg$**		See **Control Flags Parameters** on page 91.

W 1 : Linear move at feed rate

Definition: `1`
`1 2 3 4 5 6 7 8 9`

1	Wire compensation	**cc$**	0	Wire compensation modal (no change)
			40	Cancel wire compensation in the control
			41	Wire compensation in the control = left
			42	Wire compensation in the control = right
			140	Cancel wire compensation last move in the contour
2	X position	**xnci$, x$**		
3	Y position	**ynci$, y$**		
4	Z position	**znci$, z$**		
5	Feed rate	**fr$**	Positive	Feed rate in units per minute
			-1	Unchanged
6	Wire taper	**wt$**		
7	Corner type	**wc$**	0	Conical
			1	Sharp
			2	Constant
			3	Other
			4	Fixed
			5	Fishtail
8	Control flags	**cur_cflg$**		See **Control Flags Parameters** on page 91.
9	Corner type radius	**wc_rad$**		

M L R 2 : Arc Move CW

Definition: `2`
`1 2 3 4 5 6 7 8 9 10`

1	Plane position	**plane$**	0	XY plane
			1	YZ plane
			2	XZ plane
2	Cutter compensation	**cc$**	0	Cutter compensation modal (no change)
			40	Cancel cutter compensation in the control
			41	Cutter compensation in the control = left
			42	Cutter compensation in the control = right
			140	Cancel cutter compensation last move in the contour
3	X position	**xnci$, x$**		
4	Y position	**ynci$, y$**		
5	Absolute X axis arc center	**xc$**		(relative to plane)
6	Absolute Y axis arc center	**yc$**		(relative to plane)
7	Z position	**znci$, z$**		
8	Feed rate	**fr$**	Positive	Feed rate per minute
			Negative	Feed rate per revolution
			-1	Unchanged
			-2	Rapid
9	Control flags	**cur_cflg$**		See **Control Flags Parameters** on page 91.
10	Full arc flag	**full_arc_flg$**	0	NOT a full arc move
			1	Full arc move (360-degree sweep)

W 2 : Arc move clockwise

Definition: **2**
1 2 3 4 5 6 7 8 9 10 11 12 13 14 15

1	Plane	**plane$**		This is set, but is never actually used since the plane in Wire is always TOP.
2	Wire compensation	**cc$**	0	Wire compensation modal (no change)
			40	Cancel wire compensation in the control
			41	Wire compensation in the control = left
			42	Wire compensation in the control = right
			140	Cancel wire compensation last move in the contour
3	X position	**xnci$, x$**		
4	Y position	**ynci$, y$**		
5	Absolute X-axis arc center	**xc$**		(relative to plane)
6	Absolute Y-axis arc center	**yc$**		(relative to plane)
7	Z position	**znci$, z$**		
8	Feed rate	**fr$**	Positive	Feed rate per minute
			-1	Unchanged
9	Wire taper	**wt$**		
10	Corner type	**wc$**	0	Conical
			1	Sharp
			2	Constant
			3	Other
			4	Fixed
			5	Fishtail
11	Control flags	**cur_cflg$**		See **Control Flags Parameters** on page 91.
12	Corner radius	**wc_rad$**		
13	Arc type	**warc_ctyp$**	0	Conical
			1	Sharp
			2	Constant
			3	Other
			4	Fixed
			5	Fish Tail
14	Arc radius	**warc_rad$**		
15	Full arc flag	**full_arc_flg$**	0	NOT a full arc move
			1	Full arc move (360-degree sweep)

M L R 3 : Arc Move CCW

Definition: `3`
`1 2 3 4 5 6 7 8 9 10`

1	Plane position	**plane$**	0	XY plane
			1	YZ plane
			2	XZ plane
2	Cutter compensation	**cc$**	0	Cutter compensation modal (no change)
			40	Cancel cutter compensation in the control
			41	Cutter compensation in the control = left
			42	Cutter compensation in the control = right
			140	Cancel cutter compensation last move in the contour
3	X position	**xnci$, x$**		
4	Y position	**ynci$, y$**		
5	Absolute X axis arc center	**xc$**		(relative to plane)
6	Absolute Y axis arc center	**yc$**		(relative to plane)
7	Z position	**znci$, z$**		
8	Feed rate	**fr$**	Positive	Feed rate per minute
			Negative	Feed rate per revolution
			-1	Unchanged
			-2	Rapid
9	Control flags	**cur_cflg$**		See **Control Flags Parameters** on page 91.
10	Full arc flag	**full_arc_flg$**	0	NOT a full arc move
			1	Full arc move (360-degree sweep)

W 3 : Arc move counterclockwise

Definition: `3`
`1 2 3 4 5 6 7 8 9 10 11 12 13 14 15`

1	Plane	**plane$**	0	This is set, but is never actually used since the plane in Wire is always TOP.
2	Wire compensation	**cc$**	0	Wire compensation modal (no change)
			40	Cancel wire compensation in the control
			41	Wire compensation in the control = left
			42	Wire compensation in the control = right
			140	Cancel wire compensation last move in the contour
3	X position	**xnci$, x$**		
4	Y position	**ynci$, y$**		
5	Absolute X-axis arc center	**xc$**		(relative to plane)
6	Absolute Y-axis arc center	**yc$**		(relative to plane)
7	Z position	**znci$, z$**		
8	Feed rate	**fr$**	Positive	Feed rate per minute
			-1	Unchanged
9	Wire taper	**wt$**		
10	Corner type	**wc$**	0	Conical
			1	Sharp
			2	Constant
			3	Other
			4	Fixed
			5	Fishtail
11	Control flags	**cur_cflg$**		See **Control Flags Parameters** on page 91.
12	Corner radius	**wc_rad$**		
13	Arc type	**warc_ctyp$**	0	Conical
			1	Sharp
			2	Constant
			3	Other
			4	Fixed
			5	Fish Tail
14	Arc radius	**warc_rad$**		
15	Full arc flag	**full_arc_flg$**	0	NOT a full arc move
			1	Full arc move (360-degree sweep)

M R 4 : Dwell and Spindle Change

Definition:
```
4
1 2 3
```

1	Dwell	**dwell$**	Dwell time
2	Spindle speed	**ss$**	Spindle speed in RPM
3	(not used)		

L 4 : Dwell and Spindle Change

Definition: **4**
1 2 3

1	Dwell	**dwell$**		Dwell time
2	Spindle speed	**ss$**	Positive	Spindle speed in RPM
			0	Spindle stop
			Negative	Spindle speed in surface units per minute
3	Spindle direction	**spdir$**	–1	Reverse
			0	Off
			1	Forward

W 4 : Dwell

Definition:
```
4
1 2 3
```

1	Dwell	**dwell$**	Dwell time
2	(Not used)		
3	(Not used)		

M R 11 : 5-Axis Move

Definition: **11**
1 2 3 4 5 6 7 8 9 10 11 12

1	X position	**xnci$, x$**		
2	Y position	**ynci$, y$**		
3	Z position	**znci$, z$**		
4	U position	**u$**		
5	V position	**v$**		
6	W position	**w$**		
7	Feed rate	**fr$**	Positive	Feed rate
			-1	Unchanged
			-2	Rapid
8 *	Tool parameters		*nn*	left digit = **cutpos$**, right digit = **cuttyp$**
		cutpos$	10	Start
			20	Middle
			30	End
			40	Entry to cut
			50	Exit from cut
			60	Safety zone
		cuttyp$	1	Zigzag
			2	One way
			3	Circular
			4	Swarf
9	Control flags	**cur_cflg$**		See **Control Flags Parameters** on page 91.
10	Surface normal vector	**p_svec$**		
11	Surface normal vector	**q_svec$**		
12	Surface normal vector	**r_svec$**		

* These are only maintained for compatibility with older posts. Use the control flags parameter instead!

W 11 : 4-Axis Taper Move

Definition: **11**
1 2 3 4 5 6 7 8 9

1	Wire compensation	**cc$**	0	Wire compensation modal (no change)
			40	Cancel wire compensation in the control
			41	Wire compensation in the control = left
			42	Wire compensation in the control = right
			140	Cancel wire compensation last move in the contour
2	X position	**xnci$, x$**		lower point
3	Y position	**ynci$,y$**		lower point
4	Z position	**znci$,z$**		lower point
5	U position	**u$**		upper point
6	V position	**v$**		upper point
7	W position	**w$**		upper point
8	Feed rate	**fr$**		Feed rate
9	Control flags	**cur_cflg$**		See **Control Flags Parameters** on page 91.

W 20 : Direct 4-axis lower guide – linear move at rapid

Definition: `20`
`1 2 3 4 5 6 7 8 9`

1	Wire compensation	**cc$**	0	Wire compensation modal (no change)
			40	Cancel wire compensation in the control
			41	Wire compensation in the control = left
			42	Wire compensation in the control = right
			140	Cancel wire compensation last move in the contour
2	X position	**xnci$, x$**		
3	Y position	**ynci$, y$**		
4	Z position	**znci$, z$**		
5	Feed rate	**fr$**	Positive	Feed rate in units per minute
			-1	Unchanged
6	Wire taper	**wt$**		
7	Corner type	**wc$**	0	Conical
			1	Sharp
			2	Constant
			3	Other
			4	Fixed
			5	Fishtail
8	Control flags	**cur_cflg$**		See **Control Flags Parameters** on page 91.
9	Corner type radius	**wc_rad$**		

W 21 : Direct 4-axis lower guide – linear move at feed rate

Definition: **21**
1 2 3 4 5 6 7 8 9

1	Wire compensation	**cc$**	0	Wire compensation modal (no change)
			40	Cancel wire compensation in the control
			41	Wire compensation in the control = left
			42	Wire compensation in the control = right
			140	Cancel wire compensation last move in the contour
2	X position	**xnci$, x$**		
3	Y position	**ynci$, y$**		
4	Z position	**znci$, z$**		
5	Feed rate	**fr$**	Positive	Feed rate in units per minute
			-1	Unchanged
6	Wire taper	**wt$**		
7	Corner type	**wc$**	0	Conical
			1	Sharp
			2	Constant
			3	Other
			4	Fixed
			5	Fishtail
8	Control flags	**cur_cflg$**		See **Control Flags Parameters** on page 91.
9	Corner type radius	**wc_rad$**		

W 22 : Direct 4-axis lower guide – arc move clockwise

Definition: **22**
1 2 3 4 5 6 7 8 9 10 11 12 13 14 15

1	Plane	**plane$**	0	This is set, but is never actually used since the plane in Wire is always TOP.
2	Wire compensation	**cc$**	0	Wire compensation modal (no change)
			40	Cancel wire compensation in the control
			41	Wire compensation in the control = left
			42	Wire compensation in the control = right
			140	Cancel wire compensation last move in the contour
3	X position	**xnci$, x$**		
4	Y position	**ynci$, y$**		
5	Absolute X-axis arc center	**xc$**		(relative to plane)
6	Absolute Y-axis arc center	**yc$**		(relative to plane)
7	Z position	**znci$, z$**		
8	Feed rate	**fr$**	Positive	Feed rate per minute
			-1	Unchanged
9	Wire taper	**wt$**		
10	Corner type	**wc$**	0	Conical
			1	Sharp
			2	Constant
			3	Other
			4	Fixed
			5	Fishtail
11	Control flags	**cur_cflg$**		See **Control Flags Parameters** on page 91.
12	Corner radius	**wc_rad$**		
13	Arc type	**warc_ctyp$**	0	Conical
			1	Sharp
			2	Constant
			3	Other
			4	Fixed
			5	Fish Tail
14	Arc radius	**warc_rad$**		
15	Full arc flag	**full_arc_flg$**	0	NOT a full arc move
			1	Full arc move (360-degree sweep)

W 23 : Direct 4-axis lower guide – arc move counterclockwise

Definition: `23`
`1 2 3 4 5 6 7 8 9 10 11 12 13 14 15`

1	Plane	**plane$**	0	This is set, but is never actually used since the plane in Wire is always TOP.
2	Wire compensation	**cc$**	0	Wire compensation modal (no change)
			40	Cancel wire compensation in the control
			41	Wire compensation in the control = left
			42	Wire compensation in the control = right
			140	Cancel wire compensation last move in the contour
3	X position	**xnci$, x$**		
4	Y position	**ynci$, y$**		
5	Absolute X-axis arc center	**xc$**		(relative to plane)
6	Absolute Y-axis arc center	**yc$**		(relative to plane)
7	Z position	**znci$, z$**		
8	Feed rate	**fr$**	Positive	Feed rate per minute
			-1	Unchanged
9	Wire taper	**wt$**		
10	Corner type	**wc$**	0	Conical
			1	Sharp
			2	Constant
			3	Other
			4	Fixed
			5	Fishtail
11	Control flags	**cur_cflg$**		See **Control Flags Parameters** on page 91.
12	Corner radius	**wc_rad$**		
13	Arc type	**warc_ctyp$**	0	Conical
			1	Sharp
			2	Constant
			3	Other
			4	Fixed
			5	Fish Tail
14	Arc radius	**warc_rad$**		
15	Full arc flag	**full_arc_flg$**	0	NOT a full arc move
			1	Full arc move (360-degree sweep)

W 30 : Direct 4-axis upper guide – linear move at rapid

Definition: `30`
`1 2 3 4 5 6 7 8 9`

1	Wire compensation	**cc$**	0	Wire compensation modal (no change)
			40	Cancel wire compensation in the control
			41	Wire compensation in the control = left
			42	Wire compensation in the control = right
			140	Cancel wire compensation last move in the contour
2	X position	**wx$**		
3	Y position	**wy$**		
4	Z position	**wz$**		
5	Feed rate	**wfr$**	Positive	Feed rate in units per minute
			-1	Unchanged
6	Wire taper	**wtpr$**		
7	Corner type	**wcor$**	0	Conical
			1	Sharp
			2	Constant
			3	Other
			4	Fixed
			5	Fishtail
8	Control flags	**cur_cflg$**		See **Control Flags Parameters** on page 91.
9	Corner type radius	**wcor_rad$**		

W 31 : Direct 4-axis upper guide – linear move at feed rate

Definition: `31`
`1 2 3 4 5 6 7 8 9`

1	Wire compensation	**cc$**	0	Wire compensation modal (no change)
			40	Cancel wire compensation in the control
			41	Wire compensation in the control = left
			42	Wire compensation in the control = right
			140	Cancel wire compensation last move in the contour
2	X position	**wx$**		
3	Y position	**wy$**		
4	Z position	**wz$**		
5	Feed rate	**wfr$**	Positive	Feed rate in units per minute
			-1	Unchanged
6	Wire taper	**wtpr$**		
7	Corner type	**wcor$**	0	Conical
			1	Sharp
			2	Constant
			3	Other
			4	Fixed
			5	Fishtail
8	Control flags	**cur_cflg$**		See **Control Flags Parameters** on page 91.
9	Corner type radius	**wcor_rad$**		

W 32 : Direct 4-axis upper guide – arc move clockwise

Definition: `32`
`1 2 3 4 5 6 7 8 9 10 11 12 13 14 15`

1	(Not used)			
2	Wire compensation	**wcc$**	0	Wire compensation modal (no change)
			40	Cancel wire compensation in the control
			41	Wire compensation in the control = left
			42	Wire compensation in the control = right
			140	Cancel wire compensation last move in the contour
3	X position	**wx$**		
4	Y position	**wy$**		
5	Absolute X-axis arc center	**wxc$**		(relative to plane)
6	Absolute Y-axis arc center	**wyc$**		(relative to plane)
7	Z position	**wz$**		
8	Feed rate	**wfr$**	Positive	Feed rate per minute
			-1	Unchanged
9	Wire taper	**wtpr$**		
10	Corner type	**wcor$**		Conical
				Sharp
				Constant
				Other
				Fixed
				Fishtail
11	Control flags	**cur_cflg$**		See **Control Flags Parameters** on page 91.
12	Corner radius	**wcor_rad$**		
13	Arc type	**warc_cortyp$**		Conical
				Sharp
				Constant
				Other
				Fixed
				Fish tail
14	Arc radius			
15	Full arc flag			NOT a full arc move
				Full arc move (360-degree sweep)

W 33 : Direct 4-axis upper guide – arc move counterclockwise

Definition: `33`
`1 2 3 4 5 6 7 8 9 10 11 12 13 14 15`

1	(Not used)			
2	Wire compensation	**wcc$**	0	Wire compensation modal (no change)
			40	Cancel wire compensation in the control
			41	Wire compensation in the control = left
			42	Wire compensation in the control = right
			140	Cancel wire compensation last move in the contour
3	X position	**wx$**		
4	Y position	**wy$**		
5	Absolute X-axis arc center	**wxc$**		(relative to plane)
6	Absolute Y-axis arc center	**wyc$**		(relative to plane)
7	Z position	**wz$**		
8	Feed rate	**wfr$**	Positive	Feed rate per minute
			-1	Unchanged
9	Wire taper	**wtpr$**		
10	Corner type	**wcor$**	0	Conical
			1	Sharp
			2	Constant
			3	Other
			4	Fixed
			5	Fishtail
11	Control flags	**cur_cflg$**		See **Control Flags Parameters** on page 91.
12	Corner radius	**wcor_rad$**		
13	Arc type	**warc_cortyp$**	0	Conical
			1	Sharp
			2	Constant
			3	Other
			4	Fixed
			5	Fish tail
14	Arc radius	**warc_radius$**		
15	Full arc flag	**wfull_arc_flg$**	0	NOT a full arc move
			1	Full arc move (360-degree sweep)

L M R W 80 : Cancel Drill / Canned Cycle

Definition:
```
80
[blank line]
```

Note: Even though Gcode 80 has no parameters, a blank line must be output for the second line.

M L R 81 : Start Drill Cycle

Definition: `81`
`1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20`

1	Drill cycle type	**drillcyc$**	0	Simple
			1	Peck
			2	Chip break
			3	Tap
			4	Bore #1
			5	Bore #2
			6	Misc #1
			7	Misc #2
			8–19	Custom cycles
				Calculated variable: **drl_cycle$**
2	X position	**drl_depth_x$**		XYZ is a 3D point that represents the drill point at the bottom of the hole. Calculated variable: **x$**
3	Y position	**drl_depth_y$**		XYZ is a 3D point that represents the drill point at the bottom of the hole. Calculated variable: **y$**
4	Z position	**drl_depth_z$**		XYZ is a 3D point that represents the drill point at the bottom of the hole. Calculated variable: **z$, depth$**
5	Dwell time	**dwell$**		
6	Feed rate	**frplunge$**		
7	First peck amount	**peck1$**		
8	Subsequent peck amount	**peck2$**		
9	Peck clearance	**peckclr$**		
10	Chip break retract	**retr$**		
11	Drill cycle initial height	**drl_sel_ini$**		The distance from the selected drill position (zdrl) to the *initial* height, sign is positive for above selected drill position. Calculated variable: **initht$**
12	Drill cycle reference height	**drl_sel_ref$**		The distance from the selected drill position (zdrl) to the *reference* height, sign is positive for above selected drill position. Calculated variable: **refht$**

13	Drill depth	**drl_sel_tos$**	The distance from the selected drill position (zdrl) to the *top of stock*, sign is positive for above selected drill position. Calculated variable: **zdrl$**
14	Boring bar clearance shift amount	**shftdrl$**	
15	U position	**drl_init_x$**	UVW is a 3D point that represents the initial height point. Calculated variable: **u$**
16	V position	**drl_init_y$**	UVW is a 3D point that represents the initial height point. Calculated variable: **v$**
17	W position	**drl_init_z$**	UVW is a 3D point that represents the initial height point. Calculated variable: **w$**
18	Control flags	**cur_cflg$**	See **Control Flags Parameters** on page 91.
19	Drill direction	**rev_drl5$**	Obsolete—no longer used.
20	Block drill diameter	**drl_dia$**	This is the diameter of the drill that was selected for the hole. For all operations besides Router block drill, this is 0.

Note: If **vers_no$** is 8 or greater, the following data is calculated and overwrites the parameter passed in the NCI:

- **depth$** from **z$**
- **zdrl$** (calculated) from **w$ – initht$**
- **refht$** from **zdrl$** (calculated) **+ refht**$
- **tosz$** (top of stock) from **zdrl$** (calculated) **+ zdrl$** (original)
- **initht$** from **w$**

W 81 : Start Canned Cycle

Definition: **81**
1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19

1	Drill cycle type	**cancyc$**	0–19	Custom cycles
2	X position	**xnci$**		XYZ is a 3D point that represents the drill point at the bottom of the hole. Calculated variable: **x$**
3	Y position	**ynci$**		XYZ is a 3D point that represents the drill point at the bottom of the hole. Calculated variable: **y$**
4	Z position	**znci$**		XYZ is a 3D point that represents the drill point at the bottom of the hole. Calculated variable: **z$**
5	Entered value	**canned1$**		
6				*(not used for Wire)*
7	Entered value	**canned4$**		
8	Entered value	**canned5$**		
9	Entered value	**canned6$**		
10	Entered value	**canned7$**		
11	Entered value	**canned2$**		
12	Entered value	**canned3$**		
13				*(not used for Wire)*
14				*(not used for Wire)*
15				*(not used for Wire)*
16				*(not used for Wire)*
17				*(not used for Wire)*
18	Control flags	**cur_cflg$**		See **Control Flags Parameters** on page 91.
19				*(not used for Wire)*

L M R W 82 : Additional Drill / Canned Cycle Parameters

Definition: **82**
1 2 3 4 5 6 7 8 9 10

1	Drill parameter 1	**drl_prm1$**	
2	Drill parameter 2	**drl_prm2$**	
3	Drill parameter 3	**drl_prm3$**	
4	Drill parameter 4	**drl_prm4$**	
5	Drill parameter 5	**drl_prm5$**	
6	Drill parameter 6	**drl_prm6$**	
7	Drill parameter 7	**drl_prm7$**	
8	Drill parameter 8	**drl_prm8$**	
9	Drill parameter 9	**drl_prm9$**	
10	Drill parameter 10	**drl_prm10$**	

NOTE: The **drl_prm** variables do not have a pre-defined meaning. The post can be customized to use these for whatever purpose is desired for that cycle.

R 83 : Block Drill / Canned Cycle Parameters

Definition:
```
83
1 2 3 4 5 6 7 8 9 10 11 12
```

1	Drill point (X) position at depth.	**bdrl_x$**	Position of the *lead* tool
2	Drill point (Y) position at depth.	**bdrl_y$**	Position of the *lead* tool
3	Drill point (Z) position at depth.	**bdrl_z$**	Position of the *lead* tool
4	Offset to lead tool in X	**bdrl_ofs_x$**	Distance of drill hole to the lead drill position.
5	Offset to lead tool in Y	**bdrl_ofs_y$**	Distance of drill hole to the lead drill position.
6	Offset to lead tool. In Z	**bdrl_ofs_z$**	Distance of drill hole to the lead drill position.
7	Tool group number	**bdrl_tool_grp$**	
8	Work offset number	**bdrl_wrk_ofs$**	
9	Position of lead drill at initial height.	**bdrl_u$**	Clearance point position in X
10	Position of lead drill at initial height.	**bdrl_v$**	Clearance point position in Y
11	Position of lead drill at initial height.	**bdrl_w$**	Clearance point position in Z
12	Number(s) of the stations whose drills have dropped.	**bdrl_tool_no$**	This is a bitwise operator where each bit represents a station on the block. See **bdrl_tool_no$** to learn more.

Note: MP also reads the following variables when block drilling is active: **bdrl_x2$, bdrl_y2$**, and **bdrl_z2$**. These three values are actually read from NCI **M L R 81 : Start Drill Cycle** and **M L R 100 : Canned Cycle Repeat Position** data records. They are the actual drilled location (which may not be the lead tool position) at depth.

.

M L R 100 : Canned Cycle Repeat Position

Definition: `100`
`1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24`

1	(Not used)		
2	X position	**drl_depth_x$**	XYZ is a 3D point that represents the drill point at the bottom of the hole. Calculated variable: **x$**
3	Y position	**drl_depth_y$**	XYZ is a 3D point that represents the drill point at the bottom of the hole. Calculated variable: **y$**
4	Z position	**drl_depth_z$**	XYZ is a 3D point that represents the drill point at the bottom of the hole. Calculated variable: **z$**
5	Drill cycle initial height	**drl_sel_ini$**	The distance from the selected drill position (**zdrl$**) to the *initial* height, sign is positive for above selected drill position. Calculated variable: **initht$**
6	Drill cycle reference height	**drl_sel_ref$**	The distance from the selected drill position (**zdrl$**) to the *reference* height, sign is positive for above selected drill position. Calculated variable: **refht$**
7	Dwell time	**dwell$**	
8	Feed rate	**frplunge$**	
9	U position	**drl_init_x$**	UVW is a 3D point that represents the initial height point. Calculated variable: **u$**
10	V position	**drl_init_y$**	UVW is a 3D point that represents the initial height point. Calculated variable: **v$**
11	W position	**drl_init_z$**	UVW is a 3D point that represents the initial height point. Calculated variable: **w$**
12	Control flags	**cur_cflg$**	See **Control Flags Parameters** on page 91.
13	Drill depth	**rev_drl5$**	Obsolete—no longer used.
14	Top of stock	**drl_sel_tos$**	The distance from the selected drill position (**zdrl$**) to the *top of stock*, sign positive for above **zdrl$**

15	Drilling matrix	**drl_m1$**	X-axis vector (x)
16		**drl_m2$**	X-axis vector (y)
17		**drl_m3$**	X-axis vector (z)
18		**drl_m4$**	Y-axis vector (x)
19		**drl_m5$**	Y-axis vector (y)
20		**drl_m6$**	Y-axis vector (z)
21		**drl_m7$**	Z-axis vector (x)
22		**drl_m8$**	Z-axis vector (y)
23		**drl_m9$**	Z-axis vector (z)
24	Block drill diameter	**drl_dia$**	This is the diameter of the drill that was selected for the hole. For all operations besides Router block drill, this is 0.

When the NCI 81 line is read, the tool plane matrix (**m1$**–**m9$**) is copied from the NCI 1014 data to the **drl_m1$**–**drl_m9$** matrix.

This matrix (**drl_m1$**–**drl_m9$**) is then copied to the tool plane matrix (**m1$**–**m9$**) when the NCI 100 line is read.

W 100 : Canned Cycle Repeat Position

Definition: `100`
`1 2 3 4 5`

1	(Not used)		
2	X position	**xnci$, x$**	
3	Y position	**ynci$, y$**	
4	Z position	**znci$, z$**	
5	(Not used)		

L 200 : Threading Parameters One

Definition: `200`
`1 2 3 4 5 6 7 8`

1	Number of spring cuts	**nspring$**		
2	Finish allowance	**thdfinish$**		
3	Anticipated thread pull-off	**thdpulloff$**		
4	Number of starts	**nstarts$**		
5	Clearance perpendicular to cuts	**thdxclr$**		
6	Thread infeed angle	**thdangle$**		Value in radians
7	Equal depth thread cuts	**thdequcut$**	0	Determine depth cuts from: Equal area method.
			1	Determine depth cuts from: Number of cuts.
8	Number of cuts	**thdncuts$**	>0	Determine number of cuts from: Number of cuts.

Always appears together with the **L 201 : Threading Parameters Two**.

L 201 : Threading Parameters Two

Definition: `201`
`1 2 3 4 5 6 7 8 9 10 11 12`

1	X position 1	**thdx1$**		Thread major
2	X position 2	**thdx2$**		Thread minor
3	Z position 1	**thdz1$**		Starting Z position of thread
4	Z position 2	**thdz2$**		Ending Z position of thread
5	Lead settings	**thdlead$**	Positive	Lead in units per thread
			Negative	Lead in threads per inch
6	Amount of first cut	**thdfirst$**		Calculated based on **thdequcut$**
7	Amount of last cut	**thdlast$**		
8	Stock clearance in Z	**thdzclr$**		Acceleration clearance
9	Thread angle	**thda1$**		Value in radians
10	Thread included angle	**thda2$**		Value in radians
11	Thread type settings	**thdtype$**	0	Longhand cycle—example, G32
			1	Canned cycle—example, G76
			2	Box thread—example, G92
			3	Alternating—example, G32
12	X position 3	**thdx3$**		Ending X position of thread

Always appears together with the **L 200 : Threading Parameters One**.

- **thdlead$** is always converted to a (positive) units-per-thread value.
- Calculate thread taper by (**thdx$2 – thdx3$**).

L 900 : Stock Transfer – Misc Ops function

Definition: `900`
`1 2 3 4 5 6 7 8 9 10 11`

1	Active spindle for stock to transfer	**stck_spindle$**	0	Main spindle
			1	Sub spindle
2		**stck_init_z$**		Z coordinate on stock to be transferred
3		**stck_final_z$**		Z coordinate on transferred stock
4		**stck_chuk_st_z$**		Source chuck Z axis reference position *before* transfer
5		**stck_chuk_st_x$**		Source chuck X axis reference position *before* transfer
6		**stck_chuk_end_z$**		Source chuck Z axis reference position *after* transfer
7		**stck_chuk_end_x$**		Source chuck X axis reference position *after* transfer
8		**stck_chuk_st_dz$**		Destination chuck Z axis reference position *before* transfer
9		**stck_chuk_st_dx$**		Destination chuck X axis reference position *before* transfer
10		**stck_chuk_end_dz$**		Destination chuck Z axis reference position *after* transfer
11		**stck_chuk_end_dx$**		Destination chuck X axis reference position *after* transfer

Processed by postblock **pstck_trans$**.

L 901 : Stock Flip – Misc Ops function

Definition: `901`
`1 2 3 4 5 6 7`

1	Active spindle for stock to transfer	**stck_spindle$**	0	Main spindle
			1	Sub spindle
2		**stck_init_z$**		Z coordinate on stock *before* flip
3		**stck_final_z$**		Z coordinate on stock *after* flip
4		**stck_chuk_st_z$**		Chuck Z axis position *before* flip
5		**stck_chuk_st_x$**		Chuck X axis position *before* flip
6		**stck_chuk_end_z$**		Chuck Z axis position *after* flip
7		**stck_chuk_end_x$**		Chuck X axis position *after* flip

Processed by postblock **pstck_flip$**.

L 902 : Stock Advance – Misc Ops function

Definition: **902**
1 2 3 4 5 6 7 8 9 10 11 12 13

1	Active spindle for stock to transfer	**stck_spindle$**	0	Main spindle
			1	Sub spindle
2		**stck_op$**	0	Push stock
			1	Push stock with Use Tool Stop option
			2	Pull stock
3		**stck_clear$**		Stock clearance (pull stock method)
4		**stck_grip$**		Grip length (pull stock method)
5		**stck_tool_x$**		Tool X axis position for bar stop/puller
6		**stck_init_z$**		Z coordinate of stock *before* advance
7		**stck_final_z$**		Z coordinate of stock *after* advance
8		**stck_appr_fr$**		Feed rate that the bar puller uses while moving into position
9		**stck_adv_fr$**		Feed rate that the stock advances at
10		**stck_chuk_st_z$**		Chuck Z axis position *before* advance
11		**stck_chuk_st_x$**		Chuck X axis position *before* advance
12		**stck_chuk_end_z$**		Chuck Z axis position *after* advance
13		**stck_chuk_end_x$**		Chuck X axis position *after* advance

Processed by postblock **pstck_bar_fd$.**

L 903 : Chuck – Misc Ops function

Definition: `903`
`1 2 3 4 5 6`

1	Active spindle for clamp/unclamp	**clmp_spindle$**	0	Main spindle
			1	Subspindle
2	Chuck action	**clmp_op$**	0	Clamp
			1	Un-clamp
			2	Re-position
			3	Eject stock *(added for X5)*
3		**stck_chuk_st_z$**		Original Z-axis chuck position
4		**stck_chuk_st_x$**		Original X-axis chuck position
5		**stck_chuk_end_z$**		Final Z-axis chuck position
6		**stck_chuk_end_x$**		Final X-axis chuck position

L 904 : TailStock – Misc Ops function

Definition:
```
904
1 2 3
```

1	Operation	**tlstck_on$**	0	Retract tailstock
			1	Engage tailstock
2		**stck_init_z$**		Initial Z position of tailstock
3		**stck_final_z$**		Final Z position of tailstock

L 905 : SteadyRest – Misc Ops function

Definition: `905`
`1 2`

1	**stck_init_z$**	Initial steady rest position
2	**stck_final_z$**	Final steady rest position

Processed by postblock **psteadyrest$.**

L 911 : Define Misc Ops custom parameters — reals

Definition: **911**
1 2 3 4 5 6 7 8 9 10

1	Miscellaneous real 1	**miscops_mr1$**	
2	Miscellaneous real 2	**miscops_mr2$**	
3	Miscellaneous real 3	**miscops_mr3$**	
4	Miscellaneous real 4	**miscops_mr4$**	
5	Miscellaneous real 5	**miscops_mr5$**	
6	Miscellaneous real 6	**miscops_mr6$**	
7	Miscellaneous real 7	**miscops_mr7$**	
8	Miscellaneous real 8	**miscops_mr8$**	
9	Miscellaneous real 9	**miscops_mr9$**	
10	Miscellaneous real 10	**miscops_mr10$**	

L 912 : Define Misc Ops custom parameters — integers

Definition: **912**
1 2 3 4 5 6 7 8 9 10

1	Miscellaneous integer 1	**miscops_mi1$**
2	Miscellaneous integer 2	**miscops_mi2$**
3	Miscellaneous integer 3	**miscops_mi3$**
4	Miscellaneous integer 4	**miscops_mi4$**
5	Miscellaneous integer 5	**miscops_mi5$**
6	Miscellaneous integer 6	**miscops_mi6$**
7	Miscellaneous integer 7	**miscops_mi7$**
8	Miscellaneous integer 8	**miscops_mi8$**
9	Miscellaneous integer 9	**miscops_mi9$**
10	Miscellaneous integer 10	**miscops_mi10$**

M R L 950 : Axis combination

Definition: `950`
`1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26`

1	**synclath$**	
2	**syncbfor$**	
3	**syncmode$**	
4	**syncaxis$**	Component ID of axis combination
5	**syncstream$**	
6	**syncmodebfor$**	
[all other parameters]	(Not used)	

M R L W 999 : Start of operation

Definition: `999`
`1 2 3`

New predefined variables for parameters 1 and 3 were introduced for Mastercam X5.

1	Code for specific operation type	**synctool_op$**	Takes the same values as the **tool_op$** operation codes: **M R L 1016 : Additional Miscellaneous Parameters** on page 68 **W 1016 : Additional Miscellaneous Parameters** on page 69
2	data stream	**syncstream$**	
3	Operation ID numbers	**syncop_id$**	Takes the same values as **op_id$**.

These let you access the **tool_op$** and **op_id$** values before the 1016 line is written.

M R 1000 : Null tool change

Definition: `1000`
`1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18`

1	Program number	**progno$**		
2	Starting sequence number	**seqno$**		
3	Sequence number increment	**seqinc$**		
4	Tool number	**t$**		
5	Tool diameter offset number	**tloffno$**		
6	Tool length offset number	**tlngno$**		
7	Plane position	**plane$**	0	XY plane
			1	YZ plane
			2	XZ plane
8	Spindle speed in RPM	**ss$**	Positive	Spindle forward
			0	Spindle stop
			Negative	Spindle reverse
9	Feed rate	**fr$**		
10	Coolant use	**coolant$**	0	Off
			1	Flood
			2	Mist
			3	Tool
11	X rapid position	**xr$**		
12	Y rapid position	**yr$**		
13	Z rapid position	**zr$**		
14	X home position	**xh$**		
15	Y home position	**yh$**		
16	Z home position	**zh$**		
17	Axis substitution	**rotaxis$**	-2	Axis substitution, substitute Y, CCW
			-1	Axis substitution, substitute X, CCW
			0	None
			1	Axis substitution, substitute X, CW
			2	Axis substitution, substitute Y, CW
			11	Polar conversion, rotate about X
			12	Polar conversion, rotate about Y
			13	Polar conversion, rotate about Z
			21	4-axis, rotate about X
			22	4-axis, rotate about Y
			23	4-axis, rotate about Z

18	Diameter for axis substitution	**rotdia$**	

L 1000 : Null tool change

Definition: `1000`
`1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18`

1	Program number	**progno$**		
2	Starting sequence number	**seqno$**		
3	Sequence number increment	**seqinc$**		
4	Tool number	**t$**		
5	Tool diameter offset number	**tloffno$**		
6	Maximum spindle speed	**maxss$**		
7	Tool orientation	**orient$**		
8	Spindle speed	**ss$**	Positive	Spindle speed in RPM
			0	Spindle stop
			Negative	Spindle speed in surface units per minute
9	Feed rate	**fr$**	Positive	Feed rate in units per minute
			Negative	Feed rate in units per revolution
10	Coolant use	**coolant$**	0	Off
			1	Flood
			2	Mist
			3	Tool
11	X rapid position	**xr$**		
12	Y rapid position	**yr$**		
13	Z rapid position	**zr$**		
14	X home position	**xh$**		
15	Y home position	**yh$**		
16	Z home position	**zh$**		
17	Spindle direction	**spdir$**	1	Spindle forward
			0	Spindle stop
			-1	Spindle reverse
18	(Not used)			

W 1000 : Null tool change

Definition: `1000`
`1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22`

1	Program number	**progno$**		
2	Starting sequence number	**seqno$**		
3	Sequence number increment	**seqinc$**		
4	Cut pass	**pass$**		
5	Condition code	**ccode$**		
6	Offset number	**offset$**		
7	(Not used)			
8	Initial wire taper	**inittaper$**	Positive	Taper, right
			0	No taper
			Negative	Taper, left
9	Feed rate	**fr$**		
10	Flushing	**water$**	0	Off
			1	Flood
			2	Other
11	X thread position	**threadx$**		
12	Y thread position	**thready$**		
13	Z thread position	**threadx$**		
14	X start position	**startx$**		
15	Y start position	**starty$**		
16	Z start position	**startz$**		
17	Height of XY plane	**xyheight$**		
18	Height of UV plane	**uvheight$**		
19	X skewed wire thread	**up_st_vecx$**		
20	Y skewed wire thread	**up_st_vecy$**		
21	Z skewed wire thread	**up_st_vecz$**		
22	Skewed wire thread	**up_st_mode$**	0	Off
			1	Apply to thread
			2	Apply to cut
			3	Apply to both thread/cut

M R 1001 : Start-of-file tool change

Definition: `1001`
`1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18`

1	Program number	**progno$**		
2	Starting sequence number	**seqno$**		
3	Sequence number increment	**seqinc$**		
4	Tool number	**t$**		
5	Tool diameter offset number	**tloffno$**		
6	Tool length offset number	**tlngno$**		
7	Plane position	**plane$**	0	XY plane
			1	YZ plane
			2	XZ plane
8	Spindle speed in RPM	**ss$**	Positive	Spindle forward
			0	Spindle stop
			Negative	Spindle reverse
9	Feed rate	**fr$**		
10	Coolant use	**coolant$**	0	Off
			1	Flood
			2	Mist
			3	Tool
11	X rapid position	**xr$**		
12	Y rapid position	**yr$**		
13	Z rapid position	**zr$**		
14	X home position	**xh$**		
15	Y home position	**yh$**		
16	Z home position	**zh$**		
17	Axis substitution	**rotaxis$**	-2	Axis substitution, substitute Y, CCW
			-1	Axis substitution, substitute X, CCW
			0	None
			1	Axis substitution, substitute X, CW
			2	Axis substitution, substitute Y, CW
			11	Polar conversion, rotate about X
			12	Polar conversion, rotate about Y
			13	Polar conversion, rotate about Z
			21	4-axis, rotate about X
			22	4-axis, rotate about Y
			23	4-axis, rotate about Z

18	Diameter for axis substitution	**rotdia$**	

L 1001 : Start-of-file tool change

Definition: `1001`
`1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18`

1	Program number	**progno$**		
2	Starting sequence number	**seqno$**		
3	Sequence number increment	**seqinc$**		
4	Tool number	**t$**		
5	Tool diameter offset number	**tloffno$**		
6	Maximum spindle speed	**maxss$**		
7	Tool orientation	**orient$**		
8	Spindle speed	**ss$**	Positive	Spindle speed in RPM
			0	Spindle stop
			Negative	Spindle speed in surface units per minute
9	Feed rate	**fr$**	Positive	Feed rate in units per minute
			Negative	Feed rate in units per revolution
10	Coolant use	**coolant$**	0	Off
			1	Flood
			2	Mist
			3	Tool
11	X rapid position	**xr$**		
12	Y rapid position	**yr$**		
13	Z rapid position	**zr$**		
14	X home position	**xh$**		
15	Y home position	**yh$**		
16	Z home position	**zh$**		
17	Spindle direction	**spdir$**	1	Spindle forward
			0	Spindle stop
			-1	Spindle reverse
18	(Not used)			

W 1001 : Start-of-file tool change

Definition: `1001`
`1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22`

1	Program number	**progno$**		
2	Starting sequence number	**seqno$**		
3	Sequence number increment	**seqinc$**		
4	Cut pass	**pass$**		
5	Condition code	**ccode$**		
6	Offset number	**offset$**		
7	(Not used)			
8	Initial wire taper	**inittaper$**	Positive	Taper, right
			0	No taper
			Negative	Taper, left
9	Feed rate	**fr$**		
10	Flushing	**water$**	0	Off
			1	Flood
			2	Other
11	X thread position	**threadx$**		
12	Y thread position	**thready$**		
13	Z thread position	**threadx$**		
14	X start position	**startx$**		
15	Y start position	**starty$**		
16	Z start position	**startz$**		
17	Height of XY plane	**xyheight$**		
18	Height of UV plane	**uvheight$**		
19	X skewed wire thread	**up_st_vecx$**		
20	Y skewed wire thread	**up_st_vecy$**		
21	Z skewed wire thread	**up_st_vecz$**		
22	Skewed wire thread	**up_st_mode$**	0	Off
			1	Apply to thread
			2	Apply to cut
			3	Apply to both thread/cut

M R 1002 : Tool Change

Definition: `1002`
`1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18`

1	Program number	**progno$**		
2	Starting sequence number	**seqno$**		
3	Sequence number increment	**seqinc$**		
4	Tool number	**t$**		
5	Tool diameter offset number	**tloffno$**		
6	Tool length offset number	**tlngno$**		
7	Plane position	**plane$**	0	XY plane
			1	YZ plane
			2	XZ plane
8	Spindle speed in RPM	**ss$**	Positive	Spindle forward
			0	Spindle stop
			Negative	Spindle reverse
9	Feed rate	**fr$**		
10	Coolant use	**coolant$**	0	Off
			1	Flood
			2	Mist
			3	Tool
11	X rapid position	**xr$**		
12	Y rapid position	**yr$**		
13	Z rapid position	**zr$**		
14	X home position	**xh$**		
15	Y home position	**yh$**		
16	Z home position	**zh$**		
17	Axis substitution	**rotaxis$**	-2	Axis substitution, substitute Y, CCW
			-1	Axis substitution, substitute X, CCW
			0	None
			1	Axis substitution, substitute X, CW
			2	Axis substitution, substitute Y, CW
			11	Polar conversion, rotate about X
			12	Polar conversion, rotate about Y
			13	Polar conversion, rotate about Z
			21	4-axis, rotate about X
			22	4-axis, rotate about Y
			23	4-axis, rotate about Z

18	Diameter for axis substitution	**rotdia$**	

L 1002 : Tool Change

Definition: `1002`
`1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18`

1	Program number	**progno$**		
2	Starting sequence number	**seqno$**		
3	Sequence number increment	**seqinc$**		
4	Tool number	**t$**		
5	Tool diameter offset number	**tloffno$**		
6	Maximum spindle speed	**maxss$**		
7	Tool orientation	**orient$**		
8	Spindle speed	**ss$**	Positive	Spindle speed in RPM
			0	Spindle stop
			Negative	Spindle speed in surface units per minute
9	Feed rate	**fr$**	Positive	Feed rate in units per minute
			Negative	Feed rate in units per revolution
10	Coolant use	**coolant$**	0	Off
			1	Flood
			2	Mist
			3	Tool
11	X rapid position	**xr$**		
12	Y rapid position	**yr$**		
13	Z rapid position	**zr$**		
14	X home position	**xh$**		
15	Y home position	**yh$**		
16	Z home position	**zh$**		
17	Spindle direction	**spdir$**	1	Spindle forward
			0	Spindle stop
			-1	Spindle reverse
18	(Not used)			

W 1002 : Tool Change

Definition: `1002`
`1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22`

1	Program number	**progno$**		
2	Starting sequence number	**seqno$**		
3	Sequence number increment	**seqinc$**		
4	Cut pass	**pass$**		
5	Condition code	**ccode$**		
6	Offset number	**offset$**		
7	(Not used)			
8	Initial wire taper	**inittaper$**	Positive 0 Negative	Taper, right No taper Taper, left
9	Feed rate	**fr$**		
10	Flushing	**water$**	0 1 2	Off Flood Other
11	X thread position	**threadx$**		
12	Y thread position	**thready$**		
13	Z thread position	**threadx$**		
14	X start position	**startx$**		
15	Y start position	**starty$**		
16	Z start position	**startz$**		
17	Height of XY plane	**xyheight$**		
18	Height of UV plane	**uvheight$**		
19	X skewed wire thread	**up_st_vecx$**		
20	Y skewed wire thread	**up_st_vecy$**		
21	Z skewed wire thread	**up_st_vecz$**		
22	Skewed wire thread	**up_st_mode$**	0 1 2 3	Off Apply to thread Apply to cut Apply to both thread/cut

M R 1003 : End of File

Definition:
```
1003
1 2 3
```

1	X home position	**xh$**	
2	Y home position	**yh$**	
3	Z home position	**zh$**	

L 1003 : End of File

Definition:
```
1003
1 2 3
```

1	X home position	**xh$**	
2	(Not used)		
3	Z home position	**zh$**	

W 1003 : End of File

Definition:
```
1003
1 2 3
```

1	X thread position	**threadx$**	
2	Y thread position	**thready$**	
3	Z thread position	**threadz$**	

L M R W 1004 : Cancel Cutter Compensation

Definition:
```
1004
[blank line]
```
Note: Even though Gcode 1004 has no parameters, a blank line must be output for the second line.

L M R W 1005 : Manual Entry / Insert text as comment

Definition: **1005**
comment

Text to be inserted into the NC program.	Text will be formatted as a comment and output immediately (before the current NC block).

L M R W 1006 : Manual Entry / Insert text as code

Definition: **1006**
comment

Text to be inserted into the NC program.	Text will be inserted as NC code, not a comment, and output immediately (before the current NC block).

L M R W 1007 : Manual Entry / Comment with move

Definition: **1007**
comment

Text to be inserted into the NC program	Text will be formatted as a comment and output with the next move. (See **L M R W 1026 : Manual Entry / Comment as code, with move** to format as code.)

L M R W 1008 : Manual Entry / Tool operation comment

Definition: **1008**
comment

Text to be inserted into the NC program	

W 1009 : Wire Cut Length (obsolete)

Definition: `1009`
`1 2 3`

1	Wirepath cut length	**cutlength$**
2	(Not used)	
3	(Not used)	

Note: This NCI Gcode is no longer output.

W 1010 : Wire Condition Change

Definition: `1010`
`1 2 3 4 5 6 7 8 9 1011 12 13 14`

1	Wire compensation	**cc$**	0	Cutter compensation modal (no change)
			40	Cancel cutter compensation in the control
			41	Cutter compensation in the control = left
			42	Cutter compensation in the control = right
			140	Cancel cutter compensation last move in the contour
2	Condition code	**ccode$**		
3	Wire offset	**offset$**		
4	Wire diameter	**tldia$**		
5	Register value 1	**reg1$**		
6	Register value 2	**reg2$**		
7	Register value 3	**reg3$**		
8	Register value 4	**reg4$**		
9	Register value 5	**reg5$**		
10	Register value 6	**reg6$**		
11	Register value 7	**reg7$**		
12	Register value 8	**reg8$**		
13	Register value 9	**reg9$**		
14	Register value 10	**reg10$**		
15		**ccode_epac_flg$**		Indicates an approach point condition change.

L M R W 1011 : Define Miscellaneous Reals

Definition: **1011**
1 2 3 4 5 6 7 8 9 10

1	Miscellaneous real 1	**mr1$**	
2	Miscellaneous real 2	**mr2$**	
3	Miscellaneous real 3	**mr3$**	
4	Miscellaneous real 4	**mr4$**	
5	Miscellaneous real 5	**mr5$**	
6	Miscellaneous real 6	**mr6$**	
7	Miscellaneous real 7	**mr7$**	
8	Miscellaneous real 8	**mr8$**	
9	Miscellaneous real 9	**mr9$**	
10	Miscellaneous real 10	**mr10$**	

L M R W 1012 : Define Miscellaneous Integers

Definition: **1012**
1 2 3 4 5 6 7 8 9 10

1	Miscellaneous integer 1	**mi1$**	
2	Miscellaneous integer 2	**mi2$**	
3	Miscellaneous integer 3	**mi3$**	
4	Miscellaneous integer 4	**mi4$**	
5	Miscellaneous integer 5	**mi5$**	
6	Miscellaneous integer 6	**mi6$**	
7	Miscellaneous integer 7	**mi7$**	
8	Miscellaneous integer 8	**mi8$**	
9	Miscellaneous integer 9	**mi9$**	
10	Miscellaneous integer 10	**mi10$**	

M R 1013 : Define Miscellaneous Parameters

Definition: `1013`
`1 2 3 4 5 6 7 8 9 10`

1	Cutter compensation use	**cc$**	0	Cutter compensation modal
			40	Cancel cutter compensation in the control
			41	Cutter compensation in the control = left
			42	Cutter compensation in the control = right
			140	Cancel cutter compensation last move in the contour
2	Tool diameter	**tldia$**		
3	Tool corner radius	**tcr$**		
4	Depth values to center or tip setting	**cctotip$**	0	Center
			1	Tip
5	View number	**tlplnno$**		The number of the view in Mastercam's view catalog. View numbers 1–8 correspond to Mastercam's standard system-defined views. If the view is a user-defined view, this will be a different, higher number.
			0	No matrix
			1	Top
			2	Front
			3	Back
			4	Bottom
			5	Right side
			6	Left side
			7	Isometric
			8	Axonometric
6	X coordinate of tool plane origin	**tox$**		(relative to view)
7	Y coordinate of tool plane origin	**toy$**		(relative to view)
8	Z coordinate of tool plane origin	**toz$**		(relative to view)
9	Operation code	**opcode$**		
			2	Contour
			3	Drill
			4	Pocket

		5	Ruled
		6	2D swept
		7	3D swept
		8	Revolution
		9	Loft
		10	Coons
		13	Multisurface finish
		14	Multisurface rough
		15	Point
		16	Drill 5-axis
		17	Swarf 5-axis
		18	Curve 5-axis
		19	Facing
		20	5-axis multi-surface
		21	5-axis slice
		22	5-axis port
		23	5-axis circle
		25	Probe
10	Tool reference path and name*	**strtoolpath+ strtool$+ strtoolext**	

L 1013 : Define Miscellaneous Parameters

Definition: `1013`
`1 2 3 4 5 6 7 8 9 10`

1	Cutter compensation	**cc$**	0	Cutter compensation modal
			40	Cancel cutter compensation in the control
			41	Cutter compensation in the control = left
			42	Cutter compensation in the control = right
			140	Cancel cutter compensation last move in the contour
2	Tool corner radius	**tcr$**		Tool nose radius or tool radius of drill type tool
3	Tool diameter	**tldia$**		Always 0
4	(Not used)			
5	(Not used)			
6	X coordinate of tool plane origin	**tox$**		(relative to view)
7	Y coordinate of tool plane origin	**toy$**		(relative to view)
8	X coordinate of tool plane origin	**toz$**		(relative to view)
9	Operation code	**opcode$**	101	Rough
			102	Finish
			103	Groove
			104	Thread
			105	Drill
			106	Point
10	Tool library path and name*	**strtoolpath+ strtool$+ strtoolext**		

W 1013 : Define Miscellaneous Parameters

Definition: `1013`
`1 2 3 4 5 6 7 8 9 10`

1	Cutter compensation use	**cc$**	0	Cutter compensation modal
			40	Cancel cutter compensation in the control
			41	Cutter compensation in the control = left
			42	Cutter compensation in the control = right
			140	Cancel cutter compensation last move in the contour
2	Tool (wire) diameter	**tldia$**		
3	Tool (wire) radius	**tlrad$**		
4	Overburn amount	**overburn$**		
5	Wire status	**wire$**	0	Off
			1	On
6	Power status	**power$**	0	Off
			1	On
7	Work origin X	**wox$**		
8	Work origin y	**woy$**		
9	Operation code	**opcode$**	201	2D contour (no skim cuts, just single rough)
			202	3D contour
			203	Canned (drill)
			204	No core (pocket)
			205	4-axis taper, no skim
			206	2D reverse skim cut
			207	(Not used)
			208	4-axis direct, reverse skim cuts
			209	4-axis direct, no skim cuts
			210	4-axis taper, reverse skim cuts
			211	4-axis taper, one-way skim cuts
			212	4-axis direct, one-way skim cuts
			213	2D one-way skim cuts
			214	Point operation (always rapid)
			215	2-axis, one-way Agie collar skim cut
10	Power library path and name	**strtoolpath+ strtool$+ strtoolext**		Full 'path and name' of the power library used for the operation

L M R W 1014 : Tool Plane View Matrix

Definition:

```
1014
1 2 3 4 5 6 7 8 9
```

1	**m1$**
2	**m2$**
3	**m3$**
4	**m4$**
5	**m5$**
6	**m6$**
7	**m7$**
8	**m8$**
9	**m9$**

View	xx	xy	xz	yx	yy	yz	zx	zy	zz
Top (1)	1	0	0	0	1	0	0	0	1
Front (2)	1	0	0	0	0	1	0	-1	0
Back (3)	-1	0	0	0	0	1	0	1	0
Bottom (4)	-1	0	0	0	1	0	0	0	-1
Right Side (5)	0	1	0	0	0	1	1	0	0
Left Side (6)	0	-1	0	0	0	1	-1	0	0
Isometric (7)	0.7071	0.7071	0	-0.4082	0.4082	0.8165	0.5774	-0.5774	0.5773
Axonometric (8)	0.5	-0.8536	0.1464	0.5	0.1464	0.8536	0.7071	0.5	0.5
Variable Name	m1	m2	m3	m4	m5	m6	m7	m8	m9

W 1015 : Subroutine Parameters

Definition: `1015`

`1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20`

1	Subroutine type settings	**subtyp$**	0	Not a subroutine
			1	Write subroutine
			2	Call subroutine only
2	Subroutine number	**subno$**		
3	Thread/cut flag	**td_ct_flg$**	0	No thread or cut
			1	Allow thread the wire
			2	Allow cut the wire
4	Tab cut	**tabcut$**	0	No tab cut
			1	Tab cut
			2	Contour with tab cut
5	Wire trim	**wtrim$**	0	Trim in control
			1	Trim in computer
			2	3D tracking
6	Skimcut options	**skimpass$**	0	No skimcut
			+1	First skim cut pass on a contour
			-1	Subsequent skim cut pass on a contour
			-2	Last skim cut pass on a contour
7	Wire cut position X	**cutx$**		
8	Wire cut position Y	**cuty$**		
9	XY trimming plane	**trimplane1$**		
10	UV trimming plane	**trimplane2$**		
11	Register value 1	**reg1$**		
12	Register value 2	**reg2$**		
13	Register value 3	**reg3$**		
14	Register value 4	**reg4$**		
15	Register value 5	**reg5$**		
16	Register value 6	**reg6$**		
17	Register value 7	**reg7$**		
18	Register value 8	**reg8$**		
19	Register value 9	**reg9$**		
20	Register value 10	**reg10$**		

M R L 1016 : Additional Miscellaneous Parameters

Definition: **1016**
1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19

1	Operation id	**op_id$**		
2	Tool type	**tool_typ$**		
3	Internal toolpath opcode	**tool_op$**		(See **tool_op$ codes** on page 70 for possible values.)
4	Construction view number	**cplnno$**		
5	X coordinate of construction plane origin	**corgx$**		(relative to view)
6	Y coordinate of construction plane origin	**corgy$**		(relative to view)
7	Z coordinate of construction plane origin	**corgz$**		(relative to view)
8	Cutter compensation in computer	**cc_computer$**	0	Off
			41	Left
			42	Right
9	Work offset number	**workofs$**		
10	Metric is used	**met_tool$**		
11	Number of flutes on cutter	**n_flutes$**		
12	Active spindle for lathe	**spindle_no$**		
13	Thread dimension	**n_tap_thds$**		For a metric tap, mm per thread (pitch); for an inch tap, the number of threads per inch (this is the inverse of the pitch).
14	Station number (lathe) or head number (mill)	**lstation$**		
15	Upper turret is used	**lturret$**	0	Lower turret
			1	Upper turret
16	Unique tool ID	**ltool_id$**		
17	Transform operation ID	**xform_op_id$**		If the current operation is the result of a transform operation, this is the **op_id$** of the transform operation.
18	Pitch (for tap tools)	**tap_pitch$**		Output is in/thread or mm/thread, depending on part units.
19	Nesting operation ID	**nesting_op_id$**		If the current operation is the result of a nesting operation, this is the **op_id$** of the nesting operation.

W 1016 : Additional Miscellaneous Parameters

Definition: **1016**
1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20

1	Operation id	**op_id$**		
2	Finish spawned from Nocore	**nocore_fin$**		
3	Internal toolpath opcode	**tool_op$**		(See **tool_op$ codes** on page 70 for possible values.)
4	Number of view used for Cplane	**cplnno$**		(not used in Wire—always 0)
5	Cplane origin (X)	**corgx$**		(not used in Wire—always 0)
6	Cplane origin (Y)	**corgy$**		(not used in Wire—always 0)
7	Cplane origin (Z)	**corgz$**		(not used in Wire—always 0)
8	Cutter compensation in computer	**cc_computer$**	0	Off
			41	Left
			42	Right
9	Work offset number	**workofs$**		
10	Metric is used	**met_tool$**		
11	Punch, die, open flag	**pdo_type$**	0	Punch
			1	Die
			2	Open
12		**spindle_no$**		(not used in Wire—always 0)
13		**rpd_hght$**		
14		**landheight$**		
15	Taper or slug type	**contour_typ$**	0	No taper
			1	Taper in
			2	Taper out
			3	Land up
			4	Land down
16	Chain height button selected	**contour_pos$**	0	XY height
			1	Land height
			2	UV height
17		**wox$**		Work plane origin (X)
18		**woy$**		Work plane origin (Y)
19		**woz$**		Work plane origin (Z)
20	Transform operation id	**xform_op_id$**		If the operation is a transform operation, this is the operation ID of the transformed operation.
21	Nesting operation ID	**nesting_op_id$**		If the current operation is the result of a nesting operation, this is the **op_id$** of the nesting operation.

tool_op$ codes

This table lists the **tool_op$** codes output on the 1016 line:

Table 1: tool_op$ codes

Mill/ Router	Lathe	Wire	tool_op$	Operation
M/R			1	Contour
M/R			2	Drill
M/R			3	Pocket
M/R			4	Transform operation
M/R			5	Multisurface rough parallel
M/R			6	Multisurface rough radial
M/R			7	Multisurface rough project
M/R			8	Multisurface rough flowline
M/R			9	Multisurface rough contour
M/R			10	Multisurface rough pocket
M/R			11	Multisurface finish parallel
M/R			12	Multisurface finish radial
M/R			13	Multisurface finish project
M/R			14	Multisurface finish flowline
M/R			15	Multisurface finish contour
M/R			16	For C-Hook- created operations
M/R			17	Manual entry
M/R			18	Circle mill
M/R			19	Point
M/R			20	Trimmed
M/R			21	Ruled
M/R			22	Revolved
M/R			23	Letters
M/R			24	Swept 2D
M/R			25	Swept 3D
M/R			26	Coons
M/R			27	Lofted
M/R			28	5-axis drilling
M/R			29	5-axis curve
M/R			30	Project toolpath onto a plane

Table 1: tool_op$ codes

Mill/ Router	Lathe	Wire	tool_op$	Operation
M/R			31	Project toolpath onto a cylinder
M/R			32	Project toolpath onto a sphere
M/R			33	Project toolpath onto a cone
M/R			34	Project toolpath onto a cross section
M/R			35	Project toolpath onto a surface
M/R			36	Non-associative contour
M/R			37	Non-associative drilling
M/R			38	Non-associative pocketing
M/R			39	Multisurface finish pencil trace
M/R			40	Multisurface finish leftover stock
M/R			41	Multisurface finish steep
M/R			42	Multisurface finish shallow
M/R			43	Multisurface finish constant scallop
M/R			44	Multisurface rough plunge
M/R			45	Multisurface finish 5-axis flowline
M/R			46	Multisurface finish 4-axis
M/R			47	Merged in ASCII NCI
M/R			48	5-axis swarf
M/R			49	5-axis roll die
	L		51	face contouring (C axis)
	L		52	cross contouring (C axis)
	L		53	C axis contouring
	L		55	face drilling (C axis)
	L		56	cross drilling (C axis)
	L		57	C axis drilling
	L		60	Rough
	L		61	Finish
	L		62	Grooving (note that chained grooves use 68.)
	L		63	Threading
	L		64	Drill
	L		65	Point
	L		66	Facing

Table 1: tool_op$ codes

Mill/ Router	Lathe	Wire	tool_op$	Operation
	L		67	Cutoff
	L		68	Plunge rough; also, chained grooves
	L		69	Manual entry
	L		70	Merged in ASCII NCI
	L		71	Lathe dynamic rough
	L		72	Lathe contour rough
		W	74	Contour
		W	75	Canned
		W	76	No Core
		W	77	Manual entry
		W	78	Point
		W	79	4-axis
		W	80	Transform
		W	81	Associative trimmed
		W	82	Merged in ASCII NCI
		W	83	Collar
M/R			100	Thread mill
M/R			101	Edit common operation parameters
M/R			102	Facing
M/R			103	Associative trimmed
M/R			104	Solid drill control operation
M/R			105	Slot mill
M/R			106	Helix bore
M/R			107	Multi-surface rough restmill
M/R			108	Associative nesting container operation
M/R			109	Multi-surface finish blend
M/R			110	Multi-surface 5axis, rough
M/R			111	Slice 5axis
M/R			112	Port 5axis
M/R			113	5-axis circle
M/R			130	Tab cutoff
M/R			131	Multi-surface rough pocket, light

Table 1: tool_op$ codes

Mill/ Router	Lathe	Wire	tool_op$	Operation
M/R			132	High-speed surface toolpaths
M/R			133	Nesting onionskin operation
M/R			134	2-D hardmill machining/peel mill
R			135	Saw
M/R			136	FBM drill control operation
M/R			137	FBM mill pocket operation
M/R			138	FBM mill contour operation
M/R			139	Solid model operation
M/R			150	Probe cycle: probe motion
M/R			151	Probe cycle command block
M/R			152	Probe cycle header
M/R			153	Probe cycle trailer
M/R			154	SafetyZone linking operation
	L		201	Canned finish
	L		202	Canned rough
	L		203	Canned rough and finish
	L		204	Canned rough face
	L		205	Canned rough and finish face
	L		206	Canned pattern repeat rough
	L		207	Canned pattern repeat rough and finish
	L		208	Canned groove rough
	L		209	Canned groove finish
	L		210	Quick rough
	L		211	Quick finish
	L		212	Quick groove
	L		213	C-hook generated
	L		214	Stock transfer
	L		215	Stock flip
	L		216	Bar feed
	L		217	Chuck clamp/unclamp
	L		218	Tailstock operation
	L		219	Steadyrest operation

Table 1: tool_op$ codes

Mill/ Router	Lathe	Wire	tool_op$	Operation
	MT		220	Pinch-turn operation
	L		221	Custom operation with tool
	L		222	Custom operation without tool
	L		223	Custom operation reference
	L		224	Plunge turn (chained geometry)
	L		225	Plunge turn (point geometry)
	L		226	Turret park operation
	MT		230	Simple bar feed
	MT		231	Bar feed with tool stop or tool pull
	MT		232	Spindle clamp/unclamp
	MT		233	Spindle advance/retract
	MT		234	Spindle sync
	MT		235	Tailstock advance/retract
	MT		236	Turret park
R			301	Router contour *(obsolete)*
R			302	Router pocket *(obsolete)*
R			303	Router circmill *(obsolete)*
R			304	Router cutoff *(obsolete)*
R			305	Router surface rough pocket *(obsolete)*
R			306	Router multi-drill (block drill)
M/R			416	Engraving
Art			439	Art
M/R			440	Advanced multiaxis (Moduleworks)

L M R 1017 : Construction Plane View Matrix

Definition: **1017**
1 2 3 4 5 6 7 8 9

1	X vector X in WCS	**cm1$**	
2	X vector Y in WCS	**cm2$**	
3	X vector Z in WCS	**cm3$**	
4	Y vector X in WCS	**cm4$**	
5	Y vector Y in WCS	**cm5$**	
6	Y vector Z in WCS	**cm6$**	
7	Z vector X in WCS	**cm7$**	
8	Z vector Y in WCS	**cm8$**	
9	Z vector Z in WCS	**cm9$**	

L M R 1018 : Subprogram Start Definition

Definition: `1018`
`1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27`

1	Subprogram number	**sub_op_id$ / sub_ref_id$**		If this is a transform subprogram, this value is read into **sub_ref_id$**. If this is a non-transform subprogram, this value is read into **sub_op_id$**. Post writers who want to access the subprogram number should use **main_prg_no$** and **sub_prg_no$**.
2	Actual operation id	**sub_grp_id$**		
3	Transform / non-transform indicator	**sub_trns_id$**	0 >0	Non-transform Transform
4	Iteration counter	**sub_sec_no$**		Transform operations: <0 = Off 0 = Original >0 = Copy Non-transform operations: <1 = Copy in transform 1 = Original >1 = Copy
5	Total number of instances (1-based)	**sub_totl_no$**		
6	Chain #	**sub_chn_no$**		For non-transform subprograms only
7	Absolute or incremental	**sub_inc$**	0 1	Absolute Incremental
8	Transform type	**sub_trnstyp$**	0 1 2 3	Mirror Rotate Scale (not used) Translate
9		**sub_trnmthd$**	0 1 2	Translate method = Tool plane Translate method = Tool plane with "Tool plane origin ONLY" checked Translate method = Coordinate
10	Transform matrix	**sub_m1$**		
11	Transform matrix	**sub_m2$**		
12	Transform matrix	**sub_m3$**		
13	Transform matrix	**sub_m4$**		
14	Transform matrix	**sub_m5$**		
15	Transform matrix	**sub_m6$**		
16	Transform matrix	**sub_m7$**		

17	Transform matrix	**sub_m8$**		
18	Transform matrix	**sub_m9$**		
19	Transform X data	**sub_trnsx$**		Mirrored data: X-axis mirror. Set X-axis intersection. Rotated data: XYZ = center of rotation relative to current view. Translated data: XYZ = translation distance relative to original operation.
20	Transform Y data	**sub_trnsy$**		Mirrored data: Y-axis mirror. Set Y-axis intersection. Rotated data: XYZ = center of rotation relative to current view Translated data: XYZ = translation distance relative to original operation.
21	Transform Z data	**sub_trnsz$**		Rotated data: XYZ = center of rotation relative to current view Translated data: XYZ = translation distance relative to original operation
22	First tool in the transform group	**sub_nxt_t$**		
23	First head number in the transform group	**sub_nxt_h$**		
24	(for internal use only)	**sub_nxt_tid$**		
25	More than one tool in transform	**sub_mny_t$**	0	Only one tool used in the transform
			1	Multiple tools used in the transform
26	(for internal use only)	**sub_nst_flg$**	1	Source
			2	Source path
			10	One level call
			100	Separate subs
			1000	All Incremental
27	(for internal use only)			Flags if it is OK to write the 1018 line

NCI file subprogram concepts

Mastercam writes subprogram information to the NCI file in long code format. All motion code is written as if subprograms weren't available. Subprogram information is written to the NCI file using the 1018 and 1019 NCI lines. These lines serve as a "wrapper" for the motion that is to become a subprogram. MP then reads these NCI lines and, based on the parameters in these lines, determines whether to:

- Write the initial subprogram.
- Make a call to the subprogram and call the appropriate predefined postblocks inside the post customization file (.PST).

***Subprogram level hierarchy*—**Subprograms are designed to allow three levels of subprograms:

- The top level is the default NC level. This level is always active if no subs are defined.
- The second level is the transform level. This level is set for all transform subprograms.
- The third level is for all non-transform subprograms. In the absence of the transform level, third level subprograms are output at the second level.

***1018 / 1019 position in the NCI file*—**The 1018 NCI line defines the start of a subprogram block and the 1019 NCI line defines the end of a subprogram block. For every 1018, there will be a corresponding 1019. The position of the 1018 and 1019 depend on whether the subprogram being written is a transform or non-transform subprogram.

- With transform subprograms—Transform subprograms position the 1018 directly after the 1020 NCI line. The 1019 NCI line then encloses all operations selected for the transform. This output and positioning continues for each transform location. Like parentheses, these NCI lines must nest any non-transform subprograms.
- With non-transform subprograms—Non-transform subprograms place the 1018 NCI line and 1019 NCI line dependent on the toolpath type.

A further distinction is made between Drill and Depth Cut subprograms:

- Non-transform depth cut subprograms—The 1018 NCI line is placed before the first position to be placed in the subprogram. The 1019 NCI line is placed after the last position to be placed in the subprogram.
- Non-transform drill subprograms—The 1018 NCI line is placed after the cycle definition (81 NCI line). The definition is outside of the subprogram so repeated points can be called with a different cycle definition. The 1019 NCI line is placed before the cancel drill cycle NCI line (80 NCI line).

***Special Cases: Lathe turning canned cycles*—**The Lathe canned turning cycle(s) automatically produce a non-transform subprogram for the chain that was selected as the final profile. All motion from the first point in the chain to the last point in the chain is included in the subprogram.The numbering procedure used for any other non-transform subprogram applies and must be included when processing for subprograms. This subprogram is used internally by the MP language processor and doesn't follow the normal subprogram output method.

L M R 1019 : Subprogram End Definition

Definition: `1019`
`1 2 3 4 5 6`

1	Subprogram number	**esub_op_id$ / esub_ref_id$**		If param 3 (**esub_trns_id$**) > 0, then: param 1 is read to **esub_ref_id$**, **esub_op_id$** = 0 otherwise: param 1 is read to **esub_op_id$**, **esub_ref_id$** = 0 Post writers who want to access the subprogram number should use **main_prg_no$** and **sub_prg_no$**.
2	Actual operation id	**esub_grp_id$**		
3	Transform / non-transform flag	**esub_trns_id$**	0	Non-transform
			>0	Transform
4	Iteration counter	**esub_sec_no$**		Transform operations: <0 = Off 0 = Original >0 = Copy Non-transform operations: <1 = Copy in transform 1 = Original >1 = Copy
5	Total number of instances	**esub_totl_no$**		
6	Chain #	**esub_chn_no$**		For non-transform subprograms only

The 1019 parameters are used to return the output stream level to the previous level that was set prior to 1018 being called. Therefore, 1018 and 1019 are matched pairs and only "non-transform" subprograms may nest in transform subprograms. The 1019 parameters match the first six parameters written on the matching 1018 line.

See **NCI file subprogram concepts** on page 77 more info about how this NCI line is used.

M R 1020 : Stock Parameters

Definition: `1020`
`1 2 3 4 5 6 7 8 9 10 11 12 13 14`

1	X component, width	**stck_ht$**		
2	Y component, height	**stck_wdth$**		
3	Z component, thickness	**stck_thck$**		
4	X origin of block	**stck_x$**		
5	Y origin of block	**stck_y$**		
6	Z origin of block	**stck_z$**		
7	Origin corner	**stck_crnr$**	0	Origin corner: top - center
			1	Origin corner: top – upper left
			2	Origin corner: top – upper right
			3	Origin corner: top – lower right
			4	Origin corner: top – lower left
			5	Origin corner: bottom – upper left
			6	Origin corner: bottom – upper right
			7	Origin corner: bottom – lower right
			8	Origin corner: bottom – lower left
8	Rotary axis in terms of Tplane	**rotary_vecx$**		
9	Rotary axis in terms of Tplane	**rotary_vecy$**		
10	Rotary axis in terms of Tplane	**rotary_vecz$**		
11	(Not used)			
12	Force tool change?	**force_tlchg$**		State of **Force tool change** option on **Tool parameters** page.
13	Maximum spindle speed	**maxss$**		
14	String with the stock material name	**stck_matl$**		

L 1020 : Stock Parameters

Definition: `1020`
`1 2 3 4 5 6 7 8 9 10 11 12 13 14`

1	Length of stock along Z axis	**stck_ht$**	
2	Maximum diameter of stock	**stck_wdth$**	
3	Same as 2	**stck_thck$**	
4	Center of stock along Z axis	**stck_x$**	
5	Center of stock	**stck_y$**	
6	Center of stock	**stck_z$**	Always 0
7	Origin corner	**stck_crnr$**	Always 0
8	Rotary axis in terms of Tplane	**rotary_vecx$**	Always 0
9	Rotary axis in terms of Tplane	**rotary_vecy$**	Always 0
10	Rotary axis in terms of Tplane	**rotary_vecz$**	Always 0
11	(Not used)		
12	Force tool change?	**force_tlchg$**	State of **Force tool change** option on **Tool parameters** page.
13	Maximum spindle speed	**maxss$**	
14	Stock material name	**stck_matl$**	

W 1020 : Stock Parameters

Definition: `1020`
`1 2 3 4 5 6 7 8 9 10 11 12 13 14`

1	X component, width	**stck_ht$**		
2	Y component, height	**stck_wdth$**		
3	Z component, thickness	**stck_thck$**		
4	X origin of block	**stck_x$**		
5	Y origin of block	**stck_y$**		
6	Z origin of block	**stck_z$**		
7	Origin corner	**stck_crnr$**	0	Origin corner: top - center
			1	Origin corner: top – upper left
			2	Origin corner: top – upper right
			3	Origin corner: top – lower right
			4	Origin corner: top – lower left
			5	Origin corner: bottom – upper left
			6	Origin corner: bottom – upper right
			7	Origin corner: bottom – lower right
			8	Origin corner: bottom – lower left
8	(Not used)			
9	(Not used)			
10	(Not used)			
11	Tank fill / empty flag	**tank$**		
12		**force_tlchg$**		*(not used for Wire)*
13	(Not used)			
14	String with the stock material name	**stck_matl$**		

L M R W 1025 : Canned Text

Each parameter is a 4-digit number where:

- The first digit is the **cant_pos1$–cant_pos20$** value. This value ranges from 0–2 and indicates how the canned text is to be output:
  - 0 = output before the line
  - 1 = output with the line
  - 2 = output after the line
- The other three digits are the **cant_val1$–cant_val20$** value and indicate which canned text item to output.

Leading zeros are not output; so, for example, **0005** would be output simply as **5**.

Definition: **1025**
1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20

1	Canned text parameter	**cant_pos1$+cant_val1$**	Output mode + canned text ID
2		**cant_pos2$+cant_val2$**	
3		**cant_pos3$+cant_val3$**	
4		**cant_pos4$+cant_val4$**	
5		**cant_pos5$+cant_val5$**	
6		**cant_pos6$+cant_val6$**	
7		**cant_pos7$+cant_val7$**	
8		**cant_pos8$+cant_val8$**	
9		**cant_pos9$+cant_val9$**	
10		**cant_pos10$+cant_val10$**	
11		**cant_pos11$ cant_val11$**	
12		**cant_pos12$+cant_val12$**	
13		**cant_pos13$+cant_val13$**	
14		**cant_pos14$+cant_val14$**	
15		**cant_pos15$+cant_val15$**	
16		**cant_pos16$+cant_val16$**	
17		**cant_pos17$+cant_val17$**	
18		**cant_pos18$+cant_val18$**	
19		**cant_pos19$+cant_val19$**	
20		**cant_pos20$+cant_val20$**	

L M R W 1026 : Manual Entry / Comment as code, with move

Definition: `1026`
`comment`

Text to be inserted into the NC program	Text will be inserted directly as NC code (not formatted as a comment) and output with the next move. (See **L M R W 1007 : Manual Entry / Comment with move** to format as comment.)

L M R W 1027 : Working Coordinate System

Definition: `1027`
`1 2 3 4 5 6 7 8 9 10 11 12`

1	t_wcs_m1$	
2	t_wcs_m2$	
3	t_wcs_m3$	
4	t_wcs_m4$	
5	t_wcs_m5$	
6	t_wcs_m6$	
7	t_wcs_m7$	
8	t_wcs_m8$	
9	t_wcs_m9$	
10	t_orgin_x$	
11	t_orgin_y$	
12	t_orgin_z$	

M R 1028 : Head definition data

Definition:
```
1028
1 2 3 4 5 6 7 8 9 10 11 12
```

1	**ra_type$**	0	No special head (std)
		1	Right-angle
		2	Compound
		3	Block drill
		4	UST
2	**ra_offset$**		
3	**ra_vecx$**		
4	**ra_vecy$**		
5	**ra_vecz$**		
6	**ra_svecx$**		
7	**ra_svecy$**		
8	**ra_svecz$**		
9	**ra_block$**		
10	**ra_station$**		
11	**ra_head_grp$**		
12	**ra_tc_type$**	0	Auto T.C. (default)
		1	Fixed unit
		2	Manual T.C.

M R 1029 : Head shift parameters

Definition: `1029`
`1 2 3 4 5 6 7 8 9 10 11`

1	ra_hvecx$	
2	ra_hvecy$	
3	ra_hvecz$	
4	ra_bvecx$	
5	ra_bvecy$	
6	ra_bvecz$	
7	ra_tvecx$	
8	ra_tvecy$	
9	ra_tvecz$	
10	ra_translated$	
11	ra_rot_head$	

L M R W 1031 Custom reals for transform operations

Definition: `1031`
`1 2 3 4 5 6 7 8 9 10`

1	Custom parameters (reals) for transform operation	**trans_mr1$**		
2		**trans_mr2$**		
3		**trans_mr3$**		
4		**trans_mr4$**		
5		**trans_mr5$**		(not currently used—reserved for future use)
6		**trans_mr6$**		(not currently used—reserved for future use)
7		**trans_mr7$**		(not currently used—reserved for future use)
8		**trans_mr8$**		(not currently used—reserved for future use)
9		**trans_mr9$**		(not currently used—reserved for future use)
10		**trans_mr10$**		(not currently used—reserved for future use)

L M R W 1032 Custom ints for transform operations

Definition: **1032**
1 2 3 4 5 6 7 8 9 10

1	Custom parameter (ints) for transform operation	**trans_mi1$**		
2		**trans_mi2$**		
3		**trans_mi3$**		
4		**trans_mi4$**		
5		**trans_mi5$**		(not currently used—reserved for future use)
6		**trans_mi6$**		(not currently used—reserved for future use)
7		**trans_mi7$**		(not currently used—reserved for future use)
8		**trans_mi8$**		(not currently used—reserved for future use)
9		**trans_mi9$**		(not currently used—reserved for future use)
10		**trans_mi10$**		(not currently used—reserved for future use)

M R 1042 : Begin probe operation/probe comments section

Definition: **1042**
[blank line]

no parameters are output after the 1042—only a blank line.

M R 1043 : End probe operation/probe comments section

Definition: **1043**
[blank line]

no parameters are output after the 1043—only a blank line.

L M R W 1050 : Define NCI Version Header

Definition: **1050**
1 2 3 4 5 6 7 8 9

1	Mastercam major version number	**vers_no$**		
2	[obsolete]	**m_vers_no$**		
3	MCX file - day stamp	**mc_day$**		
4	MCX file - month stamp	**mc_mon$**		
5	MCX file - year stamp	**mc_year$**		
6	MCX file - hour stamp	**mc_hour$**		
7	MCX file - minute stamp	**mc_min$**		
8	MCX file - second stamp	**mc_sec$**		
9	MCX file name	**smcname$**		

L M R W 1051 : Machine name

Definition: **1051**
string

Text to be inserted into the NC program.	Name of machine definition.

L M R W 1052 : Machine group comment

Definition: **1052**
string

Text to be inserted into the NC program.	Comment recorded in machine group properties.

L M R W 1053 : Machine group name

Definition: **1053**
string

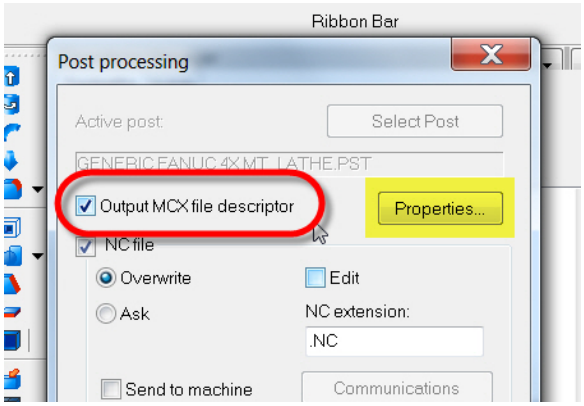
Text to be inserted into the NC program.	Name of machine group.

L M R W 1054 : File descriptor

Definition: **1054**
string

Text to be inserted into the NC program.	Text of the file descriptor property.

Note that in order for this to be output in your NCI file, the following option needs to be selected when posting:



Click the **Properties** button to edit the file descriptor.

M R 1056 : Probe data

Definition: **1056**
string

Text to be inserted into the NC program.	Renishaw probe data generated by the **Productivity+** add-in.

Control Flags Parameters

The control flags (also called “contour flags”) parameter is a single parameter passed from the NCI that carries several pieces of information in a single numeric value. The control flags parameter appears in every motion NCI line (Gcodes 0, 1, 2, 11, 81) to control such values as contour start, stop, and end, coolant, and 5-axis angles (for Mill) or rapid behavior (for Lathe).

Each decimal position in the control flags parameter value represents an individual flag. For example, 1 (first decimal place) is the contour stop flag, 10 (second decimal place) is the contour optional stop flag, 100 (third decimal place) is the contour end flag, and so forth. When added together, the result is a single number that represents multiple flags. Zero is implied when the place fields are empty, but only leading zeros may be omitted.

For example (in Mill), if:

```
cur_cflg$ = 201001
```

The control flags (reading left to right) set the following:

- Coolant flood
- Contour start on
- Contour optional stop off
- Contour stop on

The flag as read from the NCI is available as the predefined variable **cur_cflg$**. You should rarely need to use the **cur_cflg$** variable directly because the post executable sets separate variables for each flag.

The following tables describe the control flag settings for each product.

M R Mill / Router Control Flags Parameters

This is written to the NCI as a six-digit number. Each digit sets the value of a different pre-defined variable, as shown in this table. The entire six-digit number is stored in the **cur_cflg$** variable.

cstop$	0	Contour stop off
	1	Contour stop on
cgstop$	00	Contour optional stop off
	10	Contour optional stop on
cend$	000	Contour end off
	100	Contour end on
	200	Compensation OFF position
	300	Both contour and compensation off
		See notes below
cstart$	0000	Contour start off
	1000	Contour start on
	2000	Compensation ON position
	3000	Both contour & compensation start
		See notes below
rpd_typ$	70000	Pause for tool inspection (high speed surface toolpaths)
coolant$	100000	Coolant off
	200000	Coolant flood
	300000	Coolant mist
	400000	Coolant tool

The Compensation ON/OFF position flag values are added to **cend$** and **cstart$** flag, if they exist at the same location in the NCI file. Example Contour END (100) and compensation OFF (200) can occur at the same location, so the flag values are added and you will see a value of 300.

The compensation flags (2000 and 200) are independent of the compensation actually being programmed in the toolpath program! They mark where compensation would normally be activated and canceled in the toolpath by Mastercam.

The raw values shown in this chart are not the values set in the individual variables. Example: if **`cur_cflg$ = 1000`** (contour start), the variable **cstart$** is set to 1.

L Lathe Control Flags Parameters

This is written to the NCI as a six-digit number. Each digit sets the value of a different pre-defined variable, as shown in this table. The entire six-digit number is stored in the **cur_cflg$** variable.

cstop$	0	Contour stop off
	1	Contour stop on
cgstop$	00	Contour optional stop off
	10	Contour optional stop on
cend$	000	Contour end off
	100	Contour end on
	200	Compensation OFF position
	300	Both contour and compensation off
		See notes below
cstart$	0000	Contour start off
	1000	Contour start on
	2000	Compensation ON position
	3000	Both contour & compensation start
		See notes below
rpd_typ$	10000	Clear to home
	20000	Rapid to start
	30000	Rapid around obstruction
	40000	Rapid between points
	50000	Entry / Exit
	60000	Start / End rough turning cycles
	70000	Pause for tool inspection (groove toolpaths)
coolant$	100000	Coolant off
	200000	Coolant flood
	300000	Coolant mist
	400000	Coolant tool

The Compensation ON/OFF position flag values are added to **cend$** and **cstart$** flag, if they exist at the same location in the NCI file. Example: Contour END (100) and compensation OFF (200) can occur at the same location, so the flag values are added and you will see a value of 300.

The compensation flags (2000 and 200) are independent of the compensation actually being programmed in the toolpath program! They mark where compensation would normally be activated and canceled in the toolpath by Mastercam.

The raw values shown in this chart are not the values set in the individual variables. Example: if **`cur_cflg$ = 1000`** (contour start), the variable **cstart$** is set to 1.

W Wire Control Flags Parameters

This is written to the NCI as a nine-digit number. Each digit sets the value of a different pre-defined variable, as shown in this table. The entire nine-digit number is stored in the **cur_cflg$** variable.

cstop$	0	Contour stop off
	1	Contour stop on
cgstop$	00	Contour optional stop off
	10	Contour optional stop on
cend$	000	Contour end off
	100	Contour end on
	200	Compensation OFF position
	300	Both contour and compensation off
		See notes below
cstart$	0000	Contour start off
	1000	Contour start on
	2000	Compensation ON position
	3000	Both contour & compensation start
		See notes below
thrd_cut$	10000	Thread the wire
	20000	Cut the wire
water$	100000	Water off
	200000	Water on
	300000	Water option 1
power$	1000000	Power off
	2000000	Power on
tank$	10000000	Tank empty
	20000000	Tank fill
epac_flg$	100000000	Indicates that the current move is an approach point that has been added. This typically occurs if the power (epac) settings are programmed to change after the approach move.

The Compensation ON/OFF position flag values are added to **cend$** and **cstart$** flag, if they exist at the same location in the NCI file. Example: Contour END (100) and compensation OFF (200) can occur at the same location, so the flag values are added and you will see a value of 300.

The compensation flags (2000 and 200) are independent of the compensation actually being programmed in the wirepath! They mark where compensation would normally be activated and canceled in the wirepath by Mastercam.

The raw values shown in this chart are not the values set in the individual variables. Example: if **`cur_cflg$ = 1000`** (contour start), the variable **cstart$** is set to 1.

Tool information (20000s parameters)

Tool information lines are added in the 20000s lines in the NCI file. The data is presented in a two-line format:

- The first line contains the parameter number.
- The second line contains the value or values.

The second line can be interpreted as either a single string or as a series of numeric values separated by spaces. In the reference sections that follow, for each parameter there is a prototype that describes the data structure of the parameter value, followed a description of the actual values. These are not assigned variable names but can be scanned for the desired values with the function **`rpar`**.

```
g
string
```

Note that some codes might be output with a blank line if that value is not used or is otherwise not meaningful for a specific product.

The codes are divided into four sections:

- The first section contains codes numbered below 20100 and above 20500. They are either Mill/Router-specific, or are used across multiple products.
- The second section contains Lathe-specific codes, numbered from 20100–20199.
- The third section contains Wire-specific codes. Most of these are numbered above 20200.
- The fourth section describes the parameters that are used to create custom interfaces for Wire machines. These are numbered above 22000.

See **NCI Gcodes** for information about NCI Gcodes numbered from 0–1056.

See the *Working with Parameters Application Guide* to learn more about how to access these values in your post.

Mill/Router/Generic

20001 : Tool name

Used in: **Mill Lathe Router**

Definition:
```
20001
string (tool name)
```

20002 : Manufacturer's tool code

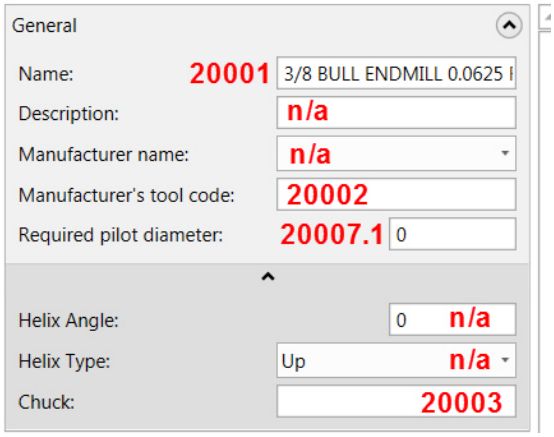
Used in: **Mill Lathe Router**

Definition:
```
20002
string (manufacturer's tool code)
```

20003 : Chuck name

Used in: **Mill Router**

Definition:
```
20003
string (chuck name)
```



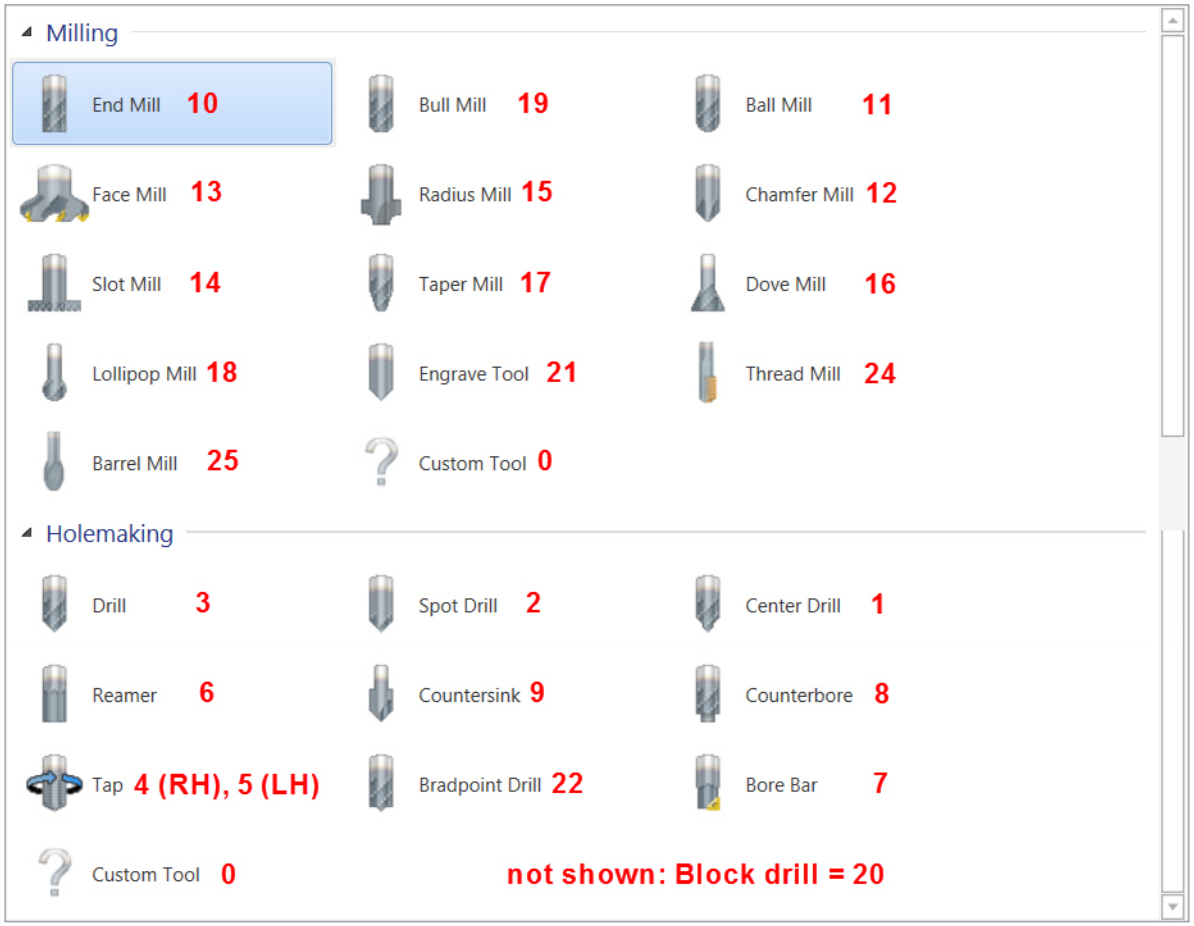
20004 : Tool definition parameters I

Used in: **Mill Router**

Definition:

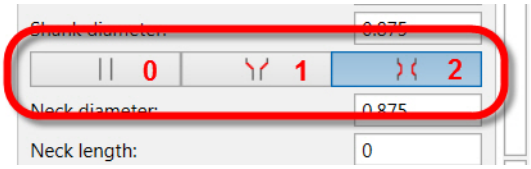
```
20004
1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22
23 24 25 26 27
```

1	Tool number
2	Tool type: 0 = Custom 1 = Center drill 2 = Spot drill 3 = Drill 4 = Right-hand tap 5 = Left-hand tap 6 = Reamer 7 = Boring bar 8 = Counterbore 9 = Countersink 10 = End mill (flat) 11 = Ball mill 12 = Chamfer mill

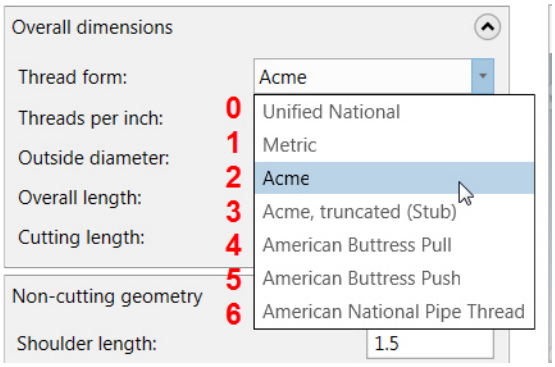


	13 = Face mill 14 = Slot mill 15 = Radius mill 16 = Dove mill 17 = Taper mill 18 = Lollipop mill 19 = Bull mill 20 = Block drill 21 = Engrave tool 22 = Bradpoint drill 23 = *future use* 24 = Thread mill 25 = Barrel mill
3	Tool material: 1 = High-speed steel (HSS) 2 = Carbide 3 = Coated carbide (Ti coated) 4 = Ceramic 5 = User defined 1 6 = User defined 1
4	Corner radius type: 0 = Flat mill 1 = Bullnose mill 2 = Spherical mill
5	Tool diameter
6	Corner radius
7	Number of threads/inch or pitch (mm)
8	Tool tip included angle
9	Diameter offset register #
10	Length offset register #
11	Linear feed rate
12	Plunge feed rate
13	Retract feed rate
14	Spindle speed
15	Coolant type *(obsolete)*
16	Number of flutes
17	Shoulder or shank diameter
18	Taper length
19	Chamfer length (tip chamfer)
20	Drill length (pilot length) for center or counter-bore drill
21	Drill diameter (pilot diameter) for center or counter-bore drill
22	Secondary radius: upper corner radius for slot mills, profile radius for barrel mills

23	Secondary chamfer length: upper corner chamfer for slot mills
24	Secondary chamfer angle: upper corner angle for slot mills
25	Shank type: 0 = straight, 1 = tapered, 2 = reduced neck:



26	Neck diameter for reduced neck shanks
27	Thread form for thread mill tool:



20005 : Cutting parameters (drills)

Used in: **Mill Router**

Definition:

```
20005
1 2 3 4 5 6 7 8 9
```

1	Canned cycle type
2	1st peck increment (% of tool diameter)
3	2nd peck increment (% of tool diameter)
4	Peck clearance (% of tool diameter)
5	Chip break (% of tool diameter)
6	Dwell in seconds
7	Tip angle
8	Thread root diameter
9	Shift value off wall for fine boring (% of tool diameter)—for boring tools only.

20006 : Cutting parameters (mills)

Used in: **Mill Router**

Definition:
```
20006
1 2 3 4 5 6 7 8 9
```

1	Type of operation: 0 = **Rough tool** and **Finish tool** 1 = **Rough tool** only 2 = **Finish tool** only
2	% of tool diameter for rough stepover (XY)
3	% of tool diameter for rough stepover (Z)
4	% of tool diameter for finish stepover (XY)
5	% of tool diameter for finish stepover (Z)
6	Tip diameter for a chamfer mill, or secondary diameter for a face mill.
7	Thread root diameter
8	*(Obsolete)*
9	*(Future use)*

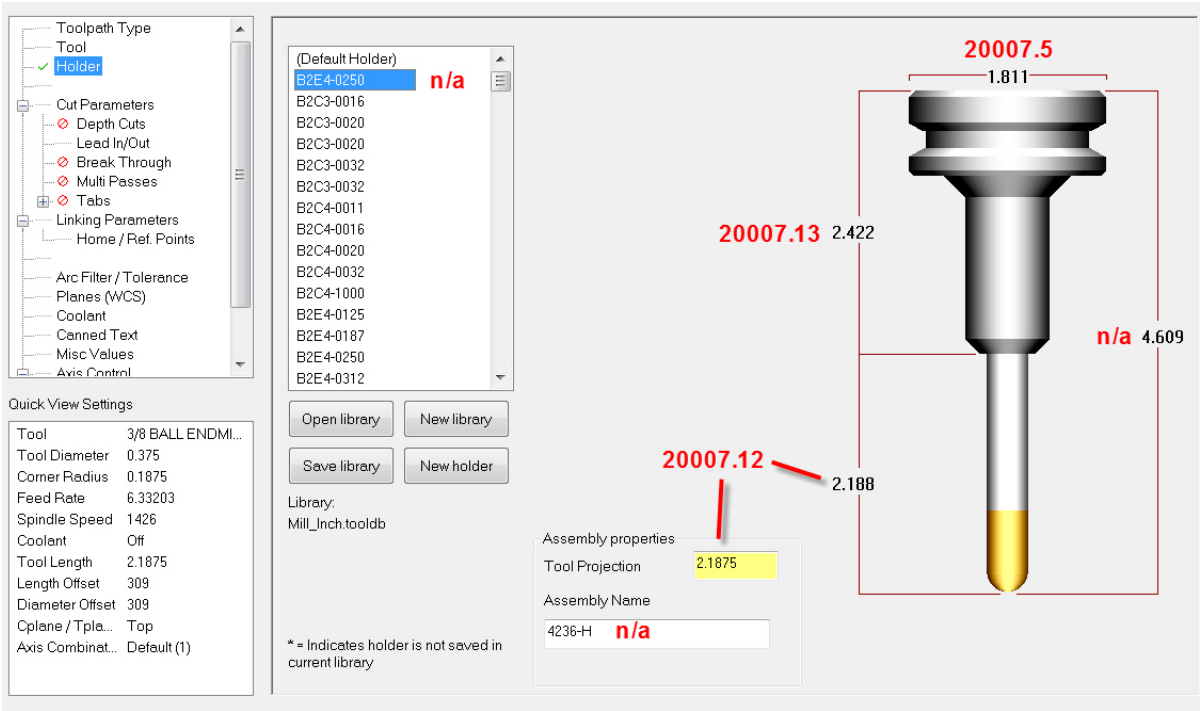
20007 : Tool definition parameters II

Used in: **Mill Router**

Definition:
```
20007
1 2 3 4 5 6 7 8 9 10 11 12 13
```

1	**Required pilot diameter** (minimum diameter required for tool to plunge)
2	Cutting length / flute length
3	Overall length
4	Shoulder length
5	Arbor diameter
6	Holder diameter *(for X6 and earlier tool definitions—deprecated for X7 and later)*

7	Holder length *(for X6 and earlier tool definitions—deprecated for X7 and later)* Parameters 6 and 7 were originally used for the holder diameter and holder length in "legacy" tool definitions—meaning tools that were created in Mastercam versions X6 and earlier. Tool holders that have been created with the newer tool holder definition functions in Mastercam X7 and later do not use these parameters. These parameters are maintained only for compatibility with older tools. If a tool definition in your part was originally created in X6 or earlier, parameters 6 and 7 will continue to be output with the original values. Otherwise, do not use them.
8	Spindle direction: 0 = CW, 1 = CCW
9	% of surface ft/min to be applied against workpiece material sfm
10	% of feed/tooth to be applied against workpiece material fpt
11	Units for: 0 = values in inches, 1 = metric
12	The **Tool Projection** distance from the **Holder** page. For pre-X8 operations, this value will not be output until the toolpath has been regenerated in X8.
13	Total holder length. For pre-X8 operations, this value will not be output until the toolpath has been regenerated in X8.



20008 : Aggregate head parameters

Used in: **Mill Router**

Definition:
```
20008
1 2 3 4 5 6 7 8 9
```

1	head axis in X
2	head axis in Y
3	head axis in Z
4	head body type: (0 = cylinder, 1 = square)
5	head body diameter
6	head body length
7	station body type (0 = cylinder, 1 = square)
8	station body diameter
9	station body length

20009 : Custom tool geometry

Used in: **Mill Router**

Definition:
```
20009
1 2
```

1	The level on which custom tool geometry is stored.
2	The source of the custom geometry (0=auto, 1=file, 2=level).

20010 : Construction plane name

Used in: **Mill Lathe Router Wire**

Definition:
```
g = 20010
string (construction plane name)
```

20011 : Construction plane commment

Used in: **Mill Lathe Router Wire**

Definition:
```
20011
string (construction plane commment)
```

This line has no value in Wire. It will be output, but will always be blank.

20012 : Tool plane name

Used in: **Mill Lathe Router Wire**

Definition:
```
20012
string (tool plane name)
```

20013 : Tool plane comment

Used in: **Mill Lathe Router Wire**

Definition:
```
20013
string (tool insert name)
```

This line has no value in Wire. It will be output, but will always be blank.

20014 : WCS plane name

Used in: **Mill Lathe Router Wire**

Definition:
```
20014
string (WCS plane name)
```

20015 : WCS plane comment

Used in: **Mill Lathe Router Wire**

Definition:
```
20015
string (WCS plane comment)
```

This line has no value in Wire. It will be output, but will always be blank.

20016 : Material name

Used in: **Mill Lathe Router**

Definition:
```
20016
string (material name)
```

This line has no value in Wire. It will be output, but will always be blank.

20017 : Material comment

Used in: **Mill Lathe Router**

Definition:
```
20017
string (material comment)
```

This line has no value in Wire. It will be output, but will always be blank.

20018 : Machine group name

Used in: **Mill Lathe Router Wire**

Definition:
```
20018
string (machine group name)
```

20501 : Nested sheet material name

Used in: **Mill Router**

Definition:
```
20501
string (material name)
```

Sheet information is output for each sheet change notification in the NCI.

20502 : Nested sheet parameters

Used in: **Mill Router**

Definition:
```
20502
1 2 3 4 5 6 7 8 9 10 11 12
```

Sheet information is output for each sheet change notification in the NCI.

1	sheet length (X dimension)
2	sheet width (Y dimension)
3	Sheet thickness (temporary placeholder)
4	sheet corner (1 = lower left, 2 = lower right, 3 = upper right, 4 = upper left)
5	sheet number
6	sheet instance
7	integer pad
8	integer pad
9	integer pad
10	real pad
11	real pad
12	real pad

20600 : Axis combination components

Used in: **Mill Router Lathe Wire**

Definition:
```
20600
1 2 3 4 5
```

A 20600 line is output for each component in the axis combination.

1	Entity ID for component
2	String ID for component
3	Axis label (absolute)
4	Axis label (incremental)
5	Component name

20601 : Axis combination info

Used in: **Mill Router Lathe Wire**

Definition:
```
20601
1 2 3 4
```

A 20601 line is output for the axis combination itself.

1	Entity ID
2	String ID
3	1=Mapped axis combination, otherwise 0
4	Axis combination name

20700 : Tool change info per data stream

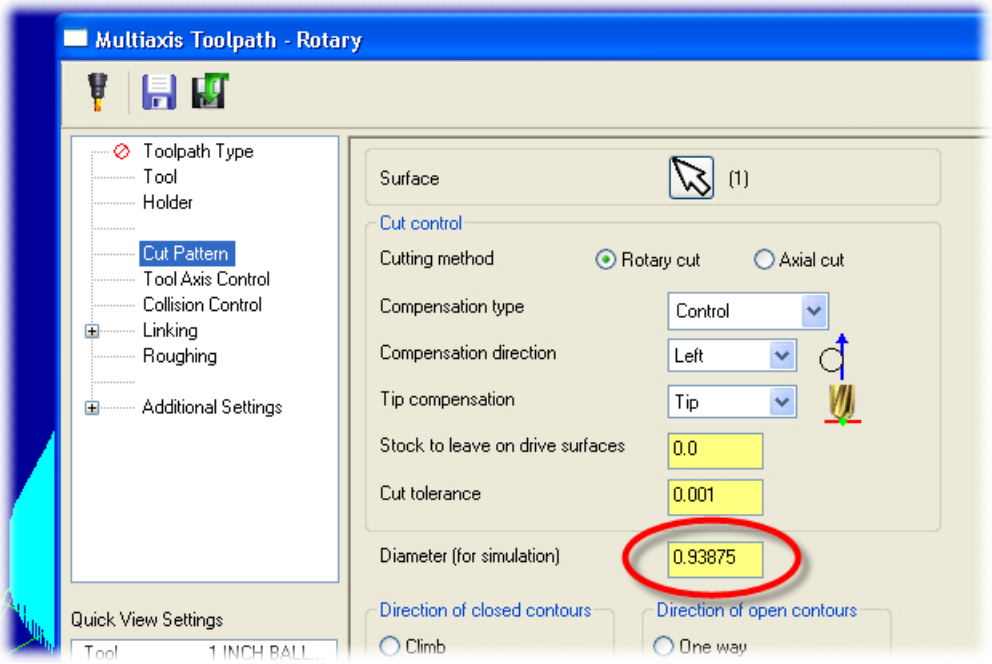
This is no longer written to the NCI, beginning with Mastercam X7.

20800 : Tool diameter for multiaxis comp in control

Used in: **Mill Router Lathe**

Definition:
```
20800
0
```

This parameter captures the tool diameter from the **Cut Pattern** page.



This is output for all operations except lathe misc ops. It will be output for tool changes and for null tool changes where the operation changes. It will be output following the 20009 line for mill tool changes, and the 20112 line for lathe tool changes.

If the operation is not a multiaxis operation, the value will be zero.

Lathe

20100 : Lathe tool programming parameters

Used in: **Lathe**

Definition:
```
20100
1 2 3 4 5 6 7 8 9
```

1	tool slot number
2	tool type: 0=General Turning Tools 1=Threading Tools 2=Grooving/Parting Tools 3=Boring Bars 4=Drills, Taps, Reamers 5=Custom Geometry Tools
3	use in top turret
4	active spindle
5	tool angle in turret (in degrees)
6	top turret
7	tool number
8	tool offsets for right edge
9	tool offsets for left edge

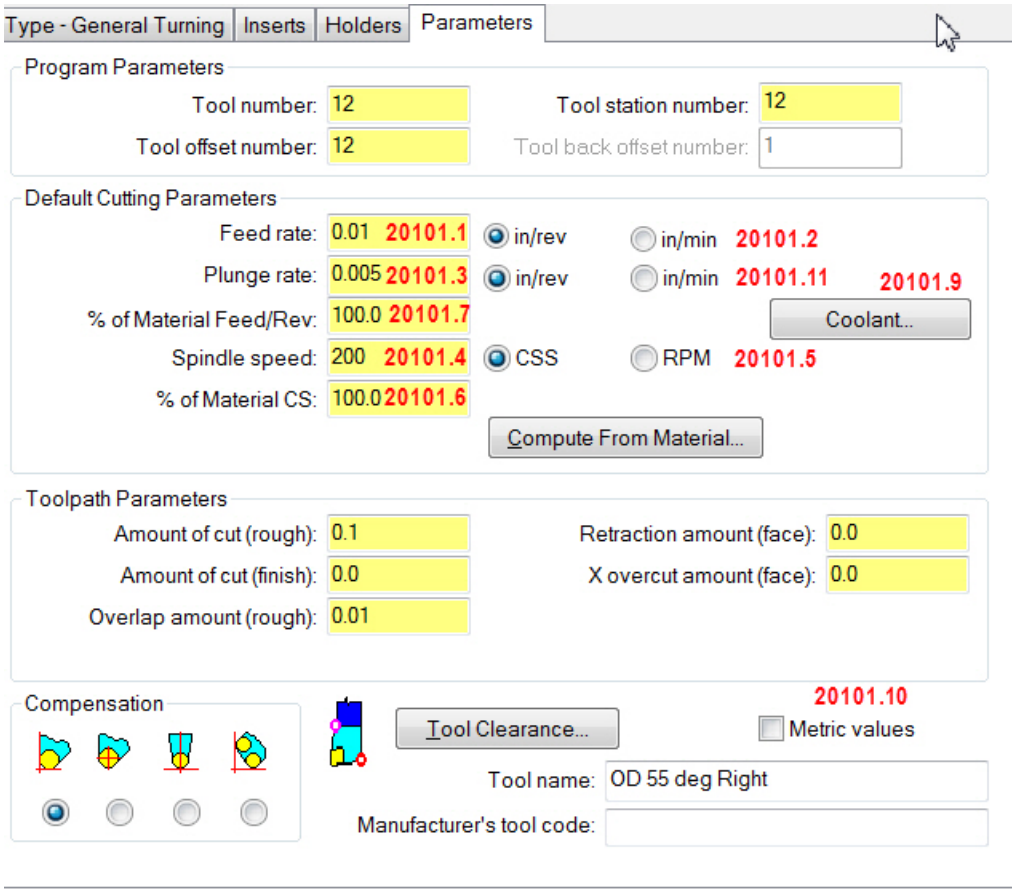
20101 : Lathe tool cutting parameters

Used in: **Lathe**

Definition:
```
20101
1 2 3 4 5 6 7 8 9 10 11
```

1	Default **Feed rate**
2	Type of default **Feed rate**: 82 = R (in/mm per rev), 77 = M (inch/mm per minute)
3	Default **Plunge rate**
4	Default **Spindle speed**
5	Units for default **Spindle speed**: 0 = **RPM**, 1 = **CSS**
6	Value in **% of Material CS** field
7	Value in **% of Material Feed/rev** field
8	Spindle direction
9	Default **Coolant** options. This value is bit-mask whose value is hex represents the on/off state and start point option for each coolant option.
10	1 = **Metric values** option selected, 0 = inch values

11	Type of default **Plunge rate**: 82 = in (mm)/rev, 77 = inch (mm)/min.



20102 : Lathe tool geometry

Used in: **Lathe**

Definition:

```
20102
1 2 3 4 5 6 7 8
```

1	tool orientation
2	tool clearance angle for programming
3	tool rake angle for programming
4	tool width for programming
5	tool height for programming
6	tool center for programming
7	tool center for programming
8	comp to center of insert nose radius

20103 : Insert name

Used in: **Lathe**

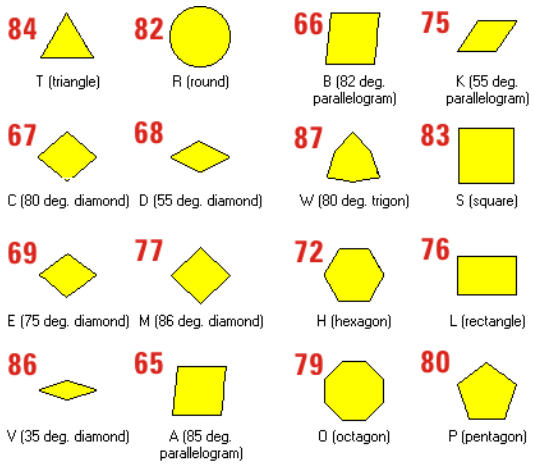
Definition:
```
20103
string (tool insert name)
```

20104 : Insert parameters

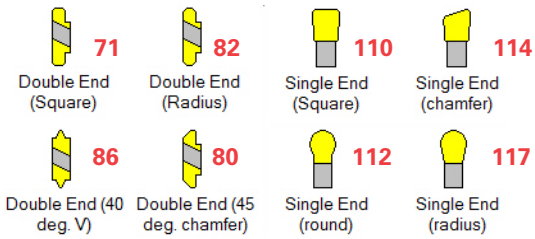
Used in: **Lathe**

Definition:
```
20104
1 2 3 4 5 6 7 8
```

1 ASCII code for the insert **Shape**. For general turning and boring tools:



For grooving tools:



2 IC diameter

3 length

4 corner radius

5 thickness

6 insert material for feed speed calculations

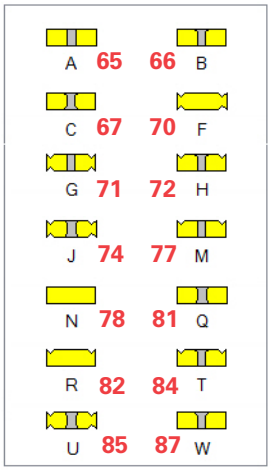
7 insert type (–1 = not used)

8 is insert defined in mm or inches?

20105 : Insert parameters, general turning/boring

Used in: **Lathe**

Definition:
```
20105
1 2 3 4 5 6 7
```

1	The ASCII code of the letter for the selected **Cross Section** type. 
2	end relief angle
3	roughing depth of cut
4	finish depth of cut
5	roughing overlap amount
6	facing retraction amount
7	facing x overcut amount

20106 : Insert parameters, threading

Used in: **Lathe**

Definition:
```
20106
1 2 3 4 5 6 7 8 9 10 11 12
```

1	insert style: 1 = top notch, 2 = lay down
2	insert type: 1 = Unified type 1 2 = Unified type 2 3 = Metric type 1 4 = Metric type 2 5 = Acme 6 = Acme stub 7 = Buttress
3	insert for external thread?
4	design thread pitch
5	top notch dist. to insert point from side of insert
6	laydown height of insert (~= thread depth)
7	width of flat for ACME, buttress

8	depth of 1st cut
9	depth of last cut
10	finish pass allowance
11	anticipated pull-off
12	number of spring cuts

20107 : Insert parameters, grooving/parting

Used in: **Lathe**

Definition:
```
20107
1 2 3 4 5 6 7 8 9 10
```

1	cutting length of insert
2	shank width
3	end length for top notch type P
4	distance to insert point for top notch type V
5	end angle for Sandvik type 5R
6	roughing depth of cut
7	finish depth of cut
8	stock clearance
9	backoff percent
10	roughing overlap amount

20108 : Drill tool parameters

Used in: **Lathe**

Definition:
```
20108
1 2 3 4 5 6 7 8 9 10 11 12 13 14
```

1	drill, tap, reamer, etc: 1=Drill 2=Center Drill 3=Countersink 4=Counterbore 5=End Mill 6=Reamer 7=Right Hand Tap 8=Left Hand Tap
2	tool diameter
3	shank diameter
4	tip included angle
5	flute length
6	length at cutting diameter
7	flute helix angle
8	number of flutes

9	chamfer height for reamers, taps
10	tip diameter for center drills
11	tip length for center drills
12	shoulder angle for center drills
13	thread pitch for taps
14	tap type: 1=Tapered Tap 2=Plug Tap 3=Bottoming Tap

20109 : Drilling parameters

Used in: **Lathe**

Definition:
```
20109
1 2 3 4 5 6
```

1	preferred drilling cycle
2	1st peck increment
3	subsequent peck increment
4	peck clearance
5	retraction amount
6	dwell time

20110 : Holder name

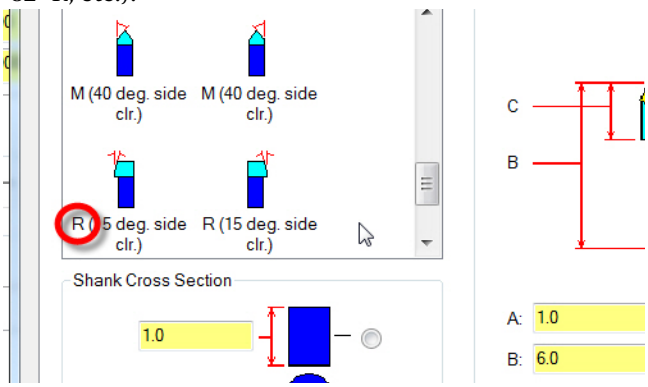
Used in: **Lathe**

Definition:
```
20110
string (tool holder name)
```

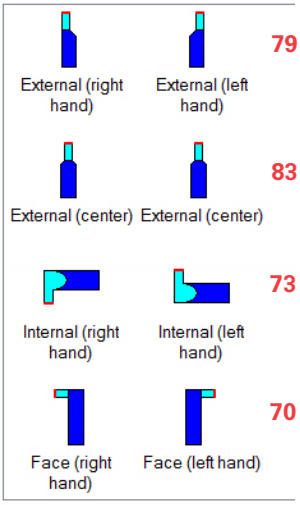
20111 : Holder parameters

Used in: **Lathe**

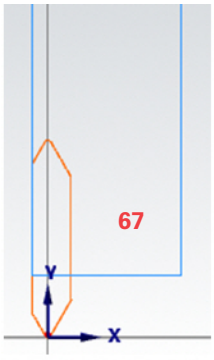
Definition: `20111`
`1 2 3 4 5 6 7 8 9 10 11 12 13 14 15`

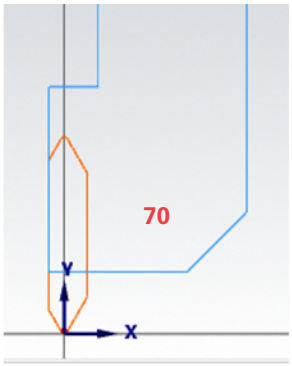
1	The ASCII code of the letter that identifies the selected holder **Style**. For general turning tools and boring bars, the code matches the picture in the dialog box (65 = A, 82=R, etc.).  For grooving and threading codes, see the charts following this table.
2	qualified length
3	maximum width
4	shank width
5	shank height
6	'head' length
7	'head' width
8	corner chamfer width
9	corner chamfer height
10	end cutting edge angle
11	side cutting edge angle
12	True = round shank
13	left hand tool?
14	vertically mounted tool?
15	is holder defined in mm or inches?

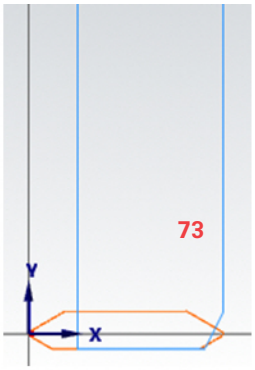
Grooving tools use the following holder style codes:

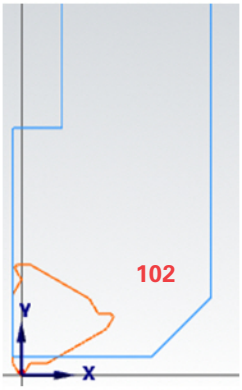


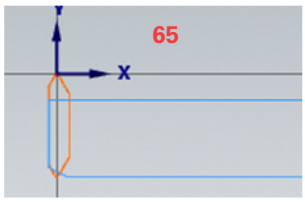
Threading tools use the following holder style codes:

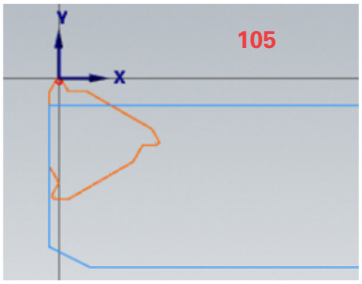












20112 : Custom tool geometry file name

Used in: **Lathe**

Definition:
```
20112
string (custom tool geometry file name)
```

29999 : Tool inspection comment

Note that this line is not output before the tool change, like the other 20000s lines—instead, it is output in the toolpath at the point where the tool inspection occurs. See the MP Application Guide, *Working with tool and operation parameters,* to learn more.

Used in: **Lathe**

Definition:
```
29999
string (lathe tool inspection comment)
```

Wire

20019 : Pass comment from power library

Used in: **Wire**

Definition:
```
20019
string (power library pass comment)
```

This line has a value in Wire only. It is output for Mill and Router toolpaths, but will be blank.

20200 : Wirepath stock to leave

Used in: **Wire**

Definition:
```
20200
1 2 3 4 5 6 7
```

1	**stock_leave$**		
2	**offset_total$**		Radius + overburn + stock-to-leave amount.
3	**offset_mach$**	0	Program coordinates; the coordinates in the NCI are already shifted by the stock-to-leave amount.
		1	Machine offset register; the stock-to-leave offset is done at the control.
4	**tlrad$**		Radius of the wire.
5	**overburn$**		
6	**cc_type$**	0	Computer
		1	Control
		2	Both
		3	Reverse both
		4	Off
7	**offset$**		Offset register number

The 20200 line is unique in that its parameters are assigned to pre-defined variables and can be accessed directly, without needing to use the standard parameter read functions. To enable this functionality, the **listrad$** switch needs to be set to 2. When **listrad$** is *not* set to 2, **tlrad$** and **offset$** are read from the tool change and 1010 lines. When **listrad$** *is* set to 2, the values from the tool change and 1010 lines are ignored. Note that **bldnxtool$** must also be set to 1.

Parameters for custom interfaces

Mastercam X4 introduced a new range of parameters numbered 22xxx. These are designed to support custom interfaces, principally for Wire. The new 22xxx parameters are designed to encapsulate settings from the new interfaces and pass them to the post. These are then read and stored during **pparameter$** like any other 20000-style parameters

- The first custom interface was the Agievision interface, introduced in Mastercam X4.
- The second custom interface was the TECH library interface for Makino and Mitsubishi machines, introduced in Mastercam X5.

The new interfaces use the following numbering scheme:

- Parameter numbers 22001–22050 will be used for generic parameters. These numbers will not be unique and will be reused in multiple interfaces. See **Common parameters** on page 117.
- Parameters numbered from 22051–22100 are used by the Agievision interface. See **Agievision parameters** on page 121.
- Parameters numbered from 22101–22150 are used by the TECH library interface. See **TECH library parameters** on page 141.

Future interfaces will be assigned new parameter numbers in blocks of 50.

Common parameters

22001 : Machine model

Used in: **Wire (custom interfaces)**

Definition:
```
22001
string (machine model)
```

From control definition. See **Control definition: Control Model page** on page 119.

22002 : Control version

Used in: **Wire (custom interfaces)**

Definition:
```
22002
1
```

From control definition. See **Control definition: Control Model page** on page 119.

Position	Description	Type	SBL command
1	Control version (0–3)	int	**none**

22003 : Piece name

Used in: **Wire (custom interfaces)**

Definition:
```
22003
string
```

This is only used by the Agievision interface. It is always 0 if the TECH library interface is selected. See **Machine group properties: Piece Details tab** on page 134.

Position	Description	Type	SBL command
1	Piece name	string	**ID_NAMEOBJ**

22004 : Piece material

Used in: **Wire (custom interfaces)**

Definition:
```
22004
string
```

See **Machine group properties: Piece Details tab** on page 134.

Position	Description	Type	SBL command
1	Material code	string	**ID_MATERIAL**

This is output as a numeric code, padded with leading zeros to 4 places. The table below lists the possible values. This is only used by the Agievision interface. It is always 0 if the TECH library interface is selected.

Table 2: Piece material codes

Value	Material
0001	Cold Die Steel

Table 2: Piece material codes

Value	Material
0011	Electrolytic Cu
0021	Graphite 1 (grain < 5µm)
0031	Tung.carbide 85 WC\15Co
0041	Aluminum
0051	Brass
0061	Sialon
0071	PCD 002 (grain 2µm)
0081	Graphite 2 (grain 5..10µm)
0091	Graphite 3 (grain > 10µm)
0101	PCD 010 (grain 10µm)
0111	PCD 025 (grain 25µm)
0121	PCD-CTC002
0122	PCD-CTB002
0123	PCD-CTB010
0124	PCD-CTB025
0125	PCD-CTH025
0126	PCD-CTM302
0131	PCD-Compax 1300
0132	PCD-Compax 1500
0133	PCD-Compax 1600
0141	PCD C30X
0151	PCB AMB90
0152	PCB DBW85
0153	PCB DBA80
0154	PCB DBC50
0155	PCB DBN45
0161	PCB BZN 8200
0162	PCB BZN 6000
0171	PCB N90
0181	CPM 10V (powder metallurgy steel)

22005 : Piece wire name

Used in: **Wire (custom interfaces)**

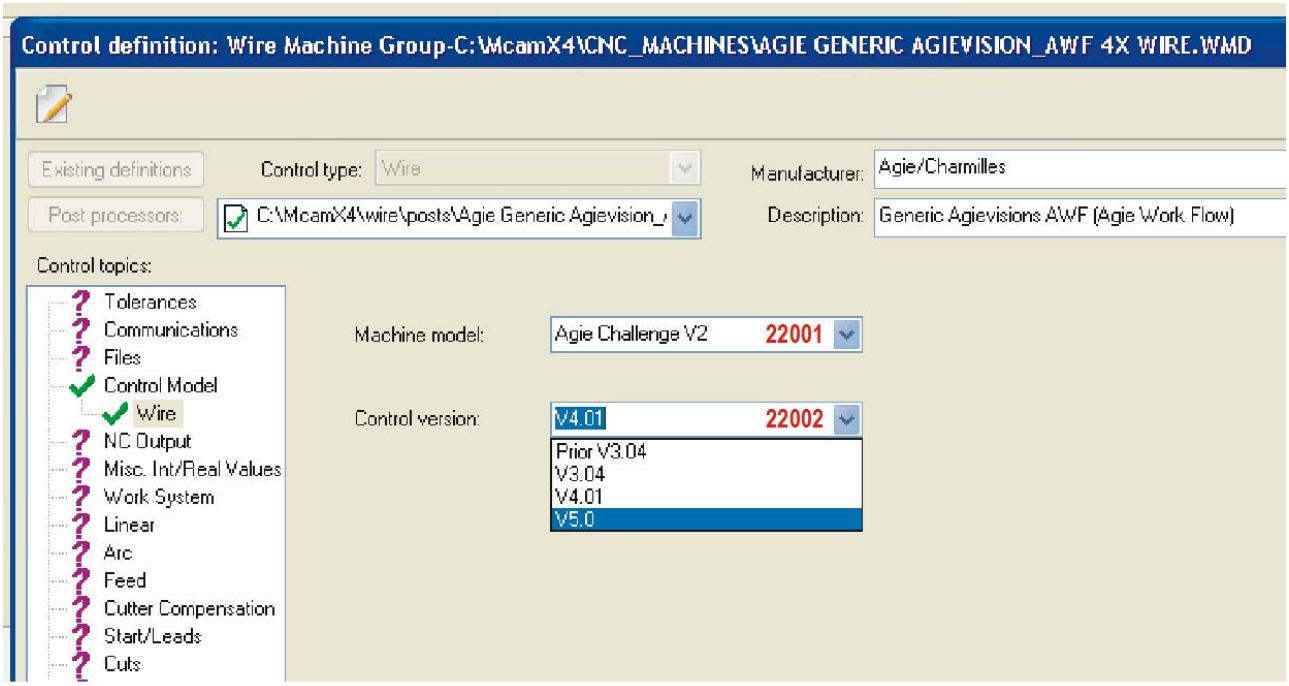
Definition: `22005`
`string`

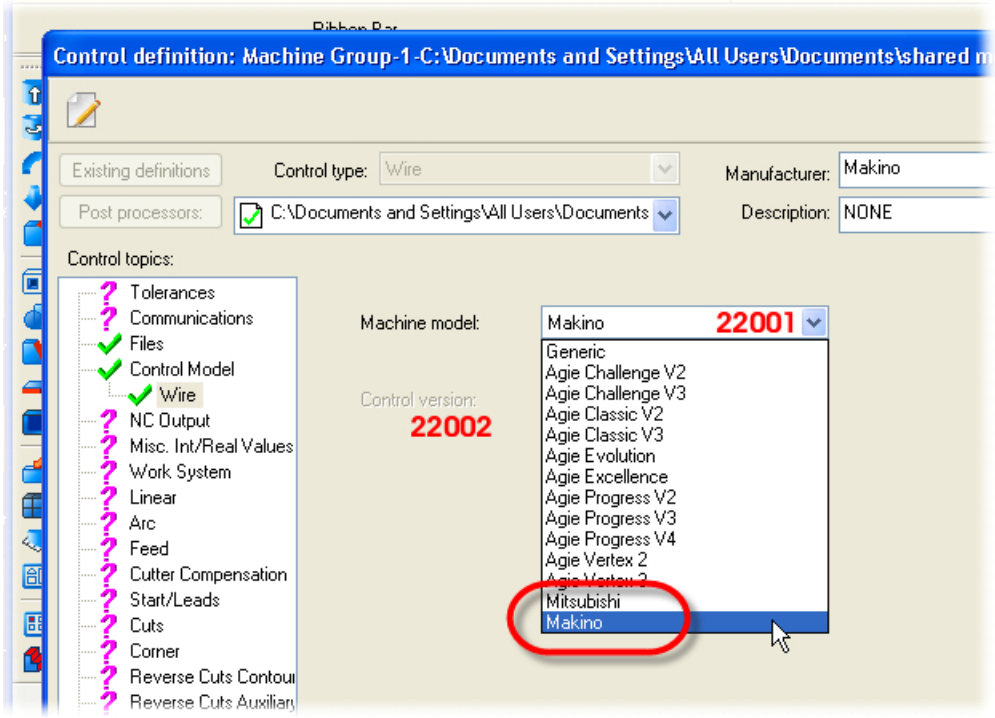
This is only used by the Agievision interface. It is always 0 if the TECH library interface is selected. See **Machine group properties: Piece Details tab** on page 134.

Position	Description	Type	SBL command
1	Piece wire name	string	**ID_THREAD**

Control definition: Control Model page

The following pictures show the **Control Model** page for both the Agievision and TECH interfaces.





The text string for the **Machine model** is output with the 22001 line. Note that for the Makino and Mitsubishi machines, the **Control version** option is disabled. This is always output as **0** on the 22002 line.

Agievision parameters

The Agievision interface introduced with Mastercam X4 includes many custom dialog boxes that mimic the look and feel of the Agievision control.

- Parameters 22051–22100 are used to output these values.
- The Agievision interface also uses 22001–22005; these are documented in **Common parameters** on page 117.

IMPORTANT: This represents a significant change from how Agie data was written out by the Agie C-Hook used in Mastercam X3. The C-Hook wrote the data to a separate .ADT file to be read by the post, instead of the 22000 parameters. Posts written for the new Agievision interface therefore need to be completely different.

You can see pictures of all the dialog boxes annotated with the parameter numbers beginning with **Machine group properties: Piece Setup tab** on page 133.

22051 : Piece quality target

Used in: **Wire (Agie interface)**

Definition:
```
22051
string (piece quality target)
```

This parameter writes the piece quality target as a string (machining quality targets are written in lines 22055–22057). The numeric real values for Ra, Tf, and Tkm that correspond to this setting are written on line 22058, parameters 1–3.

See **Machine group properties: Piece Details tab** on page 134.

22052 : Machining strategy

Used in: **Wire (Agie interface)**

Definition:
```
22052
string
```

A one- or two-letter code is written to the NCI for each strategy. See **Machine group properties: Piece Details tab** on page 134.

Position	Description	Type	SBL command
1	Strategy code	string	**ID_STATEGY**

Table 3: Machining strategy codes

Code	Strategy
A	Machine
E	Early
L	Late
W	Piece
EW	Early Piece
LW	Late Piece
WE	Piece Early

Table 3: Machining strategy codes

Code	Strategy
WL	Piece Late

22053 : Piece setup

Used in: **Wire (Agie interface)**

Definition:
```
22053
1 2 3 4 5 6 7 8 9
```

See **Machine group properties: Piece Setup tab** on page 133. (**Machine group properties: Piece Setup tab** on page 133 also lists the pre-defined variables used for the piece dimensions).

Position	Description	Type	SBL command
1	Piece reference position (X)	real	**ID_POSX**
2	Piece reference position (Y)	real	**ID_POSY**
3	Piece reference position (Z)	real	**ID_POSZ**
4	Piece reference position (C)	real	**ID_ROTATION**
5	Edge position (X)	real	**ID_POSPOSX**
6	Edge position (Y)	real	**ID_POSPOSY**
7	Edge position (Z)	real	**ID_POSPOSZ**
8	Security level	real	**ID_VALSECP**
9	Return level	real	**ID_VALRETP**

22054: Machining name

Used in: **Wire (Agie interface)**

Definition:
```
22054
string
```

See **Wirepath parameters: Machining page** on page 134.

Position	Description	Type	SBL command
1	Machining name	string	**Create working**

22055: Machining quality target (No Core Group, Collar LC1 wirepaths)

Used in: **Wire (Agie interface)**

Definition:
```
22055
string (machining quality target)
```

This parameter outputs the machining quality target as a string. Lines 22055, 22056, and 22057 all output the machining quality target, but for different types of wirepaths.

The numeric real values for Ra, Tf, and Tkm that correspond to this setting are output on line 22058, parameters 6–8.

See **Wirepath parameters: Machining page** on page 134.

Position	Description	Type	SBL command
1	Machining quality target	string	**ID_QUALITY**

22056: Machining quality target (No Core Rough, Collar LC2 wirepaths)

Used in: **Wire (Agie interface)**

Definition:
```
22056
string (machining quality target)
```

This parameter outputs the machining quality target as a string. Lines 22055, 22056, and 22057 all output the machining quality target, but for different types of wirepaths.

The numeric real values for Ra, Tf, and Tkm that correspond to this setting are output on line 22058, parameters 11–13.

See **Wirepath parameters: Machining page** on page 134.

Position	Description	Type	SBL command
1	Machining quality target	string	**ID_QUALITY**

22057: Machining quality target (No Core Finish, Collar LC3, Contour, and 4-axis wirepaths)

Used in: **Wire (Agie interface)**

Definition:
```
22057
string (machining quality target)
```

This parameter outputs the machining quality target as a string. Lines 22055, 22056, and 22057 all output the machining quality target, but for different types of wirepaths.

The numeric real values for Ra, Tf, and Tkm that correspond to this setting are output on line 22058, parameters 16–18.

See **Wirepath parameters: Machining page** on page 134.

Position	Description	Type	SBL command
1	Machining quality target	string	**ID_QUALITY**

22058: Quality info

Used in: **Wire (Agie interface)**

Definition:
```
22058
1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20
```

This line has 4 sets of 5 parameters, one for each of 4 quality targets. See **Machine group properties: Piece Details tab** on page 134 and **Wirepath parameters: Machining page** on page 134.

Position	Description	Type	SBL command
1	Piece quality (22051)—Ra	real	**none**

Position	Description	Type	SBL command
2	Piece quality (22051)—Tf	real	**none**
3	Piece quality (22051)—Tkm	real	**none**
4	Speed/quality options (22051): ▪ 0 = neither ▪ 1 = Speed ▪ 2 = Quality ▪ 3 = both	int	**none**
5	Create quality checkbox (22051). See **Wirepath parameters: User Tech (Technology Database) dialog box** for parameters 4 & 5.	int	**none**
6	Quality LC1 (22055)—Ra	real	**none**
7	Quality LC1 (22055)—Tf	real	**none**
8	Quality LC1 (22055)—Tkm	real	**none**
9	Speed/quality options (Quality LC1 :22055): ▪ 0 = neither ▪ 1 = Speed ▪ 2 = Quality ▪ 3 = both	int	**none**
10	Create quality checkbox (Quality LC1 : 22055). See **Wirepath parameters: User Tech (Technology Database) dialog box** for parameters 9 & 10.	int	**none**
11	Quality LC2 (22056)—Ra	real	**none**
12	Quality LC2 (22056)—Tf	real	**none**
13	Quality LC2 (22056)—Tkm	real	**none**
14	Speed/quality options (Quality LC2 :22056): ▪ 0 = neither ▪ 1 = Speed ▪ 2 = Quality ▪ 3 = both	int	**none**
15	Create quality checkbox (Quality LC2 : 22056). See **Wirepath parameters: User Tech (Technology Database) dialog box** for parameters 14 & 15.	int	**none**
16	Quality LC3 (22057)—Ra	real	**none**
17	Quality LC3 (22057)—Tf	real	**none**
18	Quality LC3 (22057)—Tkm	real	**none**
19	Speed/quality options (Quality LC3: 22057): ▪ 0 = neither ▪ 1 = Speed ▪ 2 = Quality ▪ 3 = both	int	**none**

Position	Description	Type	SBL command
20	Create quality checkbox (Quality LC3: 22057). See **Wirepath parameters: User Tech (Technology Database) dialog box** for parameters 19 & 20.	int	**none**

22059 : Machining wire name

Used in: **Wire (Agie interface)**

Definition:
```
22059
string
```

See **Wirepath parameters: Machining page** on page 134.

Position	Description	Type	SBL command
1	Machining wire name	string	**ID_THREAD**

22060: Machining data

Used in: **Wire (Agie interface)**

Definition:
```
22060
1 2 3 4 5 6 7 8
```

See **Wirepath parameters: Machining page** on page 134.

Position	Description	Type	SBL command
1	Priority	int	**ID_PRIORITY**
2	Technological height	real	**ID_HEIGHT**
3	Machine reference (X+)	real	**ID_POSX**
4	Machine reference (Y+)	real	**ID_POSY**
5	Machine reference (Z)	real	**ID_POSZ**
6	Machine reference (A)	real	**ID_POSA**
7	Machine reference (B)	real	**ID_POSB**
8	Machine reference (C)	real	**ID_ROTATION**

22061: Agie cut data

Used in: **Wire (Agie interface)**

Definition:
```
22061
1 2 3 4 5 6 7 8 9 10 11 12
```

See **Wirepath parameters: Cut parameters page** on page 136.

Position	Description	Type	SBL command
1	Compensation: punch vs. die ▪ 0= punch ▪ 1 = die ▪ –1 = disabled (for example, an open chain)	int	**ID_PUNCH**
2	Compensation: left or right ▪ 0= left ▪ 1 = right ▪ –1 = disabled (for example, a closed chain)	int	**ID_PUNCH**
3	Has minimum Agievision radius been applied to the last cut ?	int	**ID_RADIUSMINLA**
4	*Not used*	*int*	
5	Reverse cut?	int	**ID_REVCUT**
6	The number of working steps without inversion.	int	**ID_ASWITHOUT**
7	Separation cut length	real	**ID_SEPCUT**
8	Separation cut clearance	real	**ID_CLEARANCETRENN**
9	Clearance distance between punch and die chains	real	**ID_CLEARANCE**
10	*Not used*	*int*	
11	*Not used*	*int*	
12	*Not used*	*real*	

22062: Start point name

Used in: **Wire (Agie interface)**

Definition:
```
22062
string
```

See **Wirepath parameters: Start Point page** on page 136.

Position	Description	Type	SBL command
1	Start point name	string	**ID_STP**

22063: Start point data

Used in: **Wire (Agie interface)**

Definition: `22063`
`1 2 3 4`

See **Wirepath parameters: Start Point page** on page 136.

Position	Description	Type	SBL command
1	Start point (X)	real	**ID_POSX**
2	Start point (Y)	real	**ID_POSY**
3	Start point (Z)	real	**ID_POSZ**
4	Start point diameter	real	**ID_DIAMETER**

22064: Entry data

Used in: **Wire (Agie interface)**

Definition: `22064`
`1 2 3 4 5 6 7 8`

See **Wirepath parameters: Entry page** on page 137.

Position	Description	Type	SBL command
1	Entry position: ▪ 0= Beginning of element ▪ 1 = Middle of element ▪ 2 = End of element	int	**ID_ENTRYTIPO**
2	Type of entry: ▪ 0= Free ▪ 1 = Perpendicular ▪ 2 = Tangential	int	**ID_ENTRYMODE**
3	Contour separation distance	real	**ID_GEOCOMTRENN**
4	Entry distance	real	**ID_COMMPOINTENTRY**
5	Increment entries (increment distance for each working step)	real	**ID_SETENTD**
6	Entry dislocation (new entry distance from previous entry point)	real	**ID_SETENTM**
7	Entry “A” distance (deviation distance from start point to contour entry, in Y direction)	real	**ID_SETENTA**
8	Entry “B” distance (deviation distance from start point to contour entry, in X direction)	real	**ID_SETENTB**

22065: Exit data

Used in: **Wire (Agie interface)**

Definition: `22065`
`1 2 3 4`

See **Wirepath parameters: Exit page** on page 137.

Position	Description	Type	SBL command
1	Type of exit: ▪ 0= Free ▪ 1 = Perpendicular ▪ 2 = Tangential	int	**ID_EXITMODE**
2	Exit distance	real	**ID_COMMPOINTEXIT**
3	Exit "A" distance (deviation distance from contour exit, parallel to exit contour element)	real	**ID_SETUSCA**
4	Exit "B" distance (deviation distance from contour exit, perpendicular to exit contour element)	real	**ID_SETUSCB**

22066: Taper thread data

Used in: **Wire (Agie interface)**

Definition: `22066`
`1 2 3 4 5 6 7`

See **Wirepath parameters: Threading page** on page 138.

Position	Description	Type	SBL command
1	Taper thread (X)	real	**ID_POSX**
2	Taper thread (Y)	real	**ID_POSY**
3	Taper thread (Z)	real	**ID_POSZ**
4	Taper thread (Xs)	real	**ID_POSX_S**
5	Taper thread (Ys)	real	**ID_POSY_S**
6	Taper thread (Zs)	real	**ID_POSZ_S**
7	Start hole diameter	real	**ID_DIAMETER**

22067: Taper data

Used in: **Wire (Agie interface)**

Definition:
```
22067
1 2 3 4 5 6
```

These parameters are only used for Contour wirepaths. See **Wirepath parameters: Taper page** on page 138.

Position	Description	Type	SBL command
1	Taper type and direction: ▪ 0 = left taper (upper wire guide moves left) ▪ 1 = right taper (upper wire guide moves right) ▪ 2 = fixed taper (defined by the X and Y component fields)	int	**ID_TAPERMODE**
2	Taper (Z)	real	**ID_POSZ**
3	Taper angle; if taper type = 0, **ID_TAPER** is output as negative value, if taper type = 1, **ID_TAPER** is output as positive value.	real	**ID_TAPER**
4	Taper (X component)	real	**ID_TAPER**
5	Taper (Y component)	real	**ID_TAPERP**
6	Isoradius: ▪ 0 = Default (conical) ▪ 1 = Isoradius	int	**none**

22068: Corner data

Used in: **Wire (Agie interface)**

Definition:
```
22068
1 2 3 4
```

See **Wirepath parameters: Corners page** on page 139.

Position	Description	Type	SBL command
1	External corner type: ▪ 0 = Minimum radius ▪ 1 = Sharp-edged ▪ 2 = Fixed radius	int	**ID_E_TYPE**
2	External corner radius (for fixed-radius corners)	real	**ID_E_VALUE**
3	Internal corner type: ▪ 0 = Minimum radius ▪ 1 = Sharp-edged ▪ 2 = Fixed radius	int	**ID_I_TYPE**
4	Internal corner radius (for fixed-radius corners)	real	**ID_I_VALUE**

22069: Attribute data

Used in: **Wire (Agie interface)**

Definition: `22069`
`1 2 3 4`

See **Wirepath parameters: Attributes page** on page 139.

Position	Description	Type	SBL command
1	Piece difficulty level: ▪ 0 = Normal ▪ 1 = More difficult ▪ 2 = Still more difficult ▪ 3 = Most difficult Note: these are written to the NCI as 0–3, but are written to the SBL file as 1–4.	int	**ID_WORKCOND**
2	Trim cut security level increment	real	**ID_DELTAPS**
3	*Not used*	*int*	

22070: Collar data

Used in: **Wire (Agie interface)**

Definition:
```
22070
1 2 3 4 5
```

These parameters are used for collar operations only. Note that the quality setting parameters for LC1, LC2, and LC3 are output on line 22058. See **Wirepath parameters: Collar page** on page 140.

Position	Description	Type	SBL command
1	Type of collar: ▪ 0 = Conical section of wirepath opens to the top ▪ 1 = Conical section of wirepath opens to the bottom ▪ 2 = Conical sections of wirepath open to both the top and bottom	int	**ID_COLLAR**
2	Collar Z1	real	**ID_POSZ**
3	Collar Alfa 1 (taper angle)	real	**ID_TAPER**
4	Collar Z2	real	**ID_POSZ**
5	Collar Alfa 2 (taper angle)	real	**ID_TAPER**

22071: Group name

Used in: **Wire (Agie interface)**

Definition:
```
22071
string
```

This is used for No core and collar operations only. See **Wirepath parameters: Group page** on page 140.

Position	Description	Type	SBL command
1	Group name	string	**CreateGroup**

22072: Group wire name

Used in: **Wire (Agie interface)**

Definition:
```
22072
string
```

This is used for No core and collar operations only. See **Wirepath parameters: Group page** on page 140.

Position	Description	Type	SBL command
1	Group wire name	string	**ID_THREAD**

22073: Group data

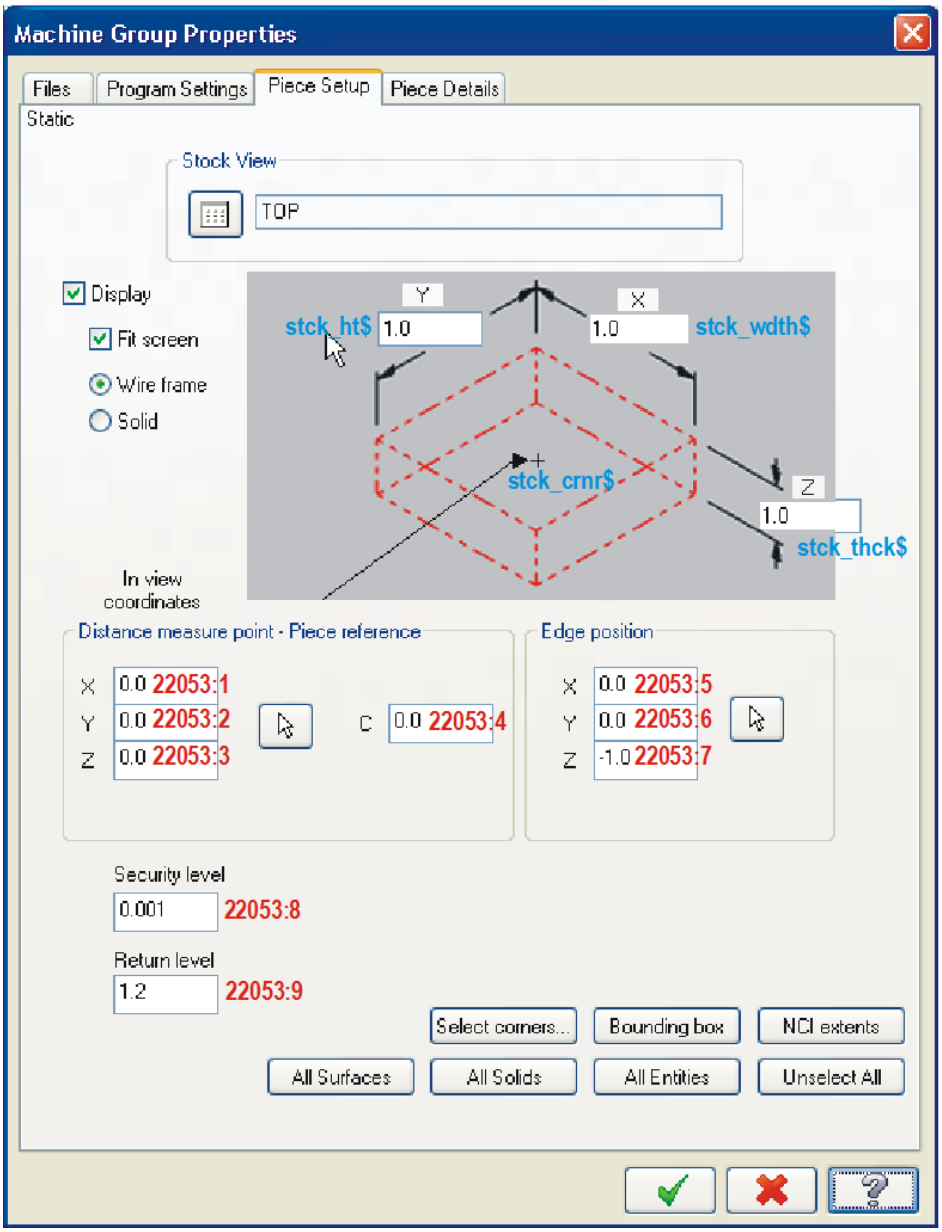
Used in: **Wire (Agie interface)**

Definition: `22073`
`1 2 3 4 5 6 7`

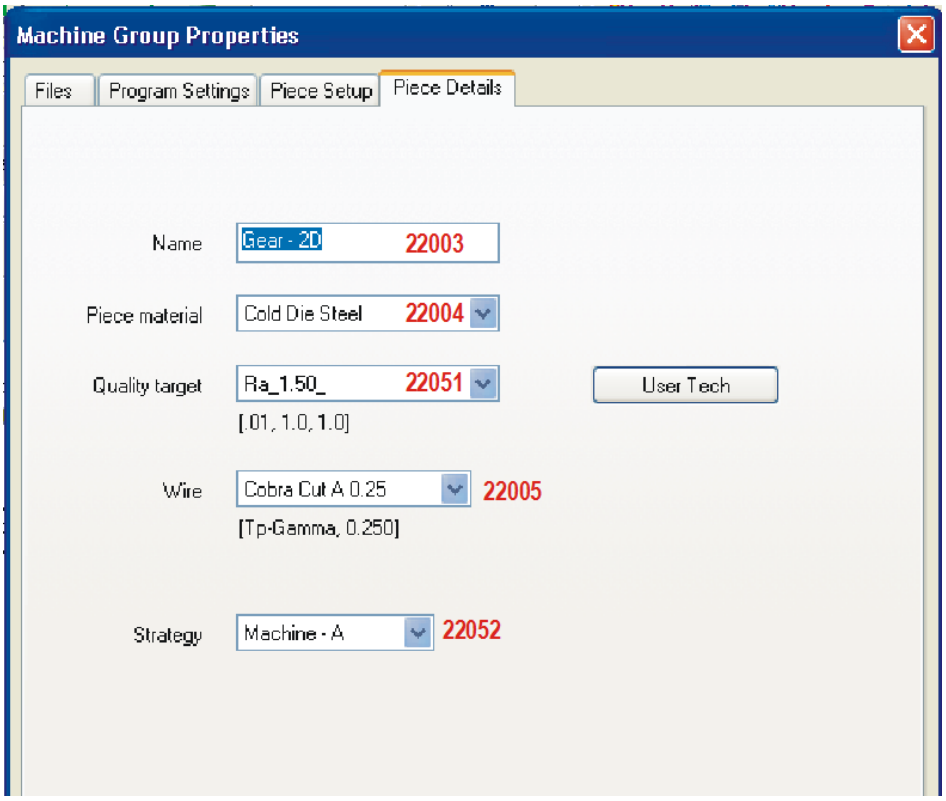
These parameters are used for No core and collar operations only. See **Wirepath parameters: Group page** on page 140.

Position	Description	Type	SBL command
1	Erosion sequence priority for group.	int	**ID_PRIORITY**
2	Group machine reference (X)	real	**ID_POSX**
3	Group machine reference (Y)	real	**ID_POSY**
4	Group machine reference (Z)	real	**ID_POSZ**
5	Group machine reference (A)	real	**ID_POSA**
6	Group machine reference (B)	real	**ID_POSB**
7	Group machine reference (C)	real	**ID_ROTATION**

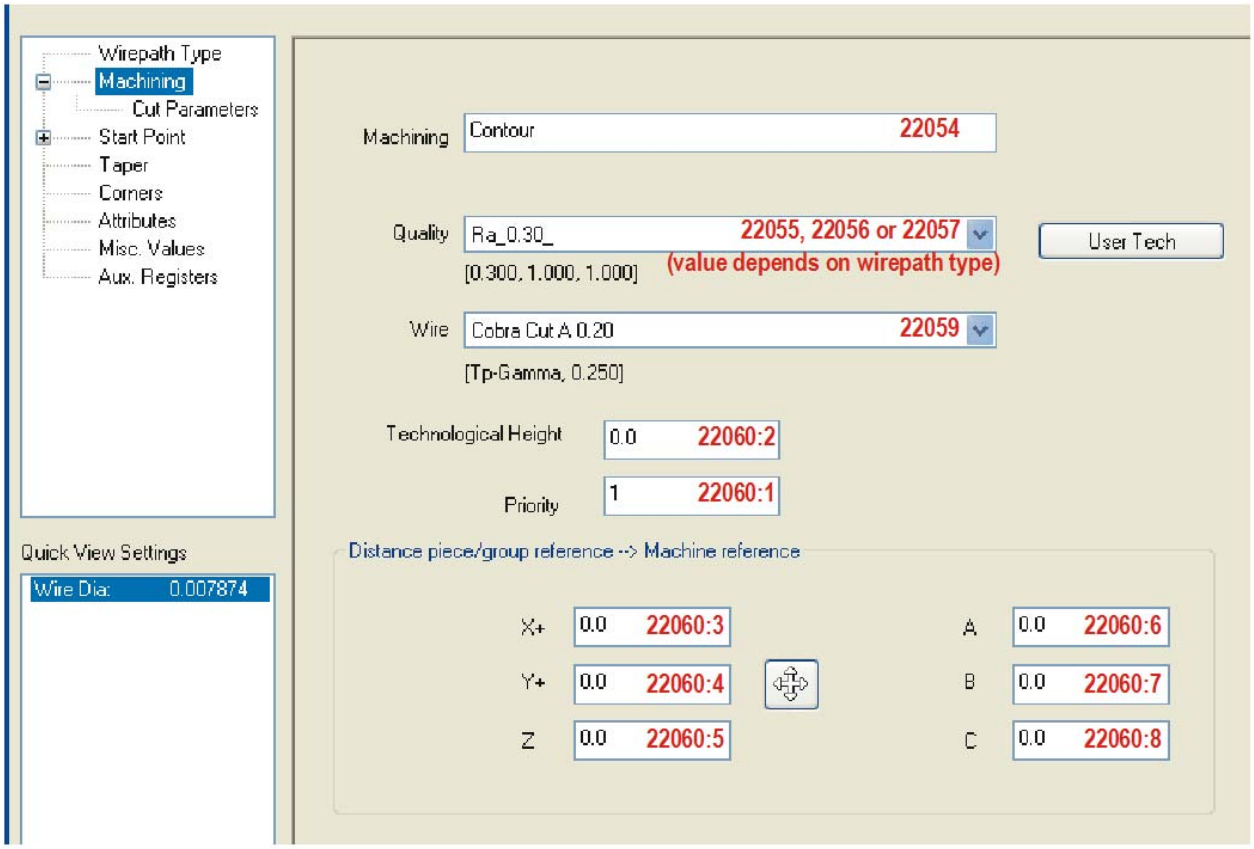
Machine group properties: Piece Setup tab



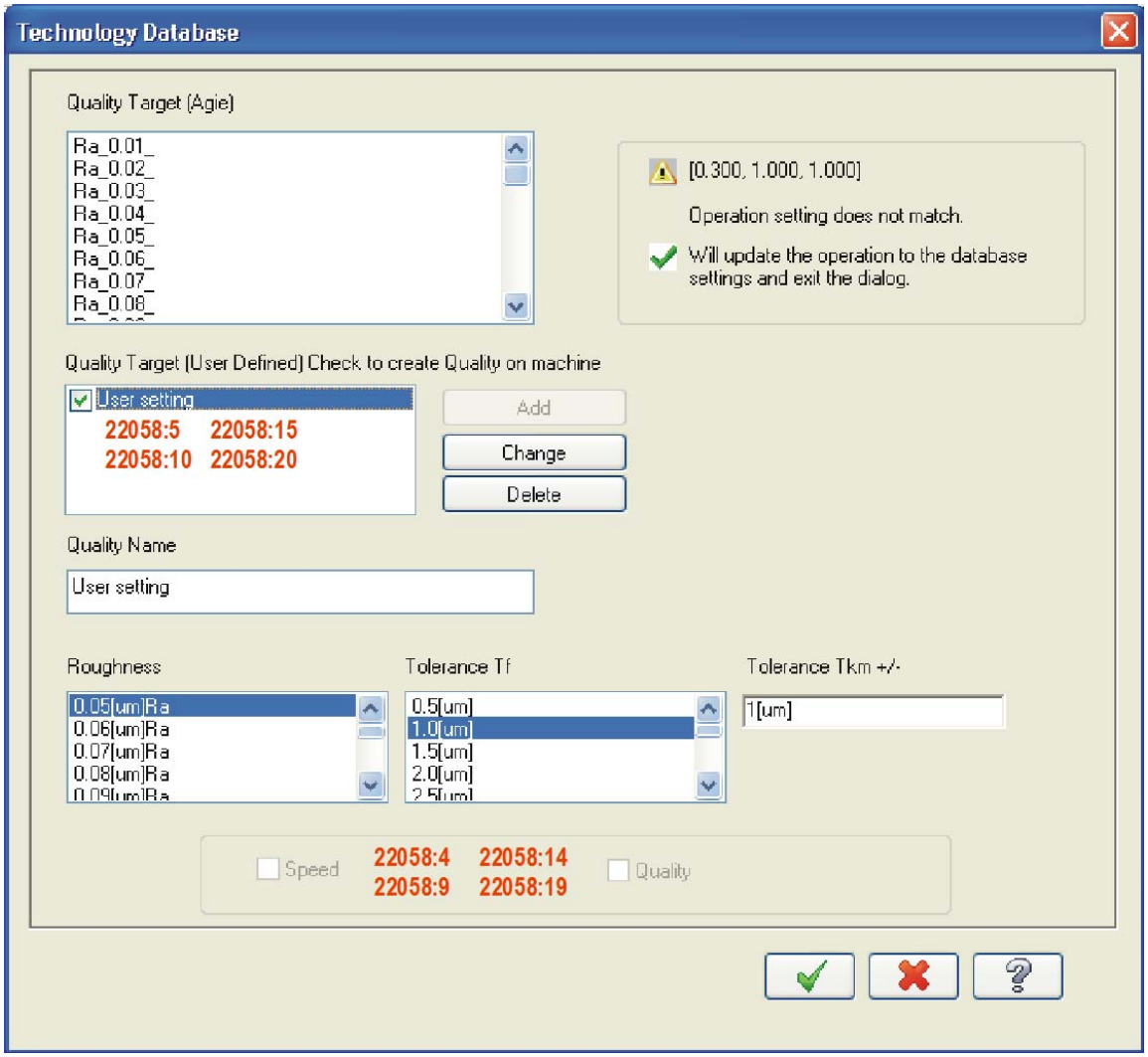
Machine group properties: Piece Details tab



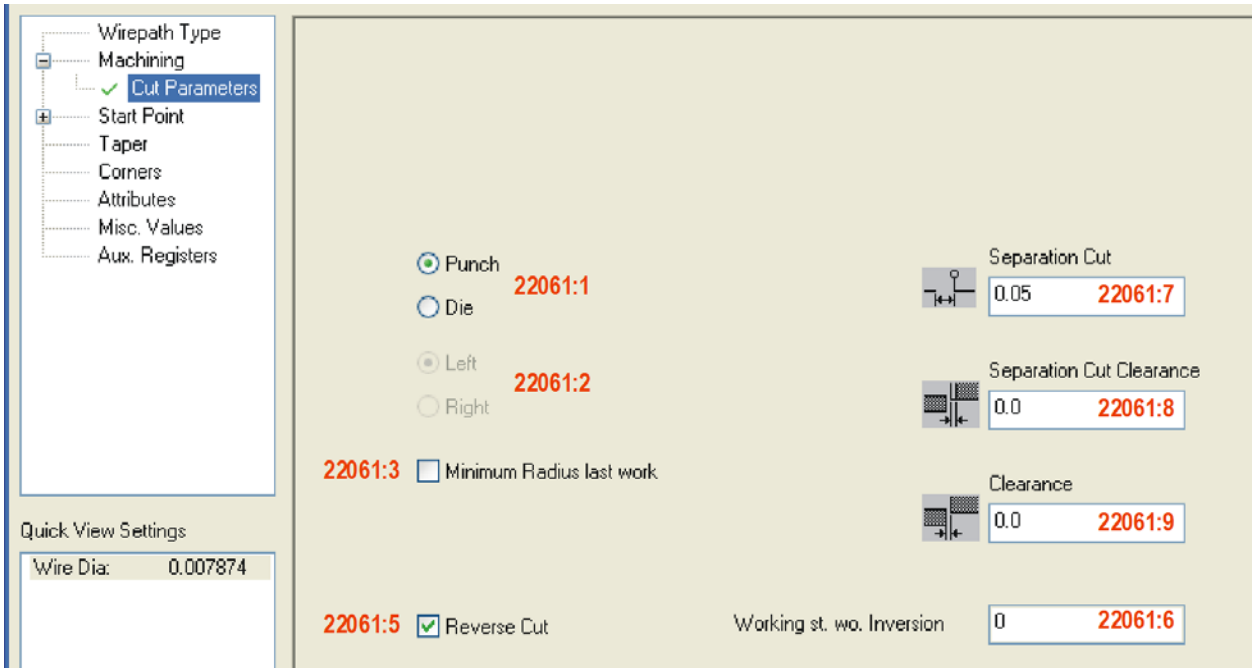
Wirepath parameters: Machining page



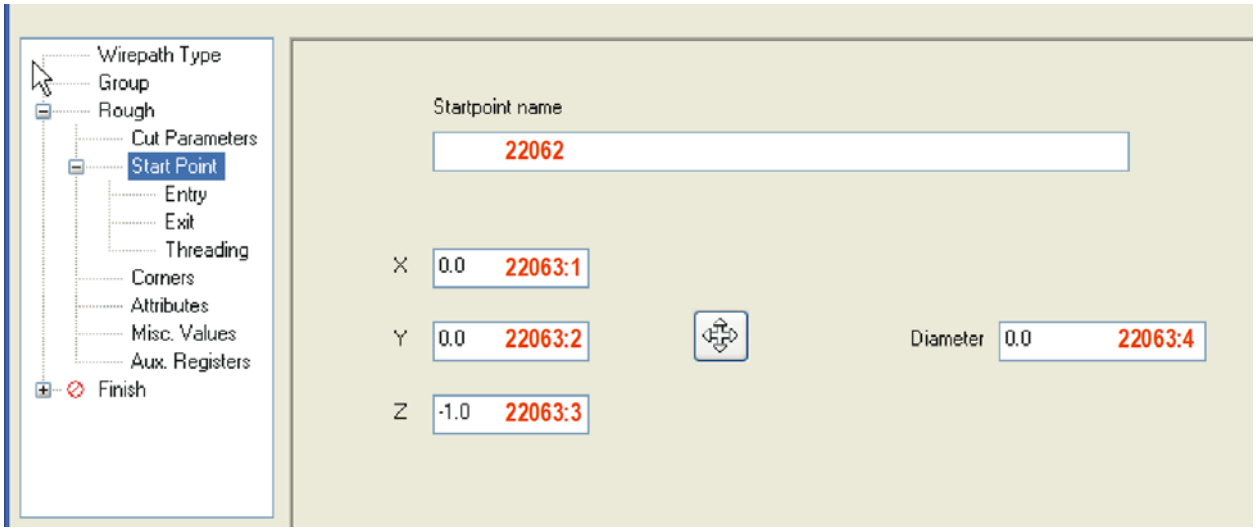
Wirepath parameters: User Tech (Technology Database) dialog box



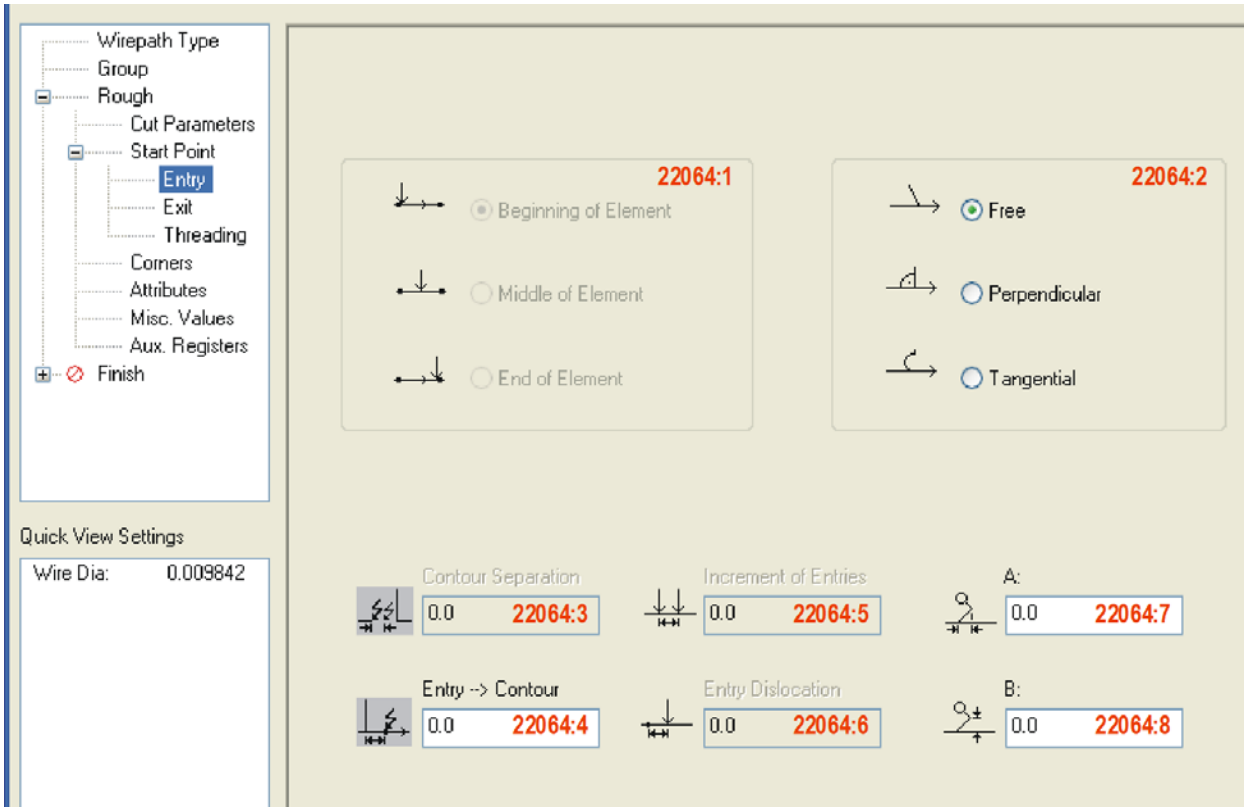
Wirepath parameters: Cut parameters page



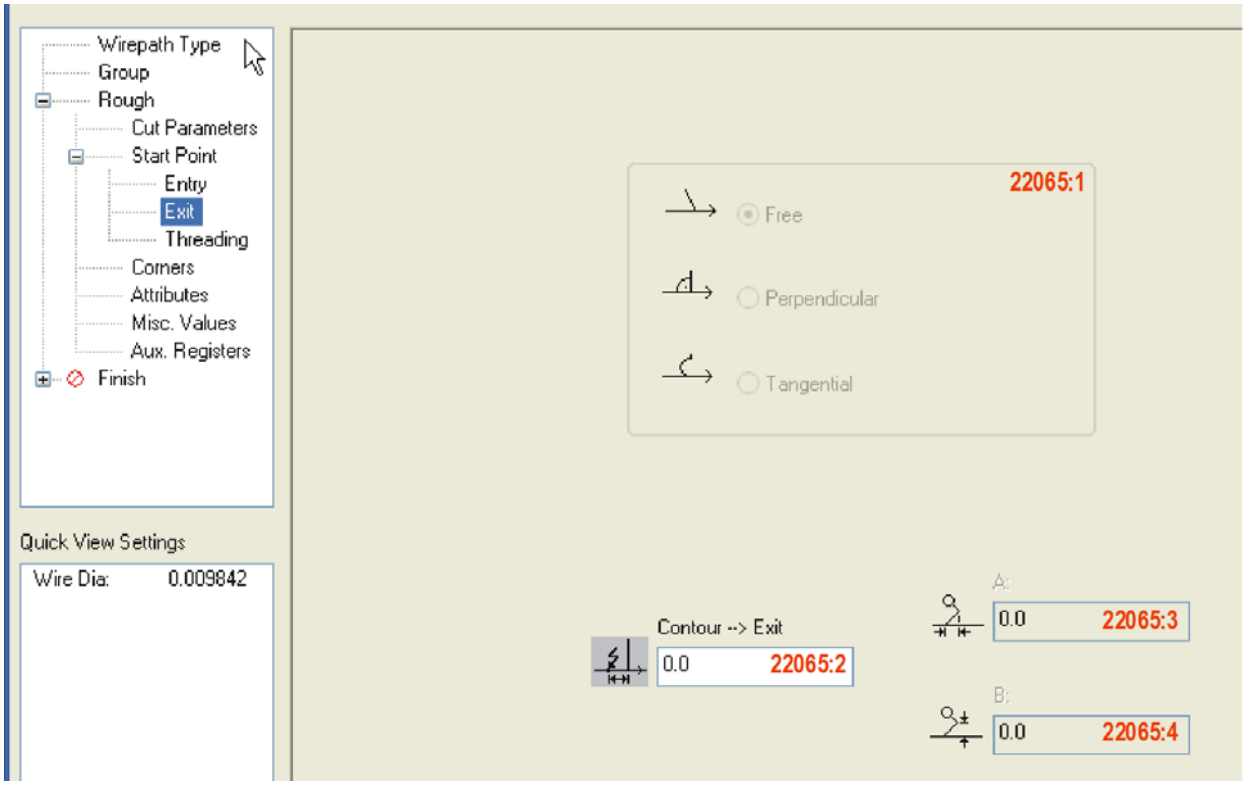
Wirepath parameters: Start Point page



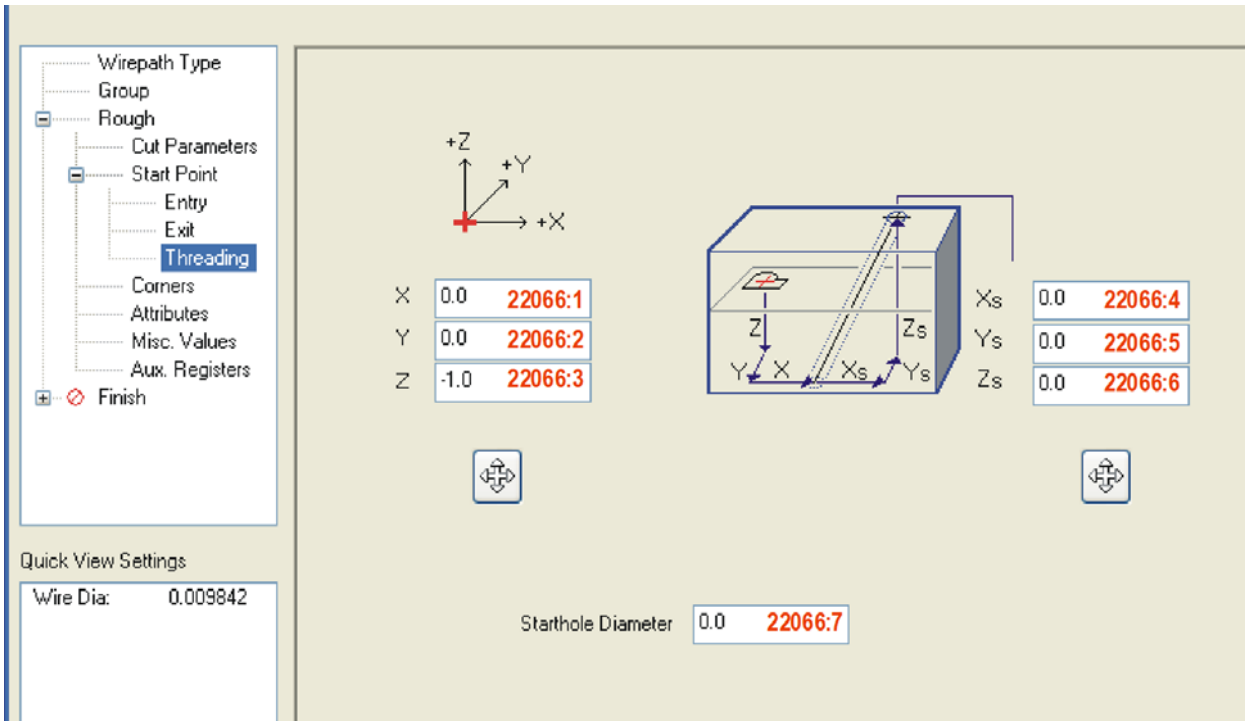
Wirepath parameters: Entry page



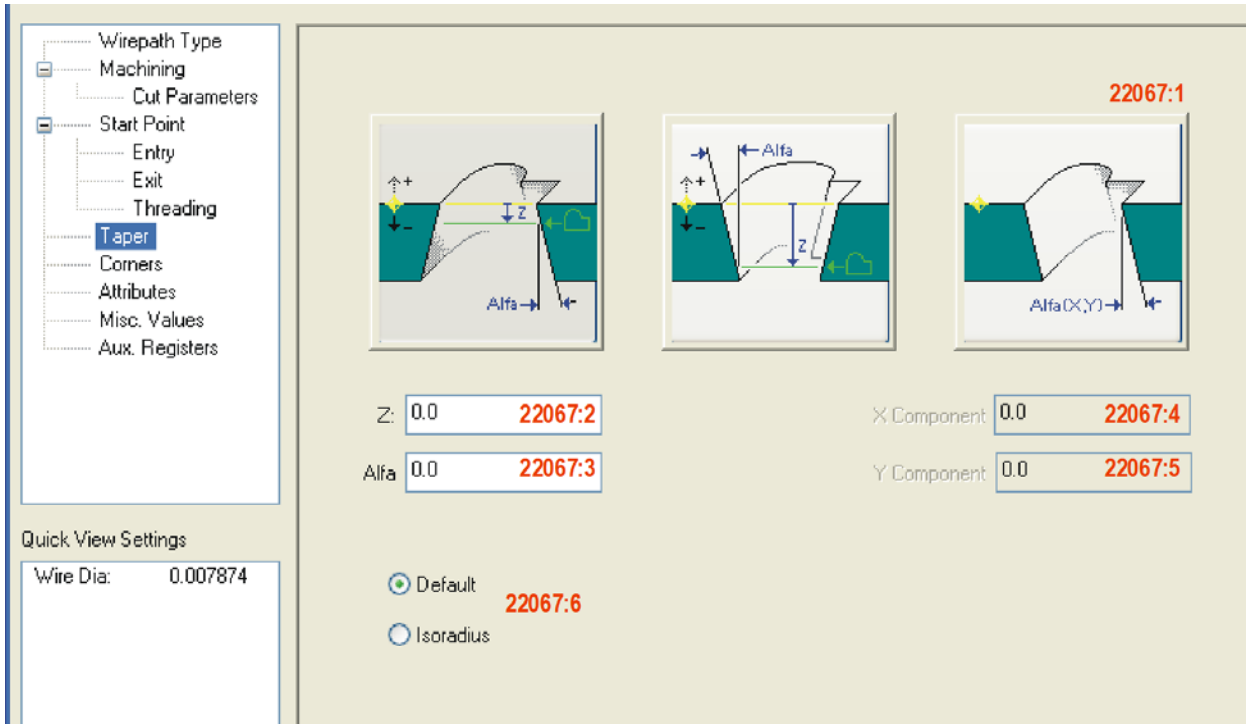
Wirepath parameters: Exit page



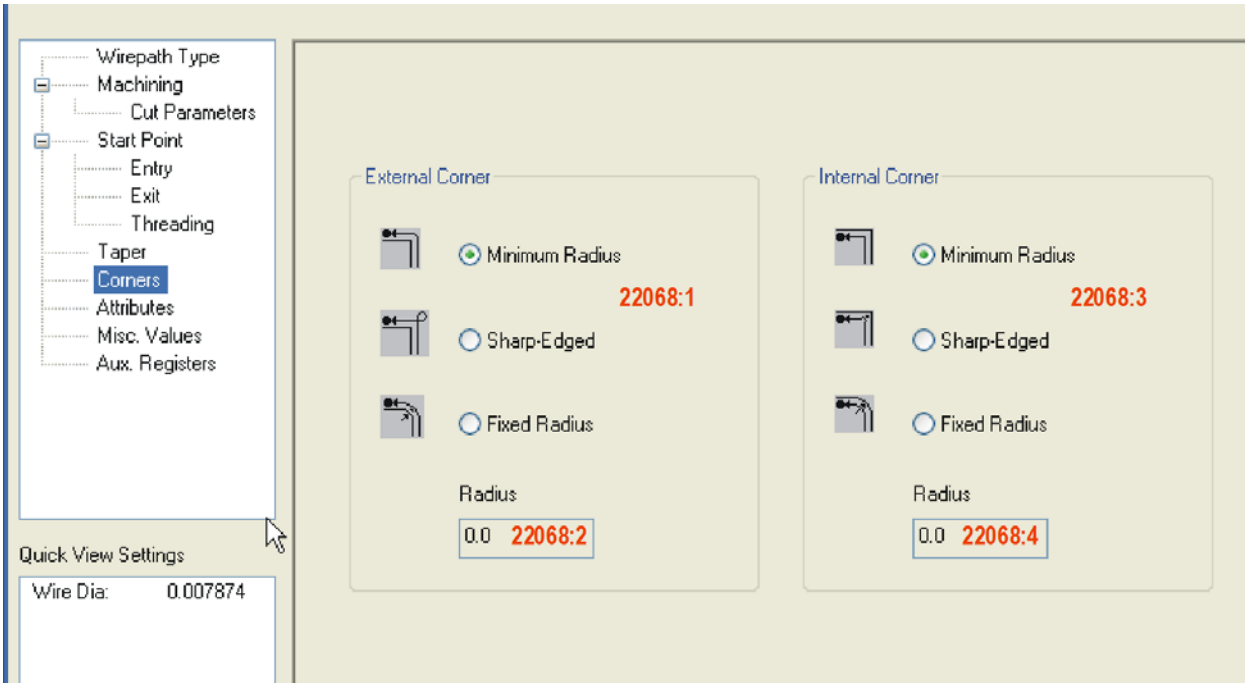
Wirepath parameters: Threading page



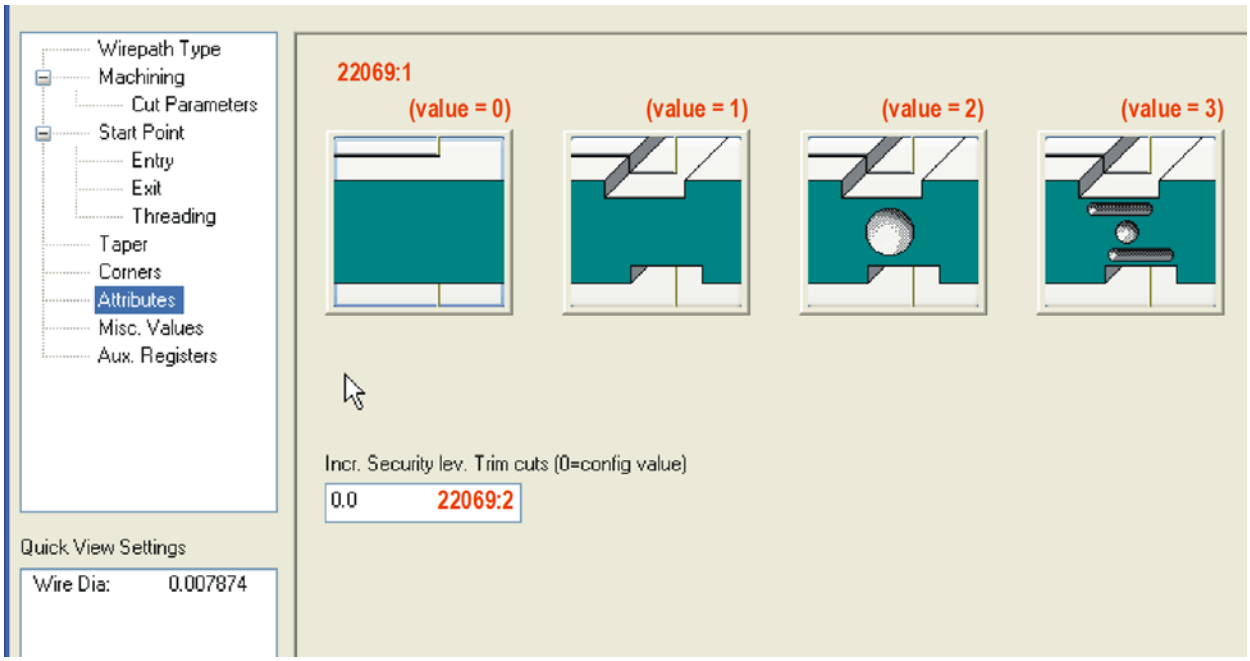
Wirepath parameters: Taper page



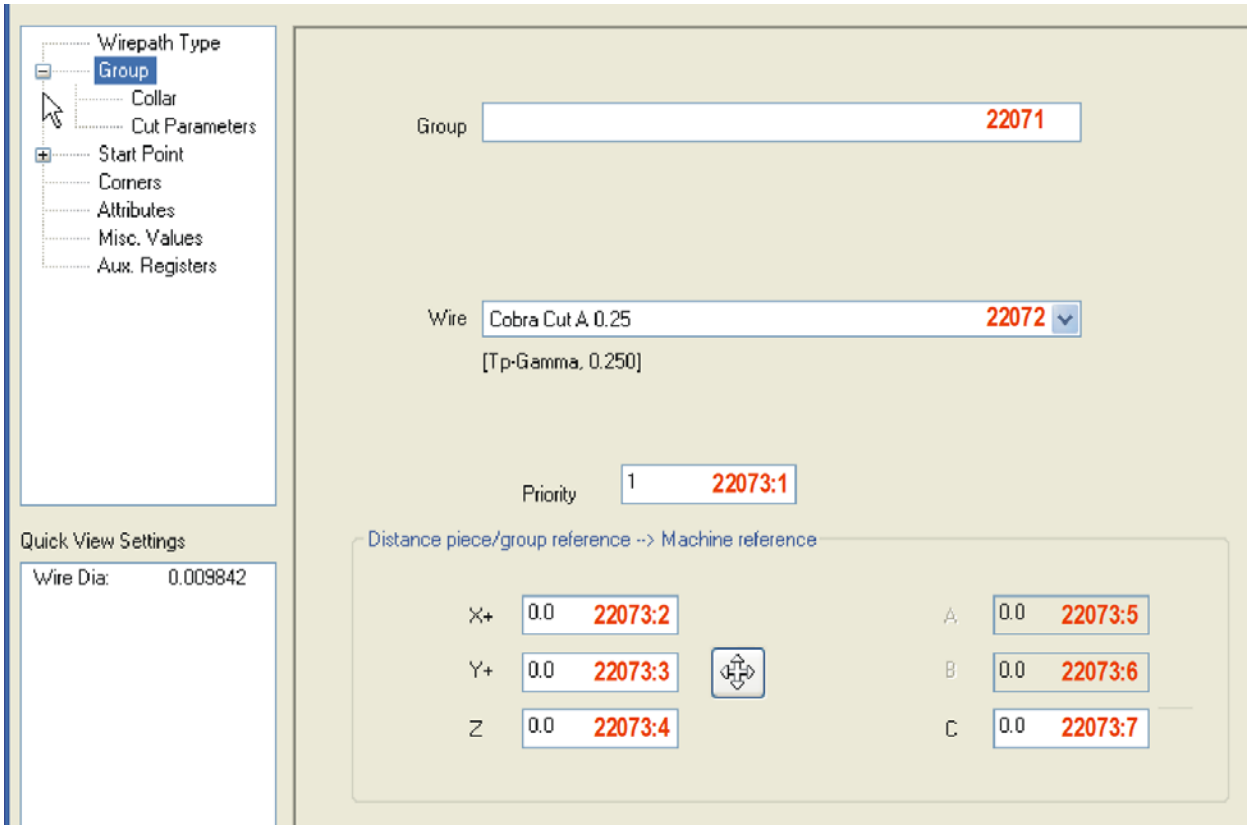
Wirepath parameters: Corners page



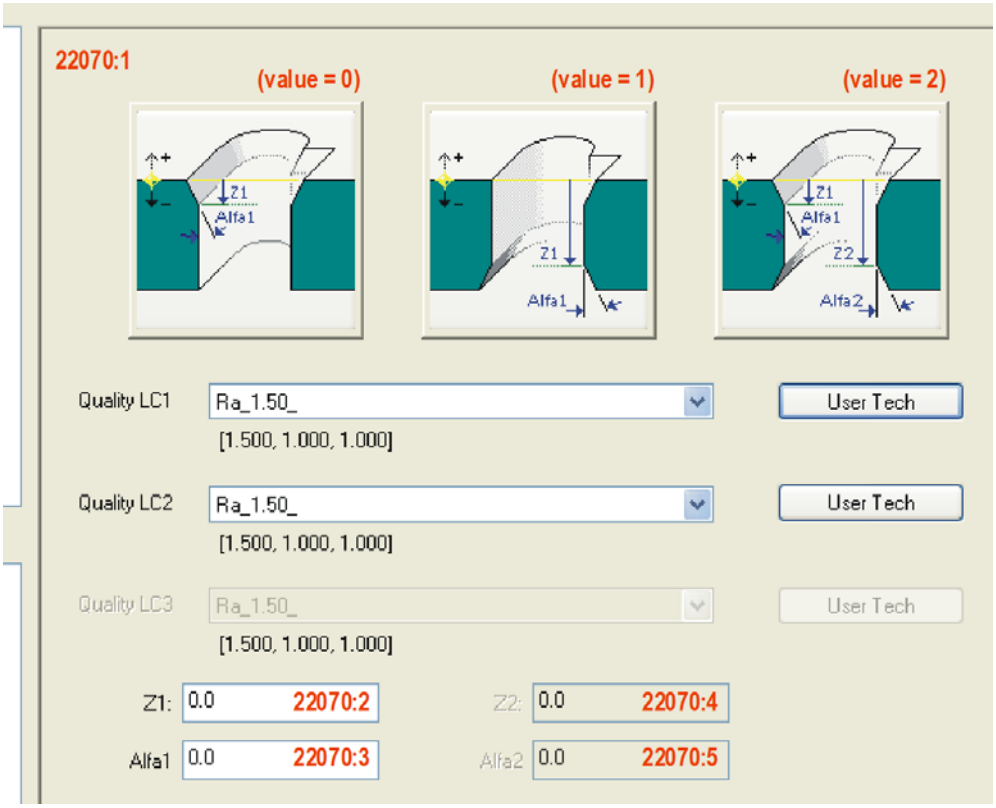
Wirepath parameters: Attributes page



Wirepath parameters: Group page



Wirepath parameters: Collar page



TECH library parameters

NCI lines 22001–22113 are output for each roughing cut and skim pass, for both primary and taper cuts. The data that you see and select in the **Technology Database dialog box** is read from the XML data in the .TECH file; not all of it is visible in the dialog box.

22101: Machine string

Used in: **Wire (TECH interface)**

Definition:
```
22101
string
```

Machine string; used to identify the library.

22102: Control string

Used in: **Wire (TECH interface)**

Definition:
```
22102
string
```

Control string; used to identify the library.

22103: Inch/metric

Used in: **Wire (TECH interface)**

Definition:
```
22103
1
```

Units integer. 0 = inch, 1 = metric.

22104: Power library comment

Used in: **Wire (TECH interface)**

Definition:
```
22104
string
```

Power library comment. This is a single string that is used for the entire library.

22105: Quality description/label

Used in: **Wire (TECH interface)**

Definition:
```
22105
string
```

Quality description/label. This is a comment that applies to the individual pass.

22106: Machining condition code

Used in: **Wire (TECH interface)**

Definition:
```
22106
string
```

Machining condition code. This is output as a string, although it only contains numeric data. This is also output with the tool change lines (NCI 1000/1001/1002) as the ccode$ parameter.

22107: Piece thickness

Used in: **Wire (TECH interface)**

Definition:
```
22107
1 2 3 4 5 6
```

This line consists of a string of 6 numeric values:

1	Minimum thickness of primary piece.
2	Maximum thickness of primary piece. Note that not all parts will have different values for maximum and minimum thickness; in these cases, a single thickness value will be output in both places.
3	Primary Ra. If the selected **Finish (Ra)** is a range of values (see **Technology Database dialog box** on page 143), the value output with this parameter will be the average.
4	Minimum thickness of taper piece.
5	Maximum thickness of taper piece; see note for parameter 2.
6	Taper Ra. If the selected **Finish (Ra)** is a range of values (see **Technology Database dialog box** on page 143), the value output with this parameter will be the average.

22108: Method for primary cuts

Used in: **Wire (TECH interface)**

Definition:
```
22108
string
```

The class **Method** for primary cuts.

22109: Method for taper cuts

Used in: **Wire (TECH interface)**

Definition:
```
22109
string
```

The class **Method** for taper cuts.

22110, 22111: Miscellaneous file paths

Used in: **Wire (TECH interface)**

Definition:
```
22110 / 22111
string
```

Miscellaneous file paths (if any). These are read directly from the .TECH file.

22112: Finish (Ra) for primary cuts

Used in: **Wire (TECH interface)**

Definition:
```
22112
string
```

Finish (Ra) string for primary cuts.

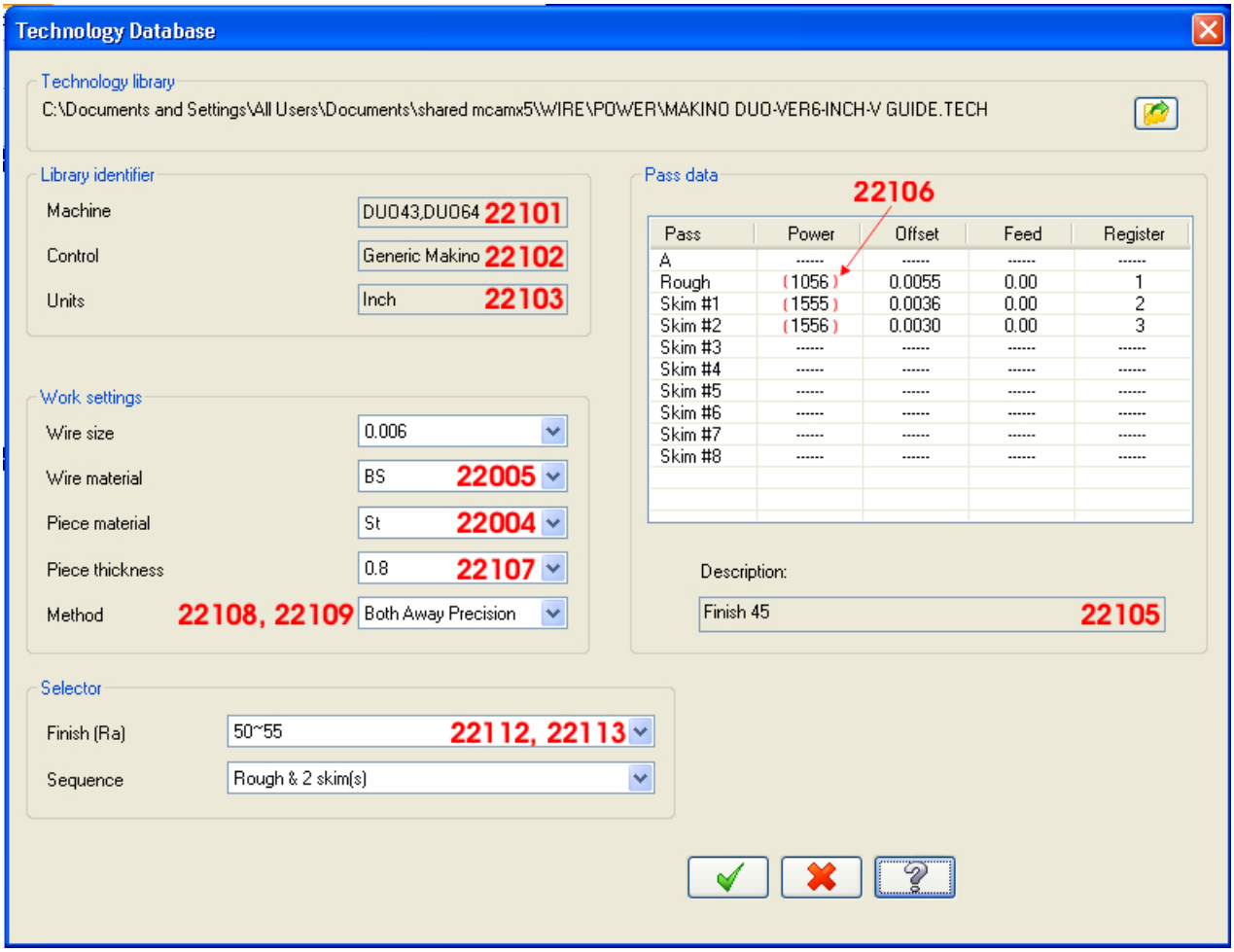
22113: Finish (Ra) for taper cuts

Used in: **Wire (TECH interface)**

Definition: `22113`
`string`

Finish (Ra) string for taper cuts.

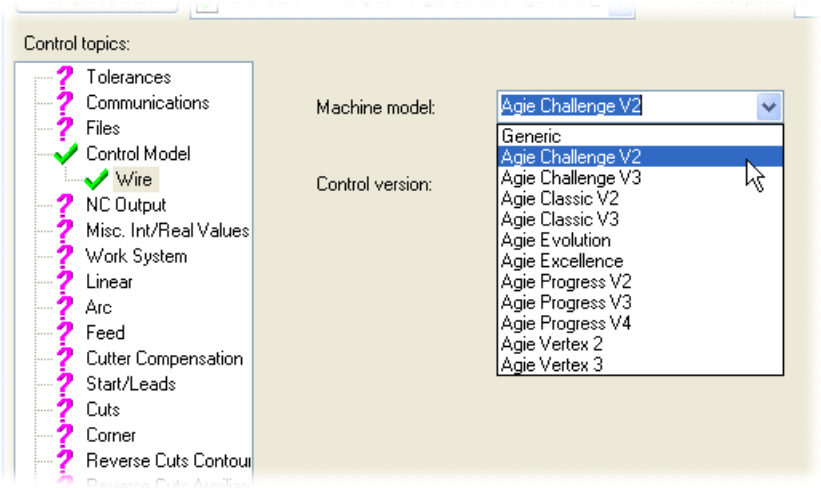
Technology Database dialog box



Validating the post for custom interfaces

Mastercam X4 introduced new validation routines designed to ensure that the post selected for the wire machine definition has been properly configured to work with the custom interface.

The Wire control definition includes a new **Control Model** page:



Selecting one of the machines from the **Machine model** list is what activates the custom interface.

- Select one of the Agie machines to enable the Agievision interface.
- Select the Makino or Mitsubishi machine to enable the TECH library interface.

The **Machine model** sets a new predefined variable, **controldefault$**.

- Selecting **Generic** sets **controldefault$** = 0. No custom interface will be enabled with this option.
- The 11 different Agie models set **controldefault$** equal to a value from 1–11.

In the Agievision post, you will see this line:

```
sx_nci_default$ : "1.11" #Enable posting for integrated Agievision
```

MP uses this string to construct a range of valid values (in this case, 1 through 11) that are used to validate **controldefault$**. So if the **Generic** machine model is selected in the control definition, **controldefault$** will equal 0 and an error message will be generated, because 0 is not included in the range of valid values.

In this way, the single Agievision post can be used with any of the 11 Agie models.

- You can limit the range of valid models by adjusting the value of **sx_nci_default$**.
- You can implement model-specific customizations by testing for the value of **controldefault$**.

For the Makino and Mitsubishi machines, there is only a single **Machine model**, so when you select one of these machines, the **Control version** option is disabled. This is always output as 0 on the 22002 line.

- For the Makino, **sx_nci_default$** = 100.100
- For the Mitsubushi, **sx_nci_default$** = 50.50

NOTE: The text of the **Machine model** string is also available directly as a string parameter, **22001**.